Instructions on Airplane Flying

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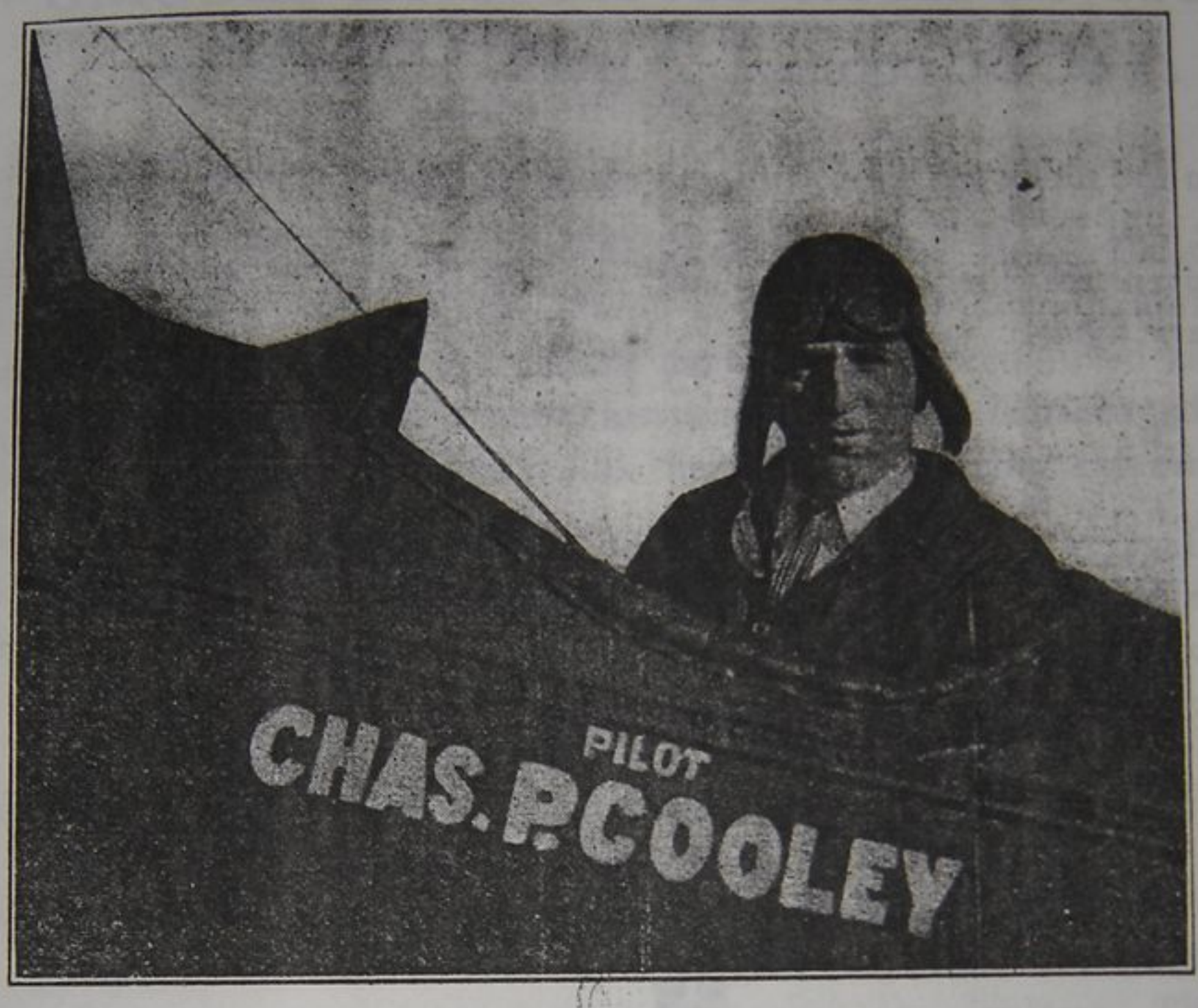

PREFACE

Charles P. Cooley, the author of this book and Instructor at San Carlos Airport, took a thorough course in airplane flying from a World War Pilot. When he had finished his course of instruction, a United States Inspector of San Francisco, California, gave him a rating of 100 per cent. He is known as a daring and successful stunt flier and a most thorough Instructor.

