EDITOR'S NOTE: The first production Caproni A-21J jet-powered sailplane in the United States is now being flown by AviA International in Palo Alto, Calif. The first aviation reporter to fly the new jet sailplane was The PILOT's *western editor, Don Downie. He was accompanied by United Air Lines Captain Bernald S. Smith (AOPA 446945), two-time president of the Soaring Society of America. Come take a flight in the "poor man's U-2."*

Pilot Flight Check:

Caproni's 'Mini U-2'

by DON DOWNIE / AOPA 188441

The jet-powered A-21J's 66-foot-plus wingspan shows to advantage in this air-to-air shot. If you are wondering where the small, compact jet engine is, see the accompanying cutaway diagram with this article.

Photos by the author

Hugo Taskovich (left), director for Caproni in the United States, and United Air Lines Captain Bernald Smith refuel the Caproni powered sailplane before flight. Cockpit seating position is virtually supine, but author Downie said he experienced "no fatigue from this position" during his flight check of the aircraft.

Yesterday, to fly your own jet, you would need nearly a million dollars. Today, with 'the poor man's U-2,' you can have almost all the performance without having to pay but a tiny fraction of the price." That's how AviA International's brochure describes the thin-winged Caproni A-21J powered sailplane. There's a considerable resemblance to the U-2 in the Caproni's 66.9-foot-long wing, which ranges from a chord of 2.95 feet at the root to a chord of 1.05 feet at the tip. The Caproni side-by-side sailplane without power package has a glide ratio of 45:1. (One A-21 holds four world records for speed and distance, set last year in Nevada.) With the added weight, air ducts, and jet exhaust tube, the A-21J glide performance is 43:1—and that's a whale of a fine sailplane right there.

Total weight of the 12½-inch-diameter TRS-18 engine—from the French Microturbo Company, which has experience in building similar-sized engines used in APU applications—is 66 pounds. Add a battery, instruments, and accessories, including a completely automatic start/shutdown system and 26.8 gallons of fuel in the center-wing-section box spar, and you have a package of 240 pounds. This weight is similar to the water ballast used on competition sailplanes [see "The Silent Competitors," Nov. 1972 PILOT]. As the fuel is used, the weight goes down.

"There are just three basic ways to launch a sailplane," explained Bernald Smith, as we walked around the glistening all-metal sailplane. "You can launch them from the ground with a winch or auto tow, use an aircraft tow plane, or self-launch them with a small self-contained powerplant. The powered sailplane is by far the simplest way to get into the air, fly to your soaring site, shut down the power, soar to your heart's content, and then restart for a flight back to your home base.

"That's the reason we're able to operate out of the busy general aviation airport here at Palo Alto, Calif. We can take off under power, climb out around the San Francisco TCA to wherever the soaring is good, shut down power, and spend as long as we want in silent flight. When it's time to come home, we relight and head for home. That includes flying a normal traffic pattern and taxiing back to the hangar.

"Come on, I'll show you."

Director for Caproni in the United States and much of the rest of the world is Hugo G. Taskovich (AOPA 220506), who acted as a one-man ground crew, pedaling his bicycle near the long wingtips as we taxied, to assure that we wouldn't snag a runway light. Taskovich has been in aviation for more than 30 years. He began gliding in Yugoslavia at 14 when a high-school course in wood shop included a primary glider. He's since flown almost all the sailplanes available and has logged more than 1,000 hours of silent flight and another 2,000 on power. Smith, a former U.S. Navy transport pilot, has more than 18,000 hours.

The day was far from ideal for sailplane ground operation, but things became better once we climbed away from the airport. There was a brisk wind spilling down over the Santa Cruz Mountains, with gusts to 25 knots at 90 degrees to Palo Alto's runway. However, this same wind pattern provided adequate ridge lift along Mission Peak, just east of Sky Sailing Airport in the city of Fremont, on the east side of the bay.

Taskovich and Smith proudly showed off N3998. After all, she represented a first-of-a-kind, and more than $33,000 of certificated sailplane and certificated engine. The Caproni was, at press time, still operating under an "Experimental" certificate as the FAA pondered how to classify powered sailplanes and how to license their pilots.

There's an open question at the moment as to what pilot ratings are required for a powered sailplane. FAA regulations call for a private power ticket without requiring sailplane experience; however, some regional GADOs suggest a sailplane rating with a minimum of experience in powered planes.

