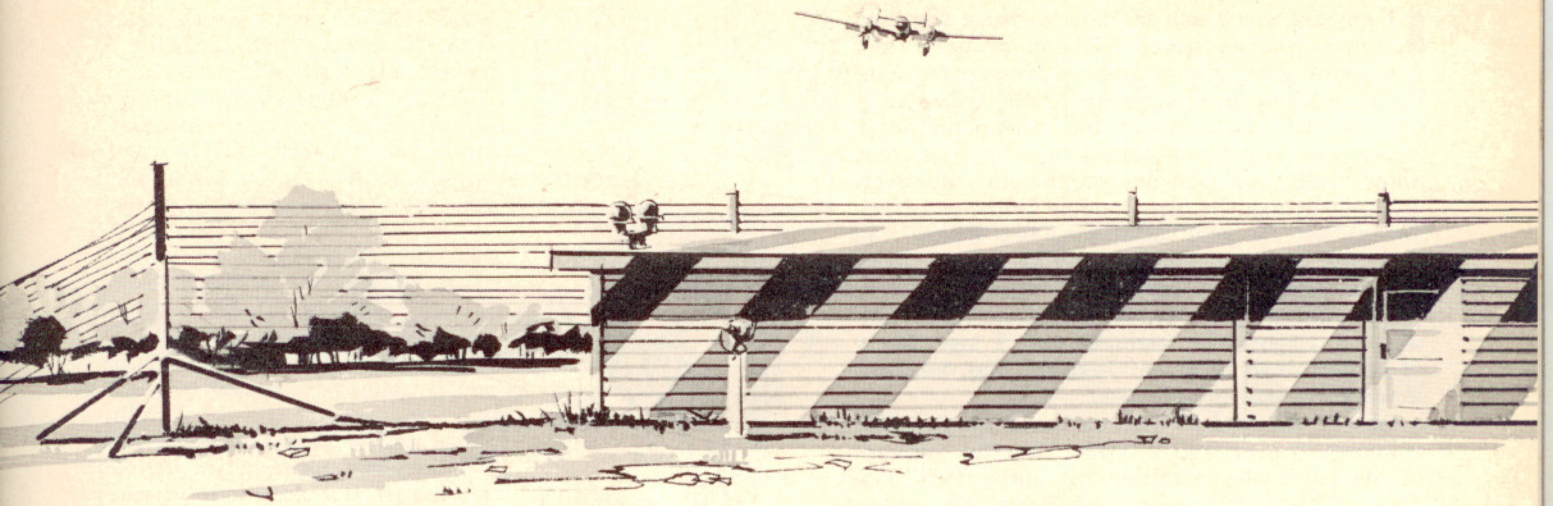

Flying The ILS

Following the glide path is not reserved for professionals alone, but your ground work should be thorough before you attempt it

by JOHN R. HOYT

We laughed when the pilot tuned in the ILS and lined himself up; he didn't have complete ILS equipment in his plane—how could he fly the ILS? He did have equipment that would receive the ILS localizer, and the needle did swing to one side.

At that moment we tried to figure out where we were. The mental gears ground furiously, albeit slowly: "Let's see . . . the needle's in the blue side, and that means we're in the blue sector . . . or does it mean we should fly toward the blue sector? We should turn right . . . no, left . . .?"

Which way should we have turned? The answer is that we should have turned around and flown home, because our ground work had been neglected. There is an easier way to fly the ILS, it CAN be used without complete ILS equipment, and there IS a method so easy that one hardly has to think about which direction to turn. Most certainly one need not think about the confusing color system.

Nowadays, with so many private pilots possessing equipment which enables them to use the *localizer* of an Instrument Landing System (ILS), and with so many pilots believing that flying the ILS is difficult, it is time to dispel the illusion that flying the ILS is reserved for professionals. As a wit remarked: "Not every lightplane has an ILS and a refrigerator, but if they were so equipped there'd be ice cubes handy."

Bring along an ILS chart of your area (available from the U.S. Coast and Geodetic Survey, Washington, D. C.). This chart contains, among other bits of valuable information, the ILS heading, the distance of markers from airport, the altitudes at which to cross markers, and not least the frequencies of the ILS, markers, and beacons.

"But," someone demurs, "I can't fly a glide path (or glide slope)—I don't have the complete equipment!" But he probably has a VOR receiver which *may* receive the *localizer*. The *localizer* is the main signal of the ILS: it is the name given to the radio signal that is lined up with the runway in order that the plane may be *located* to the right or to the left of the runway, and preferably exactly in line with it. The portion of this localizer that is north of the runway is the "blue" sector, while the southern half is "yellow." Now that you know on which side you may find blue, proceed to forget about it. There is an easier way to locate yourself.

