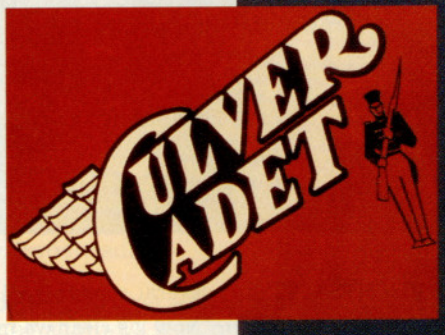
It is little wonder that the Culver Cadet attracted so much attention when it was introduced in December 1939. It had a factory-guaranteed cruise speed of 120 miles per hour while emptying the fuel tank at only 4.2 gallons per hour. Specific range was an incredible 28.6 miles per gallon. Other two-place airplanes of that era struggled to achieve 80 mph using the same 75-horsepower engine. The petite Cadet rapidly became America's sweetheart, the darling of the sportsman pilot.

The story of the Culver Cadet began in 1938 when Knight Culver Jr. purchased the design rights to the Monosport aircraft and founded the Dart Aircraft Company, which later became Culver Aircraft. The purchase included retaining a young, self-educated, and accomplished designer who would make an indelible mark on general aviation: Al Mooney. (Culver also hired Al's brother, Art, as factory superintendent.)

One of Mooney's assignments was to design an airplane that would take advantage of the new 75-hp flat-four Continental A-75-8 engine that rapidly rendered obsolescent the small radial engines that had been so popular. (The A-75 engine was a faster-turning version of the 65-hp Continental A-65.)

The result was the Mooney-designed Culver Cadet (also known as Mooney's "wooden wonder"). It was Mooney's twelfth design, which he designated according to his personal list of designs as the M–12.The structure was predominantly wood because metal was in short supply during that post-Depression, pre-war era. From such aircraft eventually came the cliché claiming with tongue in cheek that "wood airplanes stay together only because the termites are holding hands."

