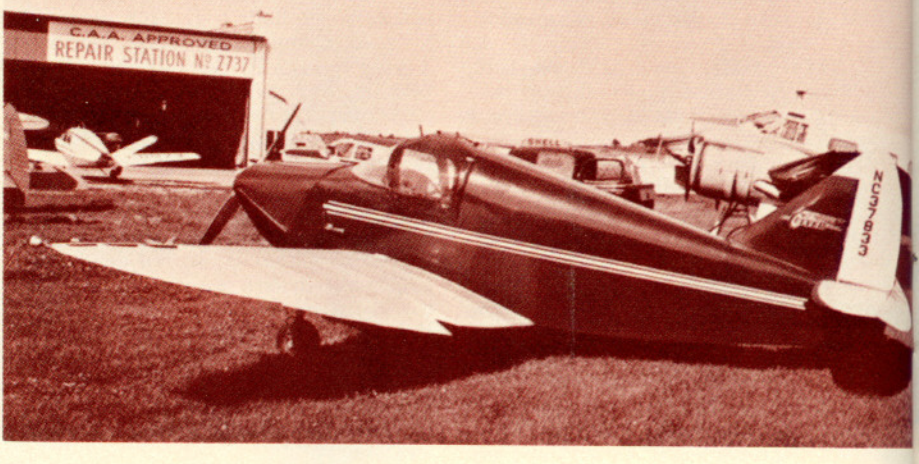
Culver model LFA, better known as the Cadet, is powered with 80 h.p. Franklin engine, but otherwise it is identical to the 75 h.p. model LCA. This photo shows small size of aileron, and fixed slots near wing tip

Photo by Leo J. Kohn



The Culver Cadet:

The ad read "It's Culver for Cross-Country," and boasted of a 120 m.p.h. cruising speed. The year? 1941. The airplane? The two-place, low-wing Culver LCA or LFA *Cadet*.

Powered with either the 80 h.p. Franklin *(Cadet* model*)*, or the 75 h.p. Continental (LCA model) four cylinder, air-cooled engine, the tiny Culver seats pilot and one passenger side-by-side in a cockpit measuring just 35 inches from one side to the other. Its elliptical wings span 27 feet, and when the gear is retracted, give it the appearance of a midget fighter of the World War Two period.

Featuring diminutive wheels and tires, the Culver's landing gear retracts mechanically by rotating a small wheel located at the forward edge of the seat. A knob just behind this retracting wheel locks the gear down, and a plunger mounted behind the throttle linkage at the carburetor prevents retarding the throttle below 1,700 r.p.m. with the gear not down and locked.

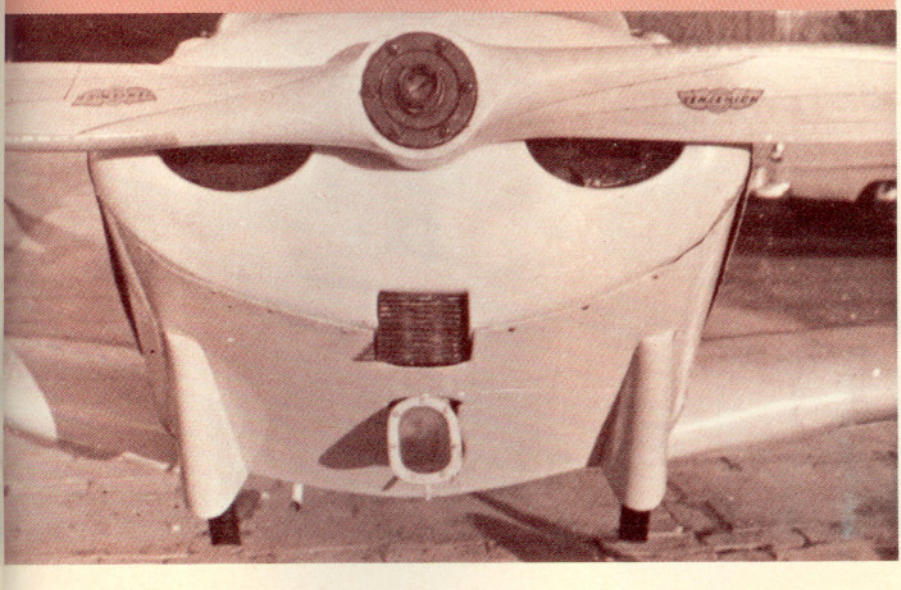
Unfortunately, this plunger can operate in a very unsafe manner. We learned about it one day when we lowered the gear in flight, then retarded the throttle to idle. We were descending to a lower altitude, and left the throttle in idle while we retracted the gear. Unknown to us, this put the plunger in *front* of the throttle arm, and prevented forward throttle movement. As you may imagine, we lost no time in diagnosing what was wrong, and in getting the gear back down and locked! Thereafter we never raised the landing gear with the throttle below 1,700 r.p.m.! To do so means the gear-warning plunger will be in front of the throttle arm, and prevent advancing the throttle.