San Carlos Airport

INSTRUCTIONS ON HOW TO BECOME A SUCCESSFUL AIRPLANE FLIER

In the following pages, full and complete instructions on airplane flying will be found in a series of eight lessons, in which beginners are given the first principles and requirements in all feature of ordinary flying.

The principal and important stress indicated in these instructions is on the safe handling, management and care of an airplane.

"Hazards of the Air" should be given most faithful, careful intense study. There is little or no danger if a flier thoroughly understands the currents of air that exist, and the possible changes he may encounter when flying over mountain tops or in the valleys.

CHARLES P. COOLEY

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LESSONS

INTRODUCTION

The instructor of this correspondence flying course is a water and land plane expert, and a pilot with a wide and thorough experience in the flying world; and is recognized as an active practical flying and stunt instructor. He has taught many experienced pilots the art of graceful stunting. For a number of years past he has been engaged as flying instructor and cross country pilot for one of the most modern flying schools in the United States.

Prior to his engagement at the flying school Mr. Cooley had been flying at the many popular pleasure resorts along the Pacific coast, having been engaged in this type of flying boats and seaplanes for some years. With the instruction given in the following course we hope to give the reader a clear understanding of the principles of piloting an airplane. The reader must plainly understand that after reading this course he will not be able to pilot an airplane, but if this course is read carefully, thoughtfully and earnest study given it, it will help him to a great extent in learning from an instructor how to fly.

Flying is something one cannot learn from any book, though the instruction may be full and complete. Learning to fly from printed instructions may be compared to studying music from an instruction book, the notes may be understood but for execution on any instrument, a good instructor, together with faithful, constant practice, is necessary to become a successful musician. The same principle applies to a student in aviation, it takes real, actual flying with a competent flying instructor to become a successful air pilot.

Type of Airplane Used in Most Flying Schools, and U. S. Army

There are numerous types of airplanes, large and small, heavy and light, where the controls and controlling differ. Nearly all the heavy airplanes are dep control, that is, they are controlled by a wheel, and the lighter and smaller airplanes are controlled by a stick, as a stick responds twice as quickly. Most of the smaller airplanes are known for their speed, and in warfare are used as pursuit ships. A pursuit ship needs quick controlling for fast maneuvering in close fighting quarters, therefore the stick has the advantage over the wheel, as the wheel is a slow, but positive control, used exclusively in heavy planes where more strength is required for controlling.

A student will find that nearly all the flying schools use a Curtiss type JN4D commonly known as a "Jenny." This particular type of airplane is more difficult to learn in than many other types, but the student will be a more successful pilot than the one who learns in an easier controlled plane, as he becomes familiar with slow "take off" and slow climb, with fairly fast landing speed, therefore our instructor, Charles Cooley, will assume that the "Jenny" is in real, actual use in the following correspondence course.

FIRST LESSON

Explaining Curtiss JN4D to Student on the Ground

This particular type of airplane was designed in 1916 and built in large numbers in 1917 for the United States Government for the purpose of training large numbers of aviators for the war duty in the World War. This was the time the "Jenny" became generally recognized as the "Ford of the air." During the entire time of the war these planes were built throughout the United States and Canada according to Curtiss plans and patents. There were over 30,000 built between 1917 and 1918; although they are known as the "Ford of the air" this title does not imply that they are built cheaply, as they are one of the strongest planes in the world in proportion to the amount of power they carry, which is 90 horse power brake test. In construction the "Jenny" is very simple, this being a great advantage over most planes, as it has very few working parts to get out of order. Its working parts are out in the open, so the pilot may check up on his plane easily. Checking up on the plane each day is the first thing I teach my students, and consists of going over control wires, rudder hinge pins, wing pins, flying and landing wires on wings, and see that hub caps are on the axles. This inspection should be given daily, as one never knows who might have tampered with the plane, not realizing the damage done or the serious danger caused.