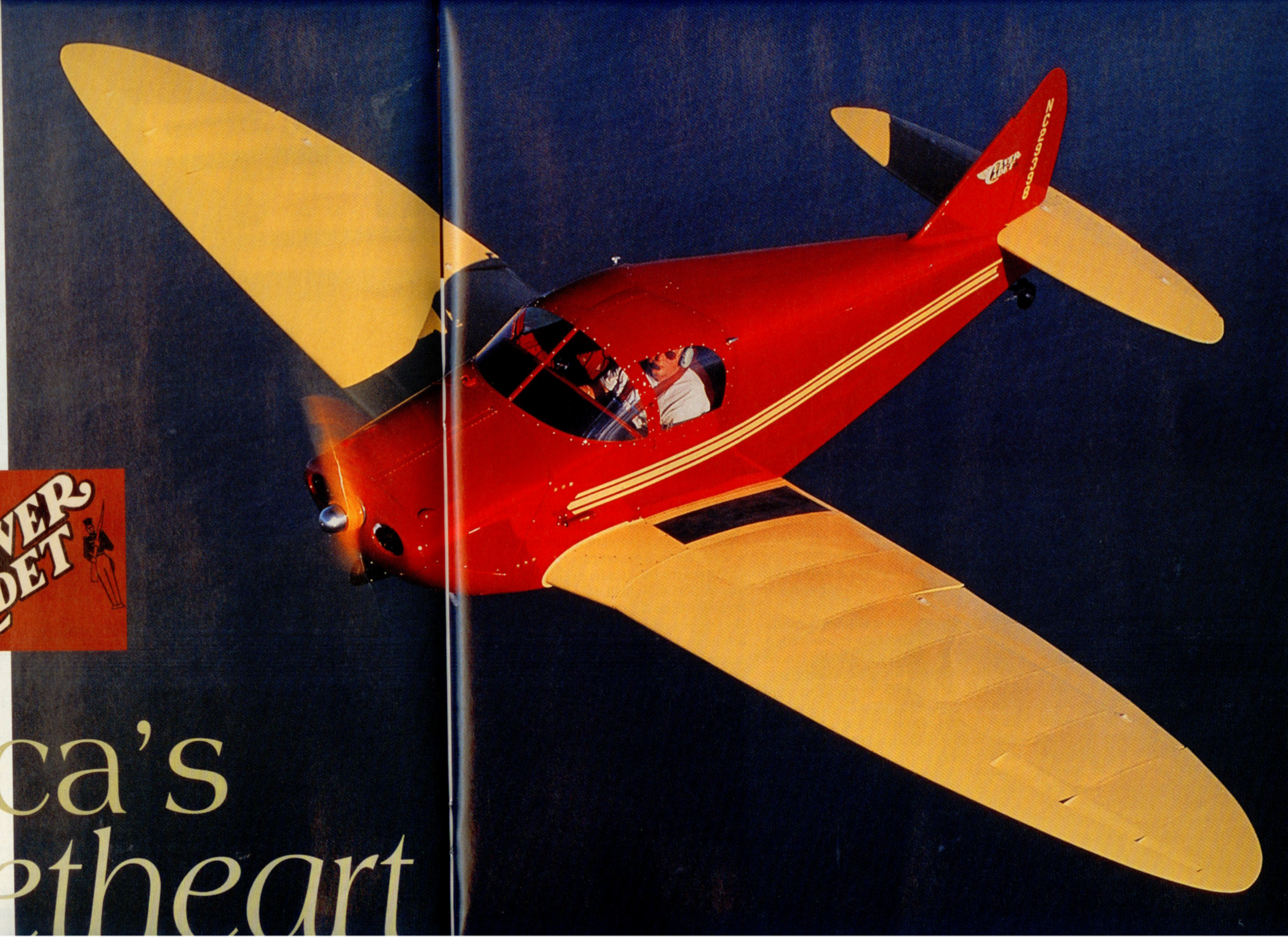


Mooney's 'wooden wonder' is a darling

BY BARRY SCHIFF

PHOTOGRAPHY BY MIKE FIZER

America's sweetheart



ca's etheart

The clean lines of the Culver Cadet are apparent during this approach into Santa Paula Airport in Southern California.

The Culver Cadet LCA made its maiden flight on December 3, 1939, and sold for $2,395. A later version, the Model LFA, had an 80-hp Franklin 4AC-176-F3 engine, was equipped with an electrical system and starter, and cost $200 more.

Original Cadets were built in Columbus, Ohio, but the factory was relocated to Wichita after being purchased by Walter Beech and attorney Charles Yankey.

A total of 359 Cadets were produced from 1939 through early 1942. Production ended so that the company could concentrate on the war effort and the building of thousands of drones to serve as targets for antiaircraft practice. The significant differences between the Cadet and the Culver PQ-8 Drone were that the drones had tricycle landing gear and were coated with aluminum paint to make them better radar targets.

Al and Art Mooney eventually formed their own company, which is when Al developed the single-place M–18 Mooney Mite and the four-place Mooney M–20, the progenitor of an entire family of popular four-place airplanes. (The 150-hp Mooney M–20 was the first four-place production airplane capable of cruising at more than one mph per hp.)

Carl Walston, whose airplane appears on these pages, became enamored of the Cadet when he was in grade school but did not begin flying until years later in 1961. At the time he lived in New Canaan, Connecticut, was in the securities business, and wanted to use his own airplane to travel from Wall Street to his other offices in the Northeast. For this he used a Cessna 310, a Piper Apache, and an Aero Commander 500. He accumulated 1,100 hours of flight time, including 400 hours in sailplanes.

When Walston began planning his retirement in Santa Barbara, California, he decided that he would make a dream come true by spending his carefree hours aloft in a Culver Cadet. Although there were more than 100 on the FAA's registry, Walston estimated that only 20 or so were airworthy, and none of these rare machines was for sale. Realizing his dream would require that he restore a basket case.

His search for a Cadet eventually led him in 1995 to Wallkill, New York, where he purchased N29398 (serial number 191) from a pilot's widow. The airplane originally had been built from scratch and in its entirety in Wichita during the week between Christmas and New Year's Eve, 1940. It was now a collection of bits and pieces.

When Walston's wife, Mimi, saw her husband's purchase, she thought he was nuts. It reminded her of an oversize model-airplane kit containing uncountable balsa-wood parts. The airplane had no logbooks, no airworthiness certificate, and had not flown since 1957.