CAPRONI JET/Sailplane

Specifications:

	CAPRONI A-21	A-21J
Engine	N/A	TRS-18 (weight 66 lb)
Wingspan (ft)	66.9	66.9
Length (ft)	25.7	25.7
Fuselage width (ft)	3.6	3.6
Fuselage height (ft)	2.9	2.9
Stabilator span (ft)	9.5	9.5
Wing area (sq ft)	173.3	173.3
Empty weight, equipped (lb)	860	950 (without fuel)
Max. takeoff weight (lb)	1,450	1,650
Max. wing loading (lb/sq ft)	6.6	8.0
Price	$17,000	Over $33,000
Performance (At Max. Weight):		
Best glide ratio	45:1 @ 59 mph	43:1 @ 67 mph
Min. sink speed	1.64 ft/sec @ 50 mph	1.97 ft/sec @ 56 mph
Stall speed, flaps up (mph)	42.8	47

Powered Performance Of A-21J (Calculated):

Max. powered speed, indicated (mph):	
Sea level	187
10,000 ft	192
20,000 ft	200
33,000 ft	209
42,500 ft	208
Ceiling (ft):	
Service (100-fpm climb)	44,600
Theoretical (no climb)	49,200
Takeoff distance in ft (Max. takeoff weight):	
Concrete runway	725
Grass runway	853
Distance (ft) to clear 50-ft obstacle:	
Concrete runway	1,140
Grass runway	1,265

Essentially, the powered sailplane is a sailplane first and a powered plane only to get to and from its favorite soaring site. The Soaring Society of America is working with FAA on developing a powered-sailplane category.

"There's no structural change between the pure sailplane and the jet-powered model," explained Taskovich. "The all-metal structure is identical except for fuel tanks and the inlet and exhaust for the engine. We have fiberglass wingtips and the sheathing for the cockpit, but there's aluminum and structure under all that. We could actually leave the fiberglass covering off the fuselage and fly it like a 'Breezy,' if we wanted to."

The wing on the Caproni consists of a 16.9-foot center section and two 25-foot outboard sections. The outer wings can be installed in 30 seconds each with a slick-operating double-expanding bolt. Both aileron and the patented combination flap–trailing edge spoiler (air brake) controls engage automatically, with facing plates, so that no rigging is necessary. A similar system is incorporated in the tail design for disassembly and trailering.

N3998 had a single 15-gallon fuel tank back of the supine seats of the cockpit, where you fly just about lying down. If you have big feet, as I do, they can stick up behind the instrument panel. A standard European four-strap seat and shoulder harness was installed. Parachutes were not required.

Smith is over 6 feet 4 inches, and I'm 6 feet 2, but there was ample room for both of us plus the bits and pieces of camera and strobe. We both strapped down, put on headsets, and were set for startup. Engine start is simplicity itself, with a built-in system that shuts off the fuel immediately if there's a short or open circuit in the wiring, if the engine speed has not exceeded underspeed datum within 25 seconds, or if engine speed exceeds the overspeed datum of 44,000 rpm. There are four engine gauges on the panel: voltmeter, engine rpm (reading in percentages), EGT, and oil pressure.

As soon as the jet engine lighted, Smith called Palo Alto Ground Control and we taxied to the end of Runway 12. Taskovich pedaled beside our upwind wingtip, but he didn't touch anything as we rolled out in a brisk crosswind. The proven crosswind component for the Caproni, with its unique side-by-side main wheels, steerable tailwheel, and tiny two-inch fiberglass wingtip wheels, is 25 knots from 90 degrees. We had just about all of that at Palo Alto.

The TRS-18 jet flown on this ship has been derated from 220 to 200 pounds of thrust for testing purposes, and the throttle provides a complete range of thrust from idle to full-bore. At full throttle, 200 pounds of thrust, fuel consumption is 36 gallons per hour at sea level. At idle, or 24,200 rpm, consumption is only 12 gallons per hour at sea level. With two people aboard, the idle setting is not quite enough to maintain zero sink, but is ideal for returning to your home airport from just about any altitude.