The "Jenny" has two cockpits from which the plane can be controlled by either, this is known as the dual control, designed for instructing student aviators. The dual control consists of two control sticks, one in the front cockpit and one in the rear cockpit; these sticks are located directly in the center of each cockpit and stand in a vertical position; just a little forward of these sticks, on the floor of each cockpit is located what is known as the rudder bar; the rudder bar controls the vertical rudder on the tail of the plane, while the stick controls the horizontal rudders also on the tail of the plane,

for the purpose of going up or coming down; also when stick is pushed from side to sids works what is called ailerons, which are constructed on the rear of the upper wings, known as the trailing edge; or sometimes they are constructed on both upper and lower wings, this is what is known as double ailerons; these which I have said, are controlled by the stick, and the horizontal rudders commonly known as the "flippers" in the flying world, are controlled when the stick is pushed forward or pulled backward. The stick is made fast to the floor by a ball and socket and works in any position. In the cockpits will be found two gas throttles, generally these gas throttles are of the hand type, one in each cockpit made fast generally to the right hand upper longeron, four of these longerons, two of which go to the entire length of the fuselage, and two on the bottom of the fuselage that run the entire length. These four longerons are the backbone of the fuselage. On the student's left is the ignition switch for the motor, being made fast to the upper left hand longeron.

Directly in front of you when you are seated in the plane is the instrument board; on this board are the following instruments: Oil pressure; altimeter from 0 to 25,000 feet; air speed for telling the speed of the plane; tachometer for telling the revolutions per minute of the motor; clock; banking indicator; thermometer to tell the heat of the motor, works by the water in the radiator; thermometer to tell heat of oil in motor crankcase; compass, also two lights over and above instruments mentioned, for the purpose of flying at night.

There are really only two of these instruments necessary for average flying, and those two instruments are the oil pressure gauge and the water thermometer. These two instruments should be noted occasionally while the plane is in flight for if the oil pressure should drop below 25 pounds the pilot should land and check up the oil system, or if the water thermometer should show a boiling hot motor, this would again cause landing to check up the water system.

LESSON TWO

Starting the Motor for the First Flight

The flying instructor now desires that the student pay strict attention and observe everything that is done and said in the process of starting the motor. The first thing the student must learn in starting the motor, is every morning make sure that the jet wells are cleaned, and the jets if necessary. The jet wells are located on the extreme bottom of the carburetor. The jet well is a brass nut with a little pocket drilled in the center of it, and it is these pockets in the jet wells that the gasoline must pass over before entering the jets to the motor.

There are four jet wells to be cleaned, two for the high speed jets, and two for the low speed jets. They are cleaned in this manner: Take a socket wrench and unscrew them clear out of the carburetor, and clean out whatever dirt there is, then place them back and make sure they are firmly screwed back, so that any possible vibration in the motor will not loosen them. The character of dirt generally found in these jet wells is water and grit, or if rubber hose is used in the transferring of gasoline into the plane there will most likely be found bits of rubber in the strainer in the bottom of the gasoline tank, or even as far as the jet wells. It is always best to strain the gasoline through a strainer, water will not pass through, for if any of this dirt accumulated in a great amount in the jet wells, it would be sucked up into the jets, and if too big to pass through the jet, it would clog the jet and the result would be the motor would start to miss, and lose practically all of its power, or if they were all to clog at the same time it would kill the motor.

This would cause what is known as a forced landing, and if the plane were not over a suitable field for landing, it would probably result in disaster to the plane and possibly

the occupants too. Whereas I believe an experienced pilot ought to be able to have a forced landing anywhere, what I mean by anywhere, is over cities and mountains, and water. To land in the heart of a city or mountain with tall trees, takes what is known as a "stall landing"; this type of landing is exceedingly slow, too slow for all landings.

Now that this has been thoroughly explained, and the jet wells have been cleaned, I will now bring to the student's attention two more dirt collectors that must be cleaned once every two weeks: one of these cleaners is a well nut that makes the gasoline line fast to the carburetor; this should be taken out in the same manner as the jet wells. The other remaining collector is a filter on the bottom of the gasoline tank where the gasoline line leads to the motor. This filterer should be cleaned by taking it from the tank and line and blow all dirt from strainer within; the strainer should not be picked with anything sharp, as it would enlarge the holes, and permit dirt to pass through.

The next operation in the starting of the motor, is to place a block in front of each wheel; these blocks in the aviation world are referred to as "starting blocks," they are for the purpose of keeping the plane from rolling forward when the motor starts and is being warmed up to a heat where it runs most efficiently. After placing the blocks in front of the wheels the instructor will then have the student walk around the plane with him, and while doing so the instructor will show the student how to make a careful check on the necessary wires, and other important parts before flight. After doing this, the instructor will then inform the student to take his place in the rear cockpit. When the student has taken his place, the instructor will then step to his side, and show the student his part to perform in starting the motor, which is to put the ignition switch on or off, and to hold the choke out while the motor is still cold.