Walston enlisted Carl Badgett of Winsted, Connecticut, to do the fabric and woodwork, and Mark Grusauski of Wingworks in Canaan, Connecticut, to do the metal and mechanical work.

The Cadet was restored as much as possible to its original condition, but

Walston made two concessions. One was to replace the original full-swivel tailwheel with a steerable unit, and the other was to strengthen the bulkhead behind the seats to accommodate the installation of shoulder harnesses.

Except for the nose bowl and tail cone, all metal parts (of which there are not too many in a Cadet) had to be made from scratch. These included fairings, doors, panels, cowlings, and so forth.

Although he purchased his project for only $7,500, Walston estimates that he has more than $100,000 invested in his dream machine. N29398 took to wing on May 16, 2000, its first flight in 43 years.

The fit and finish of N29398, which sports its original colors of Santa Fe red and Diana cream, are impeccable. It is not surprising that the restoration has garnered numerous first-place awards at airshows.

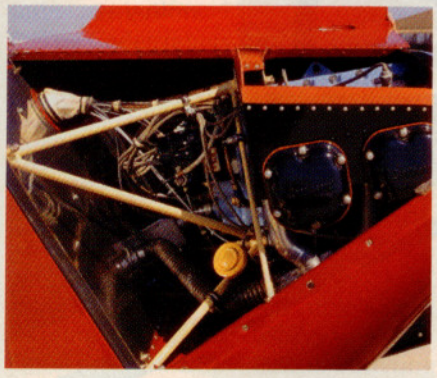
One glance at a Cadet explains why it is so fast and efficient. The wings and fuselage are exceptionally smooth, reminiscent of something made from composite materials. There are no rivets, fabric stitches, metal joints, or other blemishes to interfere with the airflow. Sheets of mahogany plywood shape the semi-monocoque fuselage, which is then overlaid with fabric to protect the wood.

The cantilever, elliptically shaped wing is similarly constructed from the leading edge to the laminated spruce and mahogany spar. Aft of the spar, the wing is covered with fabric in a conventional manner.

A slot in each wing tip is intended to improve spanwise stall characteristics and low-speed roll qualities. The U.S. Army, however, operated some Cadets with covered slots. These airplanes reportedly flew better and faster. There is no question that the gap seals used with the ailerons and elevator increase aerodynamic efficiency and performance.

Walston's airplane is equipped with a wooden fixed-pitch Sensenich propeller, although Cadets also were available from the factory with Freedman-Burnham ground-adjustable propellers.

One negative feature is that the single 20-gallon fuel tank is only eight inches forward of the instrument panel and be-



The four-cylinder Continental A-75 engine is a slightly more powerful version of the A-65 used to power thousands of Aeronca Champions and Piper Cubs (above left). A dipstick is more reliable than the Model A Ford fuel gauge in the cockpit (above center). The landing gear is raised and lowered manually using a locking mechanism and a hand crank (above right). These were the only instruments required for instrument flight during the 1940s (right).

Over-the-nose visibility during taxi is good thanks to the downward slope of the Cadet's pug nose.

hind the engine, which is not the most crashworthy configuration. A fuel gauge from a Model A Ford below the instrument panel is more nostalgic than reliable. Believe it only when it says Empty.

When I first approached the Cadet, I seriously doubted that there would be enough room in the diminutive airplane for two grown men. I climbed onto the left wing, opened the left door (there is one on each side), stepped onto the seat cushion, and slid in.

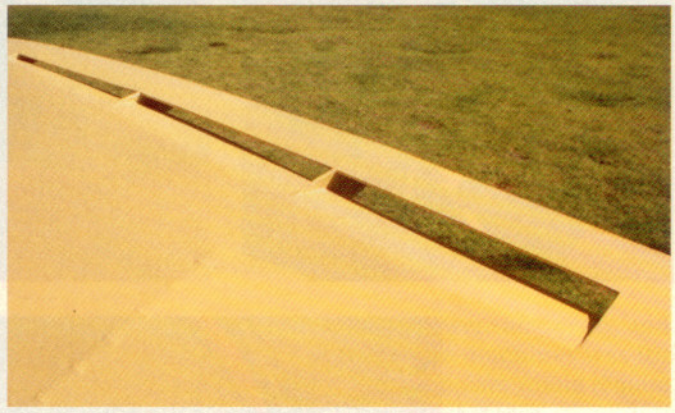
I was relieved to discover that there was ample head- and legroom for my six-foot, two-inch frame, but cabin width is miserly and makes for shoulder-rubbing intimacy. After Walston flicked the propeller for a manual start and climbed into the cockpit from the right door, I noticed that he had to defer to my not-insubstantial width and sat slightly twisted in his seat.

