

The purpose of this letter is to keep the personnel of the Air Service both in Washington and in the field informed as to the activities of the Air Service in general, and for release to the public press.

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LIEUT. MACREADY'S ALTITUDE FLIGHT

"Altitude records will not be gauged by the superchargers themselves but by the physical limitations of the pilot", is the statement made by Lieutenant John A. Macready, Air Service, in his official report covering his record-breaking altitude flight made at McCook Field on September 20th last. Lieutenant Macready adds that before any attempts can be made to reach higher altitudes some method will have to be devised to eliminate the extreme hardships suffered by the pilot, due to the intense cold and rarefied atmosphere encountered at high altitudes.

Below is given the official account of this flight, the first part of the report dealing with the technical or engineering aspects of the flight, giving a summary of the data obtained bearing a direct relation to the supercharger, engine and propeller, and the second part recording Lieut. Macready's personal experiences in this flight:

"The flight was made for the purpose of climbing supercharged LePere P-53 to its absolute ceiling with one man. An extremely large propeller was used for the purpose of keeping down the revolutions per minute of the engine at high altitude. This propeller turned up 1100 r.p.m. on the ground. It was assumed that with such a low r.p.m. at low altitude that the r.p.m. would be approximately normal as the plane approached its ceiling. It would be giving its most efficient power at high altitude without endangering the engine and supercharger by overspeeding it.

On leaving the ground the supercharger registered 3000 ft. below sea level. This supercharger altitude was allowed to rise until sea level conditions were registered on the altimeter, and was kept at this point by applying the supercharger throttle until 7000 feet was reached, and was not touched from that point, with the exception of once or twice when it was necessary to reduce supercharger capacity, until an altitude of 35,000 feet was reached.

A peculiar and unusual condition arose during this flight. Instead of putting on supercharger with altitude, it was necessary to gradually take off a little supercharger as altitude was gained. The propeller r.p.m. speeded up with altitude, this probably accounting for the increased supercharging capacity, with the resultant necessity of taking off supercharger to keep it at sea level condition and thus avoid preignition. There did not appear to be an increase of r.p.m. after 35,000 feet was reached, and from this point on it was necessary to give additional supercharger to keep the supercharged altimeter dial indicating sea level conditions.

At the ground the r.p.m. of the propeller was 1100, and gradually increased to an r.p.m. of 1680 at 35,000 feet. The r.p.m. remained at this point until an indicated ceiling of 41,200 feet was reached. Sea level conditions were maintained until 40,800 feet were attained.

With the supercharger at capacity and the engine full on, registering sea level conditions, it was assumed that the climb could be continued into some region of pressure above the point of 100% supercharger efficiency. This assumption was based on the theory that the supercharger efficiency would drop off probably, as in the case of the unsupercharged engine power losses with altitude.

With the supercharger registering sea level conditions (100% efficiency) at 40,400 feet, this assumption seemed reasonable, but the developments in the next few minutes of climb did not justify it. From 40,400 feet but slight altitude was gained, the supercharger dial registering a tremendous falling off. Although it was expected that at least 6000 or 7000 feet more altitude would be realized, but 400 feet more altitude was gained. Within a climb of

this small distance supercharging conditions within the engine went from sea level to approximately 6000 feet above sea level, at which point the airplane remained suspended as to altitude. This was the absolute ceiling of the airplane - it would go no higher.

The extreme lightness or the lack of density of the atmosphere at altitude also affects the efficiency of the airplane itself and does not permit the same climbing conditions, even with sea level power on the engine.

The following story of personal experience will also bring out information regarding equipment and other conditions:

It was not a record I was after when I started out on the flight which ultimately resulted in upsetting Major R. W. Schroeder's altitude record, but to test a new propeller and additional equipment on the Moss supercharger, which has been experimented with extensively at McCook Field.

One of the functions of the Engineering Division is the development of airplanes and equipment for military use at high altitude. Continuous effort is being made to develop planes which will be better than the planes of other nations for combat or observation work at extremely long distances above the ground.

My record flight yesterday was a test flight and the record was incidental to the very valuable engineering, propeller and supercharger data which was obtained.

To Major Schroeder is due a large portion of the credit for attaining this altitude. His mishap made possible the safety of subsequent efforts. From his experience was gained invaluable knowledge and information which was used to safeguard the pilot in other flights. It will be remembered that Major Schroeder fell unconscious for six miles, froze his eyeballs and was in the hospital for two weeks as a result of the strain and shock.