After explaining this the student is commanded to pay strict attention to the calls thereafter. The instructor's part comes now; his part is to crank the motor by means of the propeller, as this part is considered as the most dangerous thing attached to instructing beginners, for, if by any chance the student should misunderstand the calling on the switch, or even get confused, it would perhaps cause the instructor serious injury or death, so the student is again warned to listen to no one but the instructor at the propeller.

The instructor will call out to his student "Off and Choke." The student should now look at the ignition switch and be sure it is off contact and at the same time pull the choke ring out; after doing this the student will answer "Off and Choke." The instructor hearing this reply will take a good firm grip on the propeller, turning it around eight or nine times so as to get a good charge of gas in each cylinder, then he will call out to the student, "Contact". The student now puts the ignition switch on contact and answers, "Contact." After hearing the call the instructor pulls the propeller down with a fast twirl to the right. If the motor fails to start ofter this operation, the operation will be carried out again until the motor starts.

After the motor starts it should be run at a low speed until the thermometer reads 150 degrees Fahrenheit, this requires about ten to fifteen minutes, according to the temperature of the weather. Now the motor is run with a full throttle just as though the plane were taking off for the air, the tachometer should then read 1300 or 1400 revolutions per minute.

LESSON THREE

The Student Is Now Ready for His First Flight at the Controls

The motor is now warmed to 180 degrees Fahrenheit, this is the efficient running heat for most all aviation motors. The student is still in his seat in the rear cockpit, and it is now just before the first "Take Off" that the instructor explains all the controls that the stick governs, and the movements to use in executing the controlling of the plane. On the floor of the cockpit the student is shown the rudder bar. The student is now informed that he must press harder on the right foot, this is done to keep the plane in straight flight, as the propellor tort turns the plane to the left. Just how hard one should hold his right foot on the rudder bar cannot be explained in writing, but takes actual experience in the air to give the student what is known as the "sense of feeling."

When in the air the instructor will point out some object in the distance, generally a group of trees or similar landmark, instructing the student to head for the object. This is done so the student will learn to overcome the propeller tort. Propeller tort is caused by the propeller turning to the right, thus having a tendency to turn the plane to the left.

The student is also given hand signals when up in the air as one cannot talk while in flight, on account of the noise of the motor, and the wind from the propeller passing through the wires of the plane, consequently the student is given all his information that requires speech on the ground before going up.

Now the instructor thoroughly explains and demonstrates the hand signals that will be used in the air. The instructor has the cockpit directly in front of the student. Therefore it makes it possible for the student to see the instructor's hand signals which are given out the side of the cockpit, generally over the right side.

It is impossible to explain the nature of these signals as they are given according to the position of the plane. Now

that everything has been explained in a very thorough and instructive manner, the instructor takes the "starting blocks" away from in front of the wheels, previously put there for the purpose of warming the motor. He now takes his place in the front cockpit, and "taxis" the plane to the fairway, finds the direction of the wind by means of what is called a "wind tunnel," or "sock," this telling the exact direction the wind is coming from. After finding the direction of the wind, the instructor will point the nose of the plane into the wind, and then open the gas throttle wide while the plane is "taking off" after the plane attains an altitude of approximately 200 feet. The student will note that instructor will bring the gas throttle back about half speed, as after the plane is up it does not require so much power.

After the plane has attained an altitude of 1500 to 2000 feet the instructor will then motion for the student to take hold of the stick, with the left hand only; at the some time place his feet on the rudder bar. Now the instructor has his battle as a new student always takes what is known to flying instructors as the "death grip" on the controls. The so-called "death grip" soon wears off as the student gains more confidence in himself.

The first flight to a student is very difficult and sometimes discouraging, and gives him the impression he will never learn to fly, but he must forget discouragements and train his mind to what he wants to accomplish.

The student is kept very busy in this lesson in the air, also the instructor is kept busy correcting the mistakes the student makes, as the student always does the wrong thing in his attempt to master flying. The new student's common faults are, he will always point the nose of the plane too high; this is a very bad fault as it increases the climb to a point where the plane will lose its flying speed and stall, and if the plane were under 200 feet it would be almost impossible for the most experienced aviator to even think of right-

ing it. Whereas, if the plane is very high it will go into a tail spin. Here is where the student will appreciate a competent and cool-headed pilot with him to correct his mistake.