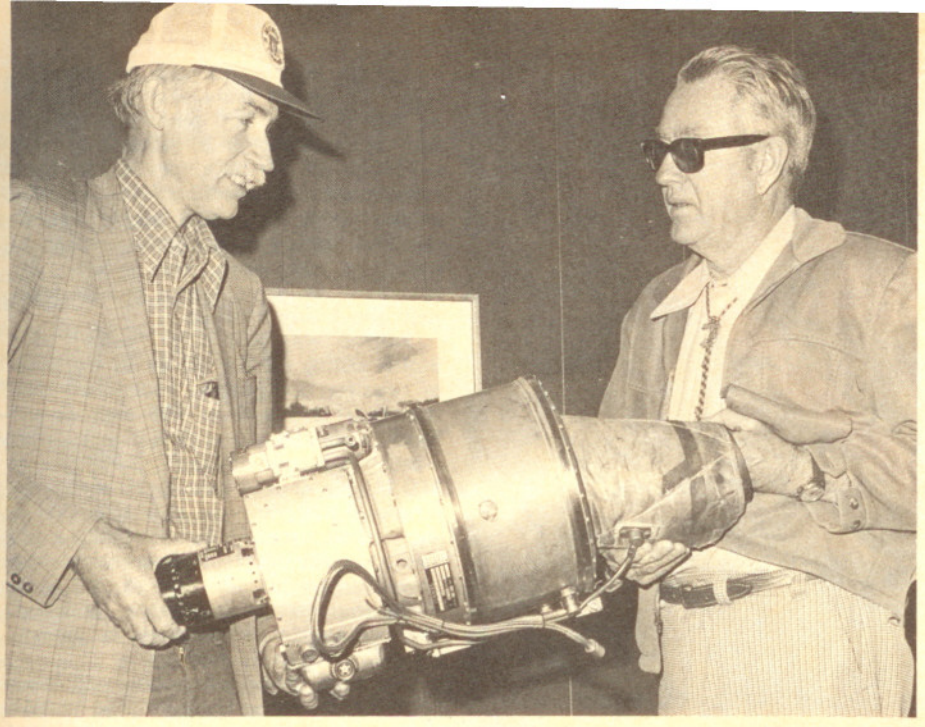
Takeoff was just a bit "hairy," with Smith using all the tricks in the book to counter the gusting crosswind. Normal roll is listed at 725 feet at sea level (Palo Alto is at 5 feet msl), with a full-power rate-of-climb of 500 fpm at 160 kilometers per hour (100 mph—the airspeed indicator on this ship was a metric instrument). Smith said he could zoom to over 600 feet if necessary, with power off, from 100 feet at 100 mph. From that resulting altitude, he added, two complete patterns could be made—all this with no power.

I've been flying gliders and sailplanes occasionally since before World War II, so it was no great surprise to find that the long-winged Caproni required liberal applications of rudder for a turn. Throwing in aileron with its high 2:1 differential, with practice you can roll the big white bird into a coordinated turn rapidly. The T-tail is extremely sensitive, and it takes quite a few minutes to become accustomed to the control system. The trim tab is a spring system inside the cockpit that works from a handle with a ratchet on its connecting link. It, too, is sensitive, and I managed to cut my thumb slightly while mastering it.

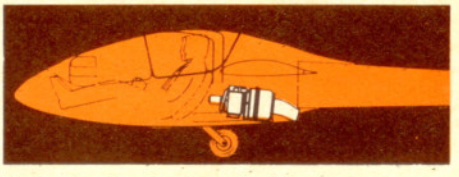
Aside from that, the flight was delightful. We had sufficient fuel (15 gallons) for 25 minutes at full power and 75 minutes at idle. We were in the air an hour and 40 minutes, but at least 60 percent of this time was spent cavorting, power off, with the hawks and at least five sailplanes from Sky Sailing on the upwind face of 2,500-foot-high Mission Peak. It was a busy place, and Smith explained, "This is the first day in two weeks when the weather has been good enough for soaring. It looks as though everyone's out for a flight. Remember the right-of-way here, where the sailplane headed downwind normally gives way to the ship headed into the wind, which should have the right-of-way next to the ridge."

Without power, the A-21J soared with the best of them. Even with my rusty touch (it's been years since I've flown a "pure" sailplane and four years since I flew the two-place Fournier RF-5 in Paris), we were able to outsoar both trainers and clean 2½-place sailplanes with comparative ease.

N3998 had an electric gyro compass, horizon, and turn-and-bank, which were not used for this flight, as well as a pressure variometer and a conventional, well-damped rate-of-climb. While we were soaring, Smith turned off the radio too, so we would be in the complete, pure, and quiet world of soaring. Thus I soon became suspicious when the needle and ball showed no indications



Capt. Bernald Smith shows Don Downie the 66-pound TRS-18 jet engine that powers the A-21J.



Engine location is shown in this cutaway.

in steep, sometimes turbulent pirouettes, with the Caproni's long wingtips reaching toward the hillsides close below. Our ridge soaring was strictly a seat-of-the-pants operation, with airspeed and a lagging rate-of-climb giving lift indication after-the-fact.

The 16-pound battery is attached to a 600-watt, 28-volt combination starter-generator. At low altitudes and warm temperatures, this battery is good for more than *two-dozen* 25-second start attempts. In normal operation, of course, after each start, the battery is kept up to charge when the starter then becomes the generator being driven by the engine. The colder it gets at altitude, the fewer the starts. The Caproni brochure indicates that air starts can be made "even above 30,000 feet."