The day was ideal - warm and clear - just the sort of day on which the best results are obtained at altitude. The warmer the day is the better instrument results are obtained, because the pressure and density corrections do not bring the final height so low after all the instruments are checked up and calibrated.

After a good night's sleep to insure the best physical condition for the flight, I arrived at the field and began at once to make the immediate preparations towards insuring reliability of all factors which are necessary to obtain safety and comfort when undergoing hardships which one encounters in this work.

The mechanic had stripped the plane of all excess weight by cutting out unnecessary equipment and by reducing the ordinary gas capacity. The supply of oxygen also was reduced for the reason that in all previous flights I had flown with an observer, thus making it necessary to have an almost double supply of oxygen.

Roy Langham had been my observer on all previous altitude flights, but in this particular case it was not necessary for him to take readings, as the data to be obtained were such that I could get them myself with very few readings and observations.

The plane climbed remarkably well considering the original slow speed of the propeller. This propeller was a very large one, having a ground speed of only 1100 revolutions per minute, whereas most propellers have a speed around 1600 revolutions per minute. The density of the atmosphere decreases with altitude, and a propeller turning slowly at the ground would have great speed as the plane arose more and more into the lighter air.

On one previous flight the propeller speeded up from 1450 revolutions per minute at the ground to 2400 revolutions at 34,000 feet, and on another occasion when attempting an altitude flight the propeller flew off the plane in the air, knocking off the airspeed indicator, which was attached to the wing strut, and hitting the strut, because of this excess speed.

For over a year I have been attempting to reach an altitude higher than had previously been made, but on all occasions something has broken while taking the plane up on the flight, and it has been necessary to descend in trouble. Oil pipes and bearings have broken in the engine, parts of the supercharger have flown off in the air, and the propeller has been lost in flight. The majority of these flights have been test flights around 25,000 feet for the purpose of obtaining data.

Everything was functioning properly during the early part of this flight on which the record was broken. As altitude was gained I became more confident that success would be obtained, because in all flights I have made with the supercharger none had shown such excellent functioning during the early part of the trip. All the mechanisms were working in excellent order. I began using oxygen at approximately 20,000 feet, using it sparingly at first in order that there would be sufficient in case of emergency.

I was well protected against the cold. Over my military uniform was a heavy suit of woolen underwear and over this was a thick, heavily padded leather covered suit made of down and feathers. On my feet were fleece lined leather moccasins. My hands were covered with fur lined gloves.

My leather head mask was lined with fur and an oxygen mask was attached to it. The goggles were separate and were placed on the outside of the head mask. The inside of the goggles was covered with a film of secret gelatin compound which was painted over the glass. The gelatin compound is for the purpose of keeping the ice from forming on the inside of the goggles. It is supposed to function in this respect to a temperature of approximately 60 degrees Fahrenheit below freezing.

In addition to the standard oxygen equipment of five flasks containing together a pressure of 2300 pounds, I had an additional emergency flask containing a pressure of 1500 pounds which would lead directly from the flask through a tube into my mouth. At 10,000 feet I passed through a stratus of clouds, and at 20,000 feet passed through another stratus which somewhat obscured the ground and hindered me in locating my position with respect to the geography of the ground.

I felt no ill effects whatever until well above 30,000 feet, as I was receiving plenty of oxygen and was plenty warm enough, but as the altitude above 30,000 feet was reached a slight slowing up of senses and faculties was noticeable, and this slowing up increased as altitude above this height was gained.

Any exertion causes need for oxygen. The faculties do not function normally. If I would stoop over to make some adjustment I would feel the need for oxygen. This need was manifested by the objects on the ground and the instruments in the cockpit becoming dim and shaky. Whenever I felt these effects I would turn on a little more oxygen which was flowing well and freely.

An altitude flight is a continual study or analysis of one's physical condition. How far one can go without collapse is the problem being studied. I have always felt that the last point of extreme danger could be determined in time, and that if it were not and the pilot became unconscious, the concentration, worry and determination undergone in striving to keep from loss of consciousness would quickly bring him to normal when favorable atmospheric conditions were reached in the same manner that one automatically awakens from sleep at a certain time if determined to do so beforehand.

I was worried at no time until approximately 39,000 feet was reached. At this altitude ice from my breath within the mask must have clogged the oxygen pipe for the reason that I felt the force become diminished and began to feel very bad effects from its lack. I tried to blow this out and did succeed in getting a taste of ice, but could not act quickly enough to clear the entire tube, so swung over onto the emergency flask and tore a small plaster from the side of my mask placing the tube through this aperture directly into my mouth within the mask, and in an instant was feeling comparatively normal.