Only the main landing gear retracts, and is housed in wells which extend into the cockpit under the pilot's and passenger's knees. A small window is provided in the wheel well so that the pilot may visually inspect the position of the landing gear. The locking knob mounted behind the retracting wheel has three positions—lock, raise, and drop. In the raise position, the retracting wheel is rotated to raise the gear, and a ratchet holds the gear in position while the pilot gets another hold on the retracting wheel.

This same ratchet holds the gear up in flight. When it is time to land, the pilot needs three hands. Originally, the landing gear was supposed to have been equipped with a hydraulic dash pot which allowed the pilot to place the selector knob in drop position, and allow the gear to slowly extend. The hydraulic dash pot was supposed to allow the gear to lower gently. However, few Culvers remain with operable dash pots, so the pilot must grasp the retracting wheel with one hand, the selector knob with the other, and the control stick with his third hand! Then, the selector knob is placed in the drop position, and the retracting wheel is allowed to rotate slowly as the gear extends.

Since few pilots have three hands, Culver pilots quickly learn to control the stick with their knees while they lower the gear. As difficult as it may sound, a pilot can become proficient in

Close-up of engine nose section of Culver LCA shows oil cooler (black square), carburetor air intake, and exhaust stacks. Shrouds around exhaust stacks are not standard, were installed by the author to allow use of longer exhaust stacks *Photo by Robert T. Smith*



Peppy Little Legend

Wooden biplane's wings measured only 27 feet and its cockpit was a cramped 35 inches wide, but it had all the get-up-and-go of a tiny fighter

this "maneuver" in an amazingly short time—about two gear extensions will do it.

It is very important to snub the retracting wheel as the gear extends. If the gear is allowed to free-fall, the locking pins may be damaged, and it may be impossible to lock the gear down. So, the retracting wheel must be snubbed with one hand as the gear extends, then the selector knob is placed in the lock position. It should move into the lock position smoothly, but if it doesn't, jiggle the retracting wheel. Never force the selector knob into the lock position. If it won't go smoothly after jiggling the retract wheel, raise the gear, and belly it in.

Despite the seemingly difficult tasks associated with raising and lowering a Culver's landing gear, this mechanism gives very little trouble, and is relatively free of maintenance outside of a little oil every now and then. The wheel brakes are hydraulic expander tubes actuated by toebrake pedals on the pilot's side only. The passenger side has rudder pedals but no brake pedals. A brake master cylinder for each wheel is located on the cockpit floor just ahead of the pilot's rudder pedal.

The brakes take automotive type brake fluid. We learned the hard way that aircraft hydraulic fluid won't work. It ruins the rubber gaskets, and leaves you with no brakes at all! A Plymouth car master brake cylinder repair kit fits the Culver brake master cylinders. As we recall, it's about a 1951 model Plymouth car brake master cylinder repair kit that fits.

With no brakes the Culver *Cadet* is helpless on the ground since it has a full-swivelling tailwheel, and must be steered entirely by differential braking. For this reason, it is essential to keep the brakes in good order. However, we found this no special problem. The brakes are easily accessible, and all components may be reached with a minimum of trouble.