The student if taught by an experienced flying instructor, will learn to keep the nose of the plane down. The student will learn that keeping the nose down will be the main thing the instructor will require of him for safe maintenance of flying speed.

Speed is the main requirement in flying. Flying speed means the least speed it takes to go into the air. For instance, the Curtiss JN4D requires a speed of approximately 50 miles per hour, in still air, before it will get lift on the wings that is safe to fly with. The Curtiss JN4D has a top speed sufficient for safety and quick handling. At times when the plane is high enough the instructor will let the student climb too much and get into a tail spin, and when he thinks the plane has spun down far enough to give the student a thrill of his life, he will then right the plane. After the landing is made the instructor explains to the student that he should not be frightened of the tail spin, as he let him get into it on purpose, and the result is that the student the next time will understand what it means to keep the nose down.

Another common fault of the new student is, he will over control; mostly on the rudder; this results in the plane flying in a side slipping manner, that is to go along forward slightly side wise. This again brings up the speed subject, being that speed is all that makes the heavier-than-air airplanes fly. I constantly impress this fact upon the student's mind. When the plane is in the air it tries to go in all directions; its nose will point up or down, it will go down on a wing, that is one wing will be lower than he other; also try to go side wise; all these faults unless corrected will cause the plane to lose altitude and speed.

After the first lesson in the air, however, the student realizes he had a difficult task on his hands, but is very anxious for the next lesson. The average lesson one half hour.

LESSON FOUR

Turning and Ba. king

A pilot, no matter how expeyienc d, is p[illegible] good flier until he can turn and bank ra[illegible]fully. Numerous pilots flying every day can make g[illegible]eful l[illegible]ndings and "take offs," but fail to turn gracefully, much to t[illegible]eir embarrassment, as other pilots make fun of the pilo[illegible] who slides all over the sky in an attempt to turn. In so[illegible]e cases it is not that they cannot turn gracefully, but is due to pure carelessness on their part. Although in most cases [illegible] the student makes these common mistakes, they [illegible] on the student's instructor, as not being a capable flier himself.

Banking is the most important part of turning, this part being possible through the co-operation of the ailerons on the wings, and the exact way to handle the ailerons has to be accomplished through real flying experience, as the operation requires the "sense of feeling." For instance if the student were told very plainly just how a turn should be made he would not by any means be able to go up and bank properly. As I previously stated it takes actual flying experience with a competent instructor to tell the student his faults, and to tell him how to overcome them, which the student will find are not so hard to overcome providing he will pay strict attention to what his superior flier instructs him to do.

The banking process is controlled by the ailerons which I have formerly stated are controlled by the stick. If a left turn is desired, the stick will be tilted to the left side of the plane, and the rudder bar being pushed forward on the left side of the plane by the left foot, as the left foot is used for turning to the left, and the right foot is used for turning to the right; in turning, however, the stick and the rudder bar should be worked simultaneously.

The principle of tilting the stick will now be thoroughly explained. For instance, when the stick is tilted to the left it puts the left wing of the plane down, and the right wing up, reversing the operation where a right turn is desired. The reason why banking is required to make flying safe, is for the same reason that racing bowls are constructed in the shape of a saucer; for a racing car traveling a speed from one hundred to one hundred and thirty miles per hour would turn over and over if the driver attempted to turn on a level course.

The airplane instead of turning over will go into a tail spin if the pilot attempts to turn without the employment of banking. Some pilots turn without banking enough; this sort of a turn has three different names; the following names are: "flat turn," "sliding turn," and "u. t. turn," the latter name meaning "undertaker's turn," this name being very suitable, as not banking enough at low altitude can result most disastrously. The plane must be banked according to the turn. If in a short turn the plane must be banked steep. The proper angle in which a plane should be banked cannot be explained in a book, but is learned through the "sense of feeling"; there is practically only one thing that one has to go by to tell if one is turning correctly, and that is the "slip stream," from the propeller, this method being very good.

It is practiced in the following manner: Suppose the plane was turning to the left, and the "slip stream" was beating against the right side of your face harder than on the left, this would indicate the plane was not banked steep enough; or if you were to find the "slip stream" harder on the left side of the face, this indicates the plane was banked too steep, and slipping inward on the low side.