The other part of the ILS is the glide slope. It is a signal beamed from approximately the touchdown part of the runway at an upward angle of about 3°, the average power-on gliding angle for planes with approach speeds of 80 to 180 m.p.h. At 104 statute m.p.h. in still air the rate of descent is 440 f.p.m.; at 173 m.p.h. the rate of descent is 730 f.p.m. It has no color system, but the method used to fly the glide slope is exactly the same as the one to be described in flying the localizer—and it's easy.

Let's make a run on Los Angeles ILS (the method is the same for all ILS's, but the localizer frequencies differ). Glance at the top of our ILS chart and find the frequency: 109.9 megacycles (mc). Turn on the radios, tune in 109.9, and identify Los Angeles, for which the chart says the identifier is "LAX." The Morse code actually says "I-LAX"—the "I" (two dots) being used to distinguish the ILS from other LAX signals like VOR, etc. We check the needle, listen to the signal, and prepare to take off.

"Wait," you say. "What about the glide slope?" Don't worry about the glide slope! The glide slope has already been turned on (if you have complete ILS equipment) ever since you turned on the ILS. G.S. receivers are fixed-tuned to 335 mc, but are tuned so broadly that they receive all glide slopes in the U.S. Inasmuch as the G.S. is beamed upward, into the sky, there is no use in having different frequencies and tunable receivers for glide slopes. Thus your slope radio receives LAX on 338.8 mc, yet has no

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interference from nearby Long Beach, 16 miles away, on 335 mc.

We'll take off and fly outbound. To shorten the discussion, we'll eliminate the transition from omni or other holding fixes and place ourselves in position for a straight-in approach about 15 miles out. Then we'll call Los Angeles Approach Control on any of the frequencies given on the chart.

This is mandatory: with traffic as congested as it is, we want to avoid the big airliners that arrive so frequently. The only good thing about hearing four fans vibrating overhead is that it tightens flabby stomach muscles. We contact LAX Approach Control, request a practice ILS run, and advise them that we'll listen on the ILS frequency of 109.9, inasmuch as we should monitor that frequency anyway.

The tower makes a reply something like this: "Los Angeles Approach Control clears Beech 777 to the Downey radio beacon; maintain 3,000 feet, cross Downey at 3,000 feet, hold east of Downey in a non-standard holding pattern. Expect approach clearance at :24. Over."

You repeat the clearance back to Approach Control (this is essential because it assures Approach Control that you have received the clearance correctly). You note the time—you *must* have the correct time on the panel clock—and observe that it is :13 minutes past whatever hour it happens to be (the exact hour is omitted in voice communications to save *time*, as it were).

Now glance at the chart. Downey is a dumbbell-shaped fan-marker with a small circle in the center: the circle represents non-directional beacons on low frequencies, used by pilots who have Automatic Direction Finders; fan markers, however, are on 75 mc, and emit a signal which causes a panel light to flash dots and dashes—Downey, for example, sends an "A" or dot-dash. A 75-mc fixed-tuned receiver is required for this, but it is the only other receiver needed to make a modified ILS approach, as it tells us when we're over any one of the three markers between us and the airport (the Downey marker, the Outer Marker, and the Middle Marker).

Now compute your ETA's. The chart shows Downey 7.8 *nautical* miles from the outer marker (shown as "OM" on the chart), and 4.7 miles from OM to the Middle Marker (MM). At an approach speed of 104 statute miles we'll estimate OM in five minutes-plus, and MM in a total of eight minutes-plus. Adding those times to the time of our actual Downey departure (presuming it will be :24) we get an ETA of :32 at MM.

The fun begins as we cross Downey at 3,000 feet and check the time: we control our holding pattern-and-turns in order to be at Downey inbound at :24, because if we are one minute late every other plane behind us will also be delayed one minute. At :24 we see the light flash as we cross Downey inbound, and Approach Control radios, "Beech 777 . . . cleared for a simulated ILS approach, report over the outer marker. Over."

We acknowledge and repeat, while the co-pilot runs through the check-off list, leaving gear and flaps to go (except that in some aircraft one-quarter flaps have been used during maneuvering speeds to increase the stability of the airplane). In your acknowledgment you tell Approach Control you're leaving Downey *and* 3,000 feet inbound because the chart says "aircraft must descend from 3,000 immediately after passing Downey inbound."

We will not descend below 1,700 feet until we reach the outer marker, the minimum stated in the chart. In the meantime we observe the vertical needle, which may be pointing to one side or the other. (The horizontal needle, if you have one, will be above center.) In which direction shall we fly?

Here is an easy way to fly the needle. You have two things to observe: (1) the position of the needle and (2) the rate of change. Both needles may be flown without thinking about color if the following is memorized:

FLY TOWARD THE NEEDLE (for on-course headings).