The Spartan instrument panel is neatly laid out and contains a center-mounted throttle, which I found a bit too high for comfort.

The top of the pug nose slopes downward significantly so that over-the-nose visibility during taxi is excellent.

The tiny tailwheel and short-coupled fuselage combine to give the Cadet a mind of its own while taxiing. The pilot needs a pair of active feet to keep the aircraft on the straight and narrow. Toe brakes are available to help, but only on the pilot's side.

With only 75 hp, the Cadet does not have sterling acceleration during the takeoff roll, but the rudder becomes effective almost immediately, which improves the ease of directional control. A stiff crosswind, however, probably would require some use of differential braking early in the takeoff roll.



Although wing tip slots are intended to improve stall characteristics, some pilots reportedly cover them to gain airspeed.

The Cadet's three-point attitude is about the same as the attitude for best climb, so it is unnecessary to raise the tail for liftoff. The airplane flies itself off the ground quite nicely. Initial climb requires a surprising amount of right rudder to compensate for p-factor considering that you're containing only 75 hp.

Like so many other pre-World War II airplanes, a pilot's operating handbook was never published for the Cadet, and many of the performance speeds have been approximated by those who have flown the aircraft. Along these lines, the airplane apparently climbs best at about 75 mph.

One caution: Pilots new to the Cadet should not attempt to retract the landing gear until reaching a safe altitude because it requires more than flipping a switch.

The procedure involves using your right hand to shift a near-vertical lever on the floor (between the pilots) from the Locked Down to the Raise position. Then you grip a small wheel and tug it about a dozen times, with each tug turning the wheel 20 or 30 degrees at a time to ratchet the wheels into their wells. (The tailwheel is not retractable.)

I am told that with practice you can raise the gear in five seconds.

The downward-sloping nose cowl is initially deceiving when leveling off at altitude. When you lower the nose to where you think it should be, the Cadet continues to climb. Leveling off requires putting the nose in what appears to be an exaggerated nose-

down attitude that in most other airplanes would cause a shallow dive. One quickly adapts to this quirk.

The elevator-trim crank is on the ceiling between, and somewhat behind, the pilots. It is similar to the trim control on many early Piper aircraft, and at first you'll have to think about which way it should be turned to achieve a given result. Fortunately, trim changes are usually small, and there is seldom a rush to relieve control forces.

The Cadet maneuvers easily and quickly about all three axes, but the controls are not that well harmonized. The elevator is most sensitive, the rudder is next, and the ailerons are least sensitive.

And if you're not in a hurry, you can chug along at 80 mph while sipping only 1.5 gph, a specific range of 53 miles per gallon.

The Cadet reacts quickly to turbulence and tends toward neutral stability about the longitudinal axis. When gusts lower a wing, the aircraft shows little desire to return to a wings-level attitude on its own. The good news is that only light corrective forces with the stick are needed to keep the aircraft on an even keel.

The aircraft does not have a stall warning system, but aerodynamic buffeting provides ample notice. Buffeting begins at 55 mph, and the Cadet tends to buck a bit as if rebelling against the impending stall, which occurs at 45 mph. There also is a noticeable loss of roll control; the Cadet has a bad reputation for its stall manners, preferring to almost always fall off on a wing at the break (power-off or power-on). Although recovery is easy and conventional, be careful not to apply excessive aileron to pick up a wing. The little airplane will enter an incipient spin with little additional encouragement.

Although the Cadet was initially approved for aerobatics, some pilots got into trouble, perhaps because of the airplane's sensitivity and quickness. Aerobatic approval was rescinded and intentional spinning prohibited. Too bad. The Cadet loves to spin.