The "slip stream" I speak of, is the wind created by the turning of the propeller, also caused by the forward motion

of the plane. This wind pressure should be felt even on both sides of the pilot's face. A plane can be banked vertically for making a very short turn; this is not a safe practice at low altitudes unless the plane is very fast, as a "vertical bank" kills speed, and the plane then drops into a "tail spin."

In a vertical bank the plane is controlled differently than in an ordinary turn, as, when the plane becomes vertical, that is when the wings are tilted at right angle with the ground below. In this position is where the controls change action; for instance, the vertical rudder takes the place of the "flippers" and the "flippers" take the place of the vertical rudder in the turning of the plane in its course.

Another important factor in turning that must not be overlooked, is to consider the direction the wind is blowing from—the pilot should always know his air conditions. For example, we will say the plane has just "taken off" into the direction the wind is coming from and the pilot desires or has to make a turn and go with the wind, a turn of this nature should be a big turn and made slowly, if it were made short and fast the plane would not be able to get its flying speed quick enough and would result in the plane losing the lift on the wings, and if the plane were low, it would result perhaps fatally to all, as the plane would crash to earth with a speed above normal flying speed.

To make this plan to all I will explain in a more simplified manner, say the wind is blowing fifty miles per hour and the plane's flying speed is fifty miles per hour, this would mean in order to go with that wind the plane must travel at a speed of one hundred miles per hour in order to keep the proper lift on the wing surface; that is why you have to turn slowly to go with the wind. To be going with the wind and desire to turn back into it, is not so hard a task. Another safe thing to practice in turning, is to keep the nose of the plane at least level.

LESSON FIVE

The "Take Off"

The instructor now finds the student confident in his air work, such as banking and turning, and keeping the plane level, and now the instructor decides to bring the student to a lower altitude, where the teaching and practice of "taking off" will proceed. The first three or four "take offs" are made by the instructor in a dual manner; that is the instructor is the one who really flies the plane off the ground, while the student just takes hold of the controls very lightly. By doing this the student gets an idea and the "feeling" how to proceed with the "take off" when he is asked to try it.

The "take off" lessons are generally given in the morning, as the air conditions are usually calm and still, each lesson lasting from half an hour to forty minutes, largely depending upon the student as to how long he can stand "taking off," as the student most always becomes over confident resulting in his not doing as good as he did in the early part of his lesson. The first thing the student will learn in getting ready to "take off," is to have the nose of the plane pointing in the direction the wind is blowing from, as taking off and landing should always be done with the plane going against the wind.

The practical way of finding the direction of the wind, is made possible by means of a "wind tunnel" or "sock" made of silk, and the shape of cone. The "wind tunnel" or "sock" is generally located on the corner of the hangar, or if the field has no hangar, it is then placed on a flag pole so it will be out in the open as it must register the wind from all directions.

Every flying field should have a wind tunnel as a pilot can tell with just a glance exactly which way to "land" or "take off." If there is no wind it is safe to "take off" in any direction, providing the field is large enough to guarantee the plane time to have altitude enough to clear any object that may be in its path.

The "take off" should never be attempted going with the wind, as it is very dangerous for the simple reason, that

any one should understand, it would increase the "take off" speed to the extent of the wind speed, requiring a longer run on the ground before "taking off," and if the field is short the plane would fail to get "off" and would smash anything that might be in its path. In this case if the pilot sees he is not going to get "off" in time, he should shut off the motor and "ground loop" the plane.

"Ground loop," as termed by experienced aviators, means to turn the plane quickly from the direction it is traveling, to the opposite direction, this type of turn is made entirely on the ground. Also if the wind is very strong it is possible for the plane to be turned over on its "nose" or even upside down. After all this has been explained carefully and thoroughly, digested in the student's mind, it is then time for the student to make an attempt at "taking off." The instructor will taxi the plane to one end of the field pointing the nose into the wind; after doing this, the instructor then calls out to the student, "are you ready"? and the student assuring himself he is, will reply, "yes," and then the instructor opens the gas throttle wide open, so the motor will have its full power. The plane now starts down the runway at a rapid speed, and when the gas is first opened the student must simultaneously push the stick all the way forward so as to get the tail off the ground to a point where the plane becomes level, and is riding on its two wheels gathering speed enough to go up.

As the plane gathers this flying speed the stick must be brought back gently, to prevent the plane from turning over on its nose; as the plane gathers speed, the wind increases on the "flippers" and tends to send the plane over on its nose; that is why the stick must be brought back gently. The plane should "take off" by itself if kept level, it is very seldom necessary to pull the stick back very far, for a "take off" depends largely upon how the plane is loaded.