The entire landing gear assembly is mounted forward of the main wing spar. A steel tube truss in the fuselage joins the main spar attachments at the fuselage sides, but the wooden wing spars do come into the fuselage, and

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A Culver Cadet, parked in the foreground, beside an Aeronca Chief gives some idea of the small size of Cadet. Wingspan of the Cadet is only 27 feet, gross weight 1,305 pounds *Photo by Robert T. Smith*

butt together at the fuselage centerline. The wing spar is just under the forward edge of the pilot's seat.

The wings have one main spar, and an aileron spar. A steel truss to carry torsion loads in the wing joins the two spars, and extends out into the wooden and fabric wing. Fuselage construction is all wood. The vertical fin and horizontal stabilizer are wood with plywood skin, while all control surfaces are good with fabric skin. Fabric is doped on over all plywood skin. The wing leading-edge back to the main spar is plywood covered, but fabric covered aft of the main spar. Wooden ribs are installed.

Metal airplanes have gained so much popularity in recent years that wooden airplanes are frowned on as being "frail," and subject to "dry rot." The Culver *Cadet* has especially suffered from these two misconceptions about wooden airplanes. In the case of being "frail," it simply isn't so. Wooden airplanes must meet the same design criteria applied to metal airplanes. In other words, they must be just as strong. In addition, wood has the ability to sustain a sudden loading far above the load it would carry if it were applied slowly.

"Dry rot" is a fairy tale—there is no such thing. Rot is a fungus and needs moisture in order to live. The term "dry rot" was originated when pilots discovered rotted wood in dry areas where they thought it impossible for moisture to accumulate. The plain fact is that moisture *did* accumulate in those areas, and did get the rot fungus started. When the moisture dried out, the rotting process stopped. However, enough damage had been done to make the pilot believed the wood had rotted because of "dry rot."

We had a bad experience with rot in our Culver *Cadet*. The ship was tied down outside by a previous owner, and water leaked into the cockpit, getting on the baggage compartment floor. It subsequently seeped downward onto the belly skin, and the aileron spar connection in the fuselage. We had to replace the baggage compartment floor, the aileron centersection spar, and a large area of lower fuselage skin.

Since woodworking for aircraft is beginning to be a lost art, labor is the expensive thing on wooden aircraft repairs. For this reason, a Culver must be inspected closely and carefully before purchase. Rotted wood appears dark, or grey in color. Carry an ice pick, and gently prick the wood. If it is good, you'll get a tiny splinter. If it's rotted, it will crumble.

In addition to wood rot, you must look for fuel leaks. The fuel tanks hold 20 gallons, and are mounted just forward of the wooden instrument panel. The instrument panel must be removed (a difficult job) to remove the fuel tank if it leaks. Stick your head under the instrument panel with a flashlight (even in the daytime), and look for fuel-tinted wood. We didn't. We were later very sorry we didn't! It leaked! Don't try to "patch" it if it does leak. Get a good quality aluminum welder to weld any leaks.

The fuel tank has a Model A Ford-type fuel gauge, and an "on-off" valve, both mounted just under the instrument panel. Fuel gravity feeds to the Franklin or Continental engine. Prewar (WWII) *Cadets* carry the 75 h.p. Continental, but after the war, a *Cadet* was licensed with the C-85-12F 85 h.p. Continental engine. The main difference between the 75 and 85 h.p. Continentals is that the 85 h.p. Continental can carry a starter and generator; the 75 h.p. model can't.

All Franklin 80 h.p. LFA *Cadets* have a starter and generator, but the Continental is a better engine. Ours was a modified LCA with the 85 h.p. Continental. The LFA Culvers will have a battery mounted on the firewall on the engine side, but LCA Culvers

will have no provision for mounting the battery there.

We installed a battery in the baggage compartment which is behind the seat, but this cuts down both baggage space and baggage weight. Normal baggage weight is 40 pounds, and the ship's maximum gross weight is 1,305 pounds. The baggage compartment is accessible by swinging the seat back forward, but is small. It will just carry a military B-4 bag. Above the baggage compartment is a very convenient shelf which can hold a small bag itself.