I was supercharging to sea level condition at 40,800 feet (indicated) and expected that flying on the engine alone I would probably reach 7000 or 8000 feet more, but this was not the case. As soon as sea level conditions were lost on the engine, the power was quickly diminished and I could only get 400 feet more altitude, which was the absolute ceiling of the plane.

While hanging suspended at an indicated altitude on the dial of 41,200 feet, the plane swung and rolled, and very little action on the controls could be obtained. The controls were almost useless, as there was not enough sustaining surface to move the plane in the direction that was desired. It hung at this point practically without control, and I held it there for almost five minutes before I was absolutely certain it would go no higher. When assured of this, I pulled the throttle slightly back in order to glide down, but even with this small movement the bottom seemed to drop out of the plane and down it quickly went toward the earth.

Before I could make the proper readjustments the engine and radiator had cooled so quickly that there was no warmth in the cockpit from the radiator pipes running thru it to warm the pilot, and as a result it became much colder in the cockpit, resulting in ice forming on the inside of my goggles, making me almost blind for the instant, and I could not handle the plane correctly for a short time.

I was feeling weak and groggy and was afraid of passing out completely. My mind was not active and I could not think fast and correctly. However, I knew that by reducing my altitude I would come back to normal and be able to make all adjustments if I could get down lower. I let the plane come down almost any way in order to get it down where I could think correctly.

I neglected to say that just before, or while I was at the supreme altitude. I remembered that Major Bane had asked me to look above me while at the great height and see if I could see the stars or any constellations, and note the appearance of the sky and any peculiar features which might exist. This I did. I was unable to see any stars, but one fact was brought forcibly to my mind and that was the fact that the atmosphere was extremely bright and light. Instead of being a dark blue, as is the case at the ground, the sky was very light in color with but a slight blue tinge. There is far more sunlight and it is far brighter at this altitude than closer to the ground.

Another point that I neglected was the fact that while climbing to the ceiling I was circling around the city of Dayton, gradually increasing the size of the circle as altitude was gained, in order to always be within gliding distance to the field. This circle as altitude was gained increased its radius until at the top of the climb I was circling within a radius of about 60 to 70 miles. I attempted to keep this circle around with Dayton as the center, but strong heavy winds tended to drift me in various directions. I do not know what these directions were for the reason that my mind was not sufficiently acute to be able to know all these facts. The original part of the return to earth was made in a very confused state, but as altitude was lost elements of consciousness became clearer, and at about 30,000 feet I was beginning to feel normal again. Here I changed goggles and continued my glide toward earth, flying around at 20,000 feet for a period of approximately 20 minutes in order that the change in condition from my altitude to the ground would not be too sudden.

I landed and taxied to the line where the boys in the hangars and on the field were waiting, curious to know the results of the flight. A pool had been made in the hangar, the different mechanics betting on the altitude. Dr. Moss, inventor of the supercharger, won the pool with a guess of 41,000 feet. The actual calibrated altitude of the flight as indicated on the barograph charts was 40,800 feet, which is the highest altitude any living being has made.

I wish to call attention again to the fact that this record flight is but merely incidental in the development of superchargers undergone by the Engineering Division of the Air Service, and is the finished and perfected work of this development. Superchargers are in such a state now, due to the developments of the Engineering Division under Major T. H. Bane, Captain G.E.A. Hallett, Dr. S.A. Moss and Adolph Berger, that they should be fairly consistent at extremely high altitudes in the future. Yet, in my opinion, altitude records will not be gauged by the superchargers themselves but by the physical limitations of the pilots. To get much higher, greater provision of some method will have to be made or it will be impossible for a pilot to sustain the extreme hardship.

SUBSIDIES BY FRANCE FOR CIVIL AERONAUTICS ✓

In 1921 France granted a sum of 27,885,008 francs in bonuses and subsidies to aerial navigation companies for working the following lines:

Paris-London; Paris-Brussels-Amsterdam; Paris-Strasbourg-Prague-Warsaw; Toulouse-Rabat-Casablanca; Bayonne-Nilbao-Santander; Bordeaux-Toulouse-Montpellier; Saint Laurent-Cayenne; and Saint Laurent-Inini.

For the year 1922 these lines are to be continued, and the following additional lines opened:

Antibes-Tunis; Bucharest-Constantinople; Oran-Casablanca; Algiers-Biskra; Dakar-Kayes; Montpellier-Marseilles-Genoa.

This accounts for an increase of 9,137,000 francs in subsidies. The remainder of the subsidies requested will go to Civil Centres of Training for reserve pilots. Excellent results have been achieved by these Training Centres.