When in the air the plane should balance, also in "taking off" the plane must be kept absolutely straight, while the two wheels are still on the ground, for to turn at a high rate of speed with the wheels on the ground would turn the plane over, tearing its wings and "landing gear" off and perhaps result fatally to those in the plane. After the plane has taken off and flown approximately two hundred feet with the nose down it is safe to turn or climb. This is done in order that the plane gets sufficient flying speed.

LESSON SIX

Learning to Land

The student has already collected considerable knowledge in the capacity of how a landing is made, while learning to "take off," and will find learning to "land" a plane will be a comparatively easy task, although it is no picnic. The success of any aviator depends upon his skill at landing gracefully, and his ability in turning and banking. A flier is not a capable pilot or is not recognized as such, until he is able to make all his landings "three point landings."

The meaning of "three point landing" is to bring the plane down to earth, landing on its two wheels and tail skid simultaneously; this makes three points of the plane touch all at one time, therefore it is termed as "three point landing." While learning to land the student will gain further knowledge in learning to "take off," as in learning to land he has to take the plane off and go around to the other end of the field, in order to land where he took off from.

Each time the plane goes around the field, it climbs to an altitude of approximately three hundred feet, to glide to earth on, this is where the student learns to glide, as there is a proper angle for gliding; and this angle of gliding has to be learned through experience as it is a "feeling" that dawns upon one. Not to glide steep enough is exceedingly dangerous, this type of glide is called a "flat glide," commonly known as "stretching the glide." The plane, if the gliding is too flat, will fall into a "tail spin."

The first landing comes in this manner: The student "takes off," goes around the field under the direction of the instructor, making a turn at the other end of the field, thereby pointing the nose of the plane into the wind. When this is accomplished and at the proper distance from the field, the instructor will signal the student to "close the throttle" until the motor is only idling, and when doing this the stick must be simultaneously pushed forward, thus pointing the nose downward so as to maintain the plane's flying speed, and in this position the plane is gliding downward.

As the plane glides to earth the student should pilot it to the place where the landing is desired, he must maintain his speed until five or six feet from the earth, and then he

is to "level off," that is he stops the downward progress, and lets the plane lose its speed; at the same time bringing the stick back gently as the plane loses it speed. This brings the tail down so it will touch the same time the two wheels do. This as previously mentioned, is a "three point landing." The plane will then commence rolling down the runway, the stick should then be pulled all the way back to prevent the plane from bouncing and damaging the wings and other vital parts. It is also drawn back to retard the speed of the plane, as the wind passing over the "flippers," when they are pulled up, puts more weight on the tail skid.

Some student fliers often misjudge the distance in landing, they will level off too late; this put them too far up the runway, and if there should be anything in the plane's path, the plane would crash into it, that is, if it were not "ground looped" as previously explained. A student should always bear in mind that a plane should never be landed going with the wind, as this increases the landing speed to a dangerous point, making the controls practically dormant.

Do not lose sight of the fact that I previously stated, one must know how to gracefully land at all times before he is recognized as an aviator, and one should keep in trim by practise. In the manner of making one landing after another, this would be suggested by any experienced pilot.

LESSON SEVEN

The Solo Flight

On some bright morning early the student gets the thrill of his life. The instructor will go up with him two or three times, and finds that everything is ideal for the student to go up by himself. The instructor will then get out of the plane and ask the student if he feels confident that he can go up alone.

This is only done when the instructor knows for certain the student is capable of doing so, it is really nothing to become alarmed over; although the student's heart is now beating way above normal, but he realizes he should not get excited, as he would perhaps, misjudge his distance.

On the "solo flight" the student will find that the plane wants to climb much faster, this is because the instructor is

not in the plane, and the plane is much lighter, therefore he must keep it down to the altitude previously flown with the instructor, or chances are he will "overshoot" the field; that is, he will misjudge by not coming down soon enough and run too far up the runway.

Another important fact that must be mentioned, is, the plane on the "solo flight" will glide further than it will with another occupant in it, therefore the student must close the gas throttle sooner, in order that he may land in the same place he did when with the instructor.