While it would have been interesting to land at Sky Sailing and indulge in a "soaring circle" (that's hangar flying for the sailplane types), we didn't, since the TRS-18 started, and we headed back across the bay toward Palo Alto where Taskovich was wondering where we'd wandered.

The plastic fuel gauge between our heads was flirting with the bottom of the line as we turned downwind, and Palo Alto Tower asked whether or not we were "under power." We were, and Smith asked for a touch-and-go to demonstrate the effectiveness of the huge 39.4-square-foot flaps/spoilers. The Caproni can be put into a vertical dive with the spoilers open, and the airspeed builds up to only 117 mph, well within the 156-mph redline. Thus, Smith put on the "air brakes" with the single lever that controls both the upper-surface trailing-edge spoiler and the lower-surface flap, with up to 90 degrees of deflection available from both, and we dove steeply at the number "30" on the southeast end of the runway. As we flared out, Smith applied the power and retracted the flaps/spoilers as we made a go-around to come back again in a circuit for a normal landing.

The tower gave a wind check of 10 knots, gusting to 17 knots, from the west, but the windsock looked more like 25 knots with a quartering tailwind. We crossed "the numbers" indicating 90 kilometers per hour (56 mph) and were stopped in time to make the first turnoff 800 feet from the approach end of the runway. Taskovich awaited us on his bicycle, but no help was needed in reaching the tiedown and refueling area.

The same lever that actuates flaps and spoilers for landing also has a forward detent for 10 degrees of negative flap. This raising of the trailing edge on the 50 feet of flap span gives better high-speed characteristics for cross-country soaring and increases "penetration," or the ability to go farther with a given altitude than possible without a negative flap capability.

One of the reasons that I've not done more soaring is that it takes a lot of time, expense, and "dry runs" to get a sailplane, a towplane, a qualified tow pilot, and the right weather all together at the same time and place, usually picked out 48 hours in advance. The key to the effectiveness of the powered sailplane is that it allows you to take off from a close-to-home airport, go to a good soaring area, shut down the engine, climb as high as you wish (permission of the Feds is necessary for flight above 18,000 feet), and stay as long as the weather permits. Most likely, you can glide a long way toward home; then you can "fire up" to fit in with the other power traffic, without the drudgery of disassembling your sailplane, loading it onto a trailer, and hauling it home—or having to figure out the complexities of an aircraft "retrieve" if you've landed on some sort of "airport" where a towplane can land.

If there were more powered sailplanes, there'd be considerably more soaring.

Since much of the material for the Caproni orginally came from the United States, Taskovich is planning to establish an assembly line in this country. Most of the duplicate tooling is already completed. With elimination of the freight charges to Europe and return, the cost of the Caproni may be reduced.

There's a building-block capability in the Caproni design. You can buy it as a pure sailplane (prices start at $17,000 basic), and then, at a later date, add the 66-pound, $14,900 jet engine. (Pound for pound, that's more expensive than steak!) By the time you've added tanks, instrumentation, and all the other goodies, the price is back over $33,000. So you won't see a Caproni in every garage. However, you will see these ships growing in number and probably coming down in price ("We could cut the engine cost in half if we could build 1,000 of them," said Taskovich), as the relatively new sport of flying powered, self-launched sailplanes becomes better known. At the present time there are about 60 powered gliders/sailplanes in the United States. Some are homebuilts or prototypes, some production from European glider builders, but the Caproni is the only jet. The time-proven Caproni package should have full FAA approval in the near future.

There's something about this "poor man's U-2" that's elusive from inside the side-by-side cockpit. Perhaps you're too close to what's going on to divide the trees from the forest. In any event, it was an interesting experience to take off directly behind Smith and Taskovich in N3998 and then fly formation with them in a Cessna for an air-to-air photo session. The beauty of the big Caproni is much more impressive from outside than when you're "doing the driving." Smith used his best U.S. Navy training to tuck the long wings of the A-21J just aft of the strut on the camera plane, as we circled below the TCA over the salt pans and the low Coyote Hills just north of the Dumbarton bridge.

The A-21J makes a magnificent sight as it slips easily around in a sweeping turn, posing for its portrait. The quick elevator responses and adequate thrust make formation flying relatively easy—if you're like Smith with his 28 years of day-by-day flying.

In a brief glance while changing cameras, it was interesting to notice youngsters flying hang gliders (Rogallo kites) off a small sand dune below us, using the same basic ridge winds we had used earlier to keep the 1,650-pound A-21J soaring easily.

I wonder what these kite pilots thought as they saw the big Caproni circling lazily overhead, escorted by a conventional camera plane? □