In other words, if the needle is on the right, *turn toward the needle*, i.e., to the right. The compass heading and the omni reading must be similar (within 80° of each other) for the rule to apply; the rule is true regardless of what the "TO-FROM" pointer says. If we have a horizontal (glide slope) needle, *we fly toward the needle,* and should the needle go below center we would fly toward it in a steeper power-glide. Of course, in this case, we do not have a glide slope needle and we are descending to 1,700 feet at a given rate of descent.

The other important clue is the RATE OF CHANGE, and it applies to both needles. Notice how far the vertical needle is from center and the *rate of change.* We have just passed Downey, 13 miles from runway, and if the needle is three dots (about an inch) from center, we'll need a big "bite" or heading correction to re-center the needle. Turn right, towards the needle, about 30°. This arbitrary figure is chosen because (1) it will quickly bring you back to course, and (2) a smaller bite may only be sufficient to compensate for wind drift. When we're closer in we'll use a much smaller bite.

Now hold the new heading and watch the needle for rate of change. (Glance at the other gauges, scanning each briefly, never staring at a single one for more than a couple of seconds . . . we might be flying actual instruments and not just the ILS dial.) If the ILS needle moves rapidly back to center, we are correcting rapidly and must uncorrect rapidly, *before* the needle is centered. If the needle moves slowly we shall uncorrect slowly and in addition may have to hold part of our bite, say 5°, until we find the correct heading which will maintain a *track* of the localizer heading, which in this case is 248°.

We left Downey at :24; with our given power setting we should lose altitude at 440 f.p.m., and at :27 we are at 1,700 feet, the altitude at which the glide slope intersects OM. We hold our altitude, and further observe the vertical needle, which is moving to the left slowly. We'll tie this down directly.

(*For those having a glide path needle:* you may descend to 1,700 as before, or you may hold 3,000 until reaching the glide path, which will require about two minutes at a 104-mile approach speed. The horizontal needle will move downward towards center as the glide path is entered; observe the *rate of change.* If the needle moves rapidly, a landing configuration must be obtained before it reaches center. "Configuration" means the power setting and the amount of flaps required, with gear down, for a 440 f.p.m. power-on glide; in a Beech, merely lowering the gear and a quarter flaps will enable you to hold the glide path without any change of throttles. Once this is obtained, try not to change the setting during the approach. Hold the power constant and attempt to stay on glide-path by moving the elevator instead of the throttles, because power changes almost always result in a porpoising effect, with the plane first above glide path and then below it. To be sure, this method has limitations, inasmuch as no one can continually fly upward toward the needle without power, but he can fly downward and add flaps if the speed increases excessively. In general, a leeway of plus or minus 10% airspeed is permissible in holding the glide path with this method before a change in throttle setting is necessary.)

At :29 we see the light flash, indicating we are over the middle marker. We obtain the configuration just described and descend to our minimum altitude, given on the VOR chart as 500 feet, with one-mile visibility. Meanwhile we must tie town the localizer heading by flying the plane with the rudder and using ailerons to bring up the wings as needed. We are holding a compass (or gyro) heading of 253° . . . the needle drifts slowly to the left. Remember, we aren't interested in *where* the needle is so much as the *rate* with which it gets there. We steer left to 251° . . . if the needle moves quickly back to center, we uncorrect quickly to 252°. The closer we get to the middle marker, the narrower the localizer beam becomes, and the more imperative it is to take little bites swiftly.

At :32-plus, at 500 feet, we break contact; under actual IFR conditions we should see the high-intensity runway lights of 25L ahead, but with the 200-foot minimum allowed during a complete ILS approach and half-mile visibility we'd continue to fly the ILS. At :33 the light flashes: that'll be the middle marker, and we should have 310 feet altitude.

At 200 feet and contact we fly down the long, bright funnel of runway lights, past the field markers, and we touch down with that good feeling of a job well done, knowing that flying the ILS isn't as hard as we thought it was, and that it can be done with our lightplane equipment. END

After unloading, helicopter hovers overhead to help extinguish fire by its downwash

New Airborne Fire Extinguisher

Fire fighting equipment that can be carried by helicopter into wilderness areas and other inaccessible regions has been developed by the American La-France Corporation of Elmira, N. Y. The equipment, which will soon go into regular production, will be particularly useful for halting fires at the site of airplane crashes.

The extinguisher will be operated by two men wielding 100-foot hoses which draw on a 300-gallon pressurized tank and spread foam over the flames. It packs into a unit 12 feet long, five feet wide and four feet high and can be lowered to the ground from a hovering helicopter in case the ship is unable to land.

The Sikorsky Aircraft division of the United Aircraft Corporation, Bridgeport, Conn., worked with American La-France on the design.