The Culver *Cadet* might be regarded today as a poor two-place, cross-country ship, because of its tiny baggage space, and small cockpit. However, it definitely will cruise at 120 m.p.h. on the Franklin 80 h.p. engine, or 75 h.p. Continental engine, and that isn't bad for the four to five gallons per hour these engines will burn. The 85 h.p. Continental will give, with a cruise prop, a positive 125 m.p.h. cruise. These are indicated airspeeds at sea level, standard day. We flew ours at altitudes between 7,000 and 9,000 feet where it would indicate between 118 and 120 m.p.h. The resulting true airspeed is as good as you'll get in any two-place ship today.

Culver *Cadet* flight characteristics are a bit "warm," but not outside the ability of a well trained private pilot. Steering on the ground is accomplished by differential braking since the tail wheel is full-swivelling. Takeoff power should be applied smoothly since the short-coupled ship does have some torque, and brakes must be used judiciously during the early part of the takeoff run to maintain directional control.

As soon as the engine reaches full power, the rudder will be fully effective, and differential braking can be discontinued. Don't try to pull the ship off, but wait until the tail is "light," then establish a very slight nose-low attitude, and allow the ship to fly itself off. Once airborne, retract the gear, and establish an 80 m.p.h. climb.

Climb above your cruising altitude, and set up cruising power. Then, allow the ship to slip down to your cruising altitude in such a manner than you accelerate to at least 120 m.p.h. cruising. We found that we could climb to an altitude and level off at about 112 m.p.h. by retarding the throttle to cruise power as we levelled off. However, by either leaving climb power on until the airspeed reached at least 120 m.p.h. or by climbing above cruise altitude, then descending, we could set up an indicated airspeed around 120 m.p.h. and hold it.

In flight, the elevators and rudders are very sensitive, and react immediately. Aileron pressure is heavier, but still fast acting. The ship will lose airspeed in turns, especially in steeply banked turns. Stall warning is good in both the power-on and power-off conditions, but the ship may roll rapidly at the stall break. Recovery is good—merely relax the back pressure, and apply power. The Culver *Cadet* not only looks like a tiny fighter plane, in some respects it acts like one! It is sensitive on the controls, elevator and rudder especially, and reacts instantly to the pilot's commands. When recovering from any stall, do not "push" the stick forward, merely release the back pressure. The *Culver Cadet* will immediately nose down and recover.

The *Cadet* could use rudder and aileron trim, but it only has elevator trim controlled from the cockpit. The trim crank is overhead, and has an indicator for trim position. Since control pressures are light anyway, any out-of-trim conditions can be easily controlled on the *Cadet*.

Landings are easier than they seem at first. Trim the ship for a power-off glide of 80 m.p.h. As the ground comes up, ease the stick back, and remember how sensitive it is. Level off a foot above the runway, and hold her off. When she gets into a normal three-point attitude, hold what you've got and let her touch down. Holding the Culver off until she's run out of back stick results in the tail wheel striking the ground considerably ahead of the main gear and is not a good landing in this ship.

Once she touches down, you will have no more rudder control. We tried this on a calm day. Immediately after touchdown, we applied full rudder. Nothing. We reversed the rudder. Still nothing. Evidently the fuselage blankets the rudder on landing, and only differential braking is available for steering. On takeoff, the propwash gives you rudder control, but on landing, you must depend on the brakes.

With a few landings under your belt, differential braking won't be a problem. Just *think* about applying a brake for steering, and you've automatically and subconsciously applied the correct amount! It, too, is sensitive, but controllable by a well qualified private pilot. Although sensitive and tiny when compared to some of the ships we have today, the legendary Culver *Cadet* is still capable of providing low-cost cross-country transportation for one or two people. We used to brag that we could fly all over the Southeast on a weekend for pocket change! Although many Culvers still exist, they are not easy to find because many sit rotting on out-of-the-way airfields around the country. They are strictly VFR airplanes, but excel as cross-country transportation in that category.

The Culver *Cadet*, and its postwar sister, the Culver "V," were designed primarily for cross-country flying for a pilot, one passenger, and moderate baggage. The design stresses economy, and simplicity of maintenance. Many of these ships are still available today, and at prices in the $1,500 to $2,500 range, depending on condition and equipment.

For the careful buyer, who will look at the ship carefully before committing himself, the Culver *Cadet* can prove to be a snappy, two-place ship, economical for local flying, but fast enough for cross-country. ●