LESSON EIGHT

How to Right a Plane Out of a Tail Spin

Learning how to get out of a "tail spin" is very easy, therefore is not a very long lesson, lasting approximately one half hour, most of the time is required in getting the altitude in which the student is accustomed to practice, this being approximately four thousand feet. This altitude being safe for the performance in the instructor's knowledge, the instructor will place the plane into a "tail spin," and the student having been previously told how to right the plane, is expected to get the plane out of its twirling nose downward course. This being accomplished by neutralizing the controls as though in straight flight, the plane will quickly respond.

In four thousand feet the "tail spin" is practiced about five times; that is all that is necessary to know how to get out of a "tail spin." Some flying schools do not teach the student how to get out of a "tail spin," and the result is if the student flier ever gets into a "tail spin" he does not know the first thing about righting the plane, and perhaps ends most disastrously with the plane "spinning" right to earth, with chances of killing the occupants. In the years I have been instructing inexperienced pilots, I have always taught every one of them how to right the plane from a "tail spin" before I would let them solo.

THE END

This entire course is prepared by
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HAZARDS OF THE AIR

In explaining "hazards of the air" I do not explain them merely on the basis of theory, but from some real, actual flying experience in and about the United States, therefore everything that is explained hereafter, will be from some episode in my career as an active aviator.

First of all the long dreaded "air pocket" will be explained in a very thorough and instructive manner, as it has been proven to me while in flight thousands of feet above mother earth. Now as a matter of fact there is no such thing as an "air pocket," however in the early days of aviation when there was an airplane accident, and the real cause could never be determined or known, naturally those who witnessed the airship accident, thought it possible there was a "pocket" in the air, that is to say, a place where there was no air.

If one will stop and think, how can it be possible for such a "pocket" in the air when science has proved that there is an air pressure of 14 7/10 pounds at sea level; therefore with this pressure it would be impossible for a pocket in the air as previously believed.

Air flows much the same as water, and is in every respect much the same as water, and practically every one knows there are no "pockets" in the ocean or any other body of water; this same fact applies to the air. A deep sea fish when brought to the surface expands, its eyes even standing out further than normal, this being possible, due to the water pressure below the surface; this also applies to man at extremely high altitudes. There is less air pressure as one goes up, the air pressure decreasing approximately 1/8 pound per thousand feet.

The so-called "air pocket" is nothing more than a down current of air, caused only when there is wind blowing, being created mostly over mountains and trees, also buildings. I will, for example, explain the air conditions over mountains: Say that a mountain bordered by the ocean on one side, and the valley on the other, therefore if the wind were from the ocean side into the valley, one would find that on the ocean side that the air would would be deflected upward, and on the valley side where the mountain sloped down, one would find a down current, caused by the air traveling down into the valley. Following the contour of the moutain, this is known properly as "dead air," and was long known as "air pockets."

When the plane gets into this "dead air" the pilot should not attempt to climb as though he were in good air, as the plane would only stall. Climbing the plane in a current of air as mentioned above, has been the cause of many airplane accidents.

To give the reader a clearer and better vision of this "dead air," I will describe one of my many experiences over mountains. It took place over the Ridge Route en route to Los Angeles. I had "taken off" at Bakersfield and was flying up the Northern slope of the mountains, the wind was traveling in the same direction I was, therefore it was possible to get altitude quicker. As previously explained the air was deflected up, taking my plane up with it to an altitude of ten thousand five hundred feet. Upon reaching the Southern slope of the first range the plane started down with the current.

I knew there was no use trying to climb; so I let the plane go down to where the down current stopped its downward course, which was one thousand feet from the ground in a canyon, with mountains high above on both sides of me. I followed this canyon until I reached the next range, and already being on the Northern slope in which the wind was again deflected up, taking the plane up again with it, only to go down again on the other side in another canyon. This canyon was Whitney canyon and leads into the valley at Van Nuys.

This would not have happened if I had a plane with just a little more power, as I could have got above the down currents, which in my case would have been approximately one thousand feet higher than I was, largely depending upon the velocity of the wind. The plane I was using was a training plane. Most any of the modern planes with their modern wing designs, would not have been bothered.

In flying over a city there is, very seldom, a down current found, but the air is found very rough, as it is disturbed by the buildings. Trees create a down current the same as mountains, providing there is a wind blowing, and if the plane gets close enough to them, it will be affected. However I find that, when I am flying a modern plane I have nothing to worry about, therefore I believe an airplane is the safest means of travel today.

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