The landing gear should be lowered before entering the traffic pattern to prevent becoming distracted during a critical phase of flight. This might be one reason why the Cadet was not certified for IFR flight. Another might be that the airplane can be a handful in turbulence because the short wings offer limited roll damping.

Gear extension requires first placing the control stick between your knees. Then use your left hand to pull up on the lever while simultaneously placing your right hand on the landing gear wheel. Pull up slightly on the wheel to release the ratchet. Then move the lever from Raise to Drop with the left hand while using your right hand to snub the wheel. This allows the gear to free-fall against a dashpot (a hydraulic dampener) and into position. The lever is then moved left to the Locked Down position, which inserts locking pins into place. Finally, restore control of the aircraft from the knees to your left hand.

The original Cadet had an interlocking throttle that prevented the pilot from reducing power to idle with the landing gear retracted. Most owners disliked this feature, deactivated it, and replaced the throttle block with a gear-warning horn powered by a nine-volt battery.

Al Mooney had a flair for unusual gear-warning solutions. Retard the throttle of a Mooney Mite with the wheels retracted, for example, and a small red metal flag at the end of a vertical rod waves like a metronome across the instrument panel to remind the pilot that he might be about to land on his belly. In a Cadet, the pilot can use the three-inch-square Plexiglas viewing lenses on the right and left sides of the cockpit floor of a Cadet to confirm that the wheels are no longer in their wells, but these lenses are essentially worthless. Being able to move the locking pins into place proves that the wheels could not be retracted.

The Cadet does not have flaps. With a stall speed of 45 mph and the agility to perform steep and effective slips, they are not needed.

Making a full-stall touchdown with the stick fully aft can result in an overflare and landing tailwheel first. The main gear then plunks firmly onto the ground, making one hope that the spindly gear legs and small five-by-four wheels are up to the task. The recommended technique is to flare to but not beyond the airplane's normal three-point attitude while close to the ground. The airplane will land softly on all three wheels, which is much preferable to a full-stall landing. The technique is relatively easy once you become accustomed to the pitch sensitivity.

The classic Culver Cadet is a joy to fly, a wonderful playmate with which to cavort about the sky, and it is doubtful if you can find another production airplane that can cruise at 120 mph and costs so little to operate. AOPA

Visit the author's Web site (www.barryschiff.com).

SPECSHEET

Culver Cadet

Price as new: $2,395 (1941)
Price as tested: $75,000 to $100,000

Specifications

Powerplant	Continental A-75-8, 75 hp @ 2,600 rpm
Recommended TBO	1,800 hr
Propeller	Sensenich, 2-blade, 70-in dia
Length	17 ft 8 in
Height	5 ft 6 in
Wingspan	27 ft
Wing area	120 sq ft
Wing loading	10.9 lb/sq ft
Power loading	17.4 lb/hp
Seats	2
Cabin length	26.5 in
Cabin width	35 in
Cabin height	33.5 in
Basic empty weight	750 lb
Max gross weight	1,305 lb
Max useful load	555 lb
Max payload w/full fuel	435 lb
Fuel capacity (all usable)	20 gal
Oil capacity	4 qt
Baggage capacity	50 lb

Performance

Takeoff distance, ground roll	600 ft
Rate of climb, sea level	800 fpm
Max level speed, sea level	145 mph
Cruise speed/endurance w/45-min rsv, std fuel (fuel consumption) 7,000 ft @75% power	120 mph/4.0 hr (4.2 gph)
Service ceiling	17,500 ft
Landing distance, ground roll	400 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)	65 mph
V_Y (best rate of climb)	75 mph
V_{LE} (max gear extended)	100 mph
V_{LO} (max gear operating)	100 mph
V_{NO} (max structural cruising)	145 mph
V_{NE} (never exceed)	175 mph
V_{S1} (stall, clean)	45 mph
V_{SO} (stall, in landing configuration)	45 mph

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted. Data are not available for takeoff and landing over a 50-foot obstacle, design maneuvering speed, and demonstrated crosswind component.

i Additional information about the Culver Cadet can be found on AOPA Online (www.aopa.org/pilot/links.shtml).