the normal 201 flight time between the two points, roughly 650 n.m. apart.

Company president Conrad worked for both Machen Industries (also in Spokane) and Turbo-Plus over on the west side of Washington, both of which have done extensive development on turbocharger intercoolers, before founding his own aviation development company. Although it has been in operation only a short time, Aircraft Development already has an ambitious schedule of products coming down the line. The Turbo Bullet conversion should be available for Mooney M20E and M20F models (Super 21/Chaparral and Executive) about the time this appears in print. And for Mooney 231 owners, the company is developing something called the 305 Turbo Rocket. Conrad has promised more information on that conversion program before the end of 1990.

***FOR MORE INFORMATION,** contact Darwin Conrad, Aircraft Design, Inc., E.5629 Rutter Ave., P.O. Box 11955, Spokane, WA 99211; telephone 509/534-5805.*

Cruise Power Table, Mooney 201 Turbo Bullet*

Altitude, Air Temp.	Engine Rpm	M.P. In. Hg.	% Power	Fuel Flow gph	TAS, Mph/kt.
4000 ft. 7°C	2400	34	80	13.9	196/170
	2300	33	78	13.4	193/168
	2250	32.5	75	12.9	189/164
	2150	29	65	11.8	179/156
	2050	26	55	10.7	167/145
8000 ft. -1°C	2400	34	80	13.9	203/177
	2300	33	78	13.4	200/174
	2250	32.5	75	12.9	195/169
	2150	29	65	11.8	185/160
	2050	26	55	10.7	173/150
12,000 ft. -9°C	2400	34	80	13.9	211/183
	2300	33	78	13.4	207/179
	2250	32.5	75	12.9	203/192
	2150	29	65	11.8	192/167
	2050	26	55	10.7	180/156
16,000 ft. -17°C	2400	34	80	13.9	219/190
	2300	33	78	13.4	215/187
	2250	32.5	75	12.9	211/183
	2150	29	65	11.8	200/174
	2050	26	55	10.7	187/162
20,000 ft. -25°C	2400	34	80	13.9	228/200
	2300	33	78	13.4	224/194
	2250	32.5	75	12.9	220/191
	2150	29	65	11.8	208/179
	2050	26	55	10.7	187/162
24,000 ft. -33°C	2400	34	80	13.9	238/207
	2300	33	78	13.4	235/205
	2250	32.5	75	12.9	231/202
	2150	29	65	11.8	218/189
	2050	26	55	10.7	204/177

**Data acquired on 1977 Mooney 201, at 2740 lb. gross weight; data supplied by Aircraft Design, Inc.*

Tiger Tale

The new 1990 American General Tiger is ready for delivery.

By LeRoy Cook

AGAC was careful not to tamper with the basic features that had led to the Tiger's 1970s success.

Photos by the Author

GREENVILLE, MISSISSIPPI, is a mid-size city of about 50,000 souls, nestled along the mighty river that forms the western boundary of the state. Long a bustling river port and agricultural center, it also possesses a fine municipal airport with 7000-foot-plus parallel runways and hangars large enough to swallow a 747. Now, this facility is poised to become an aircraft-manufacturing center, the first in Mississippi history, with the revival of the former Grumman American Tiger, dormant since 1979.

American General Aircraft Corporation, the new owners of the Grumman light aircraft production tooling, is housed in a spacious new plant where the upgraded 180-hp Tigers are being assembled. Six aircraft were on the line when we visited; first deliveries were to begin in July. James E. Cox, company president, showed us around his squeaky-clean factory and talked about the improvements AGAC had made in the venerable Tiger, of which Grumman American had delivered 1323 in the five years of production from 1975 through 1979.

Careful not to tamper with the basic features that had led to the Tiger's success in the late 1970s, American General concentrated on correcting the design's shortcomings and in preparing for the future. The nosecap, for instance, is no longer a one-piece assembly that required removal of the propeller for even minor work on the starter and alternator. It now splits horizontally when removal is required. Thankfully, the swing-up, prop-open cowling halves are retained, so one can check the engine out thoroughly before takeoff. Baffles were redesigned with asbestos-free seals, and the induction system's inlet was moved from a rear baffle inside the cowling to an outside opening in the front of the lower cowl.

AGAC also switched to a 76-inch Sensenich propeller, eliminating the caution range on the tachometer from 1850 to 2250 rpm as well as the recurring airworthiness directive on the original McCauley propeller.

The firewall-mounted battery is now a self-manifolded 24V unit, in keeping with the new 28V electrical system that will provide for growth in future power requirements, according to Cox. He also pointed out the components added to eliminate fuel and oil lines in the cockpit; electrical transducers are used instead of directly connected instruments. The hand-plunger primer has been eliminated in favor of a novel electrically operated valve in the auxiliary fuel pump's plumbing. With the master switch and boost pump on, a button next to the magneto switch is depressed (about three seconds will suffice for a cold start), allowing a solenoid-actuated valve to open and send pressurized fuel into the primer lines.

The Tiger's uniqueness always hinged on two features: the nonsteerable nosewheel, castering up to 90° either side of center, and the sliding canopy, combining ease of entry with unlimited ground ventilation. Both are retained. Two hydraulic snubbers are fitted to the nosegear to limit the tubular spring's rebound.

The no-maintenance fiberglass maingear legs are also held over by popular demand. A 5.00x5 nosetire is used, with 6.00x6 mainwheel tires.

As before, 51 gallons of fuel are carried in the two integral wing tanks, with small sump tanks and drains located beside each maingear leg's juncture with the fuselage.

Tubular wing spars, along with the bonded honeycomb-core construction of the airframe, are basic tenets of the Tiger faith and will continue as before. Each wing has two stall strips, giving a nice recognizable stall break in flaps-up or flaps-down configuration. Electrically operated flaps lower stall speed by only 3 knots, but add considerable drag, a valuable tool for landing the slick-as-wet-soap Tiger.

There is now a landing light in each wingtip, one focused for taxi attitude and the other for the actual landing. Previously, a single light in the nosecap was used for night operations. The new rudder cap is molded of red Lexan and houses a strobe for anticollision lighting.

The environmental comfort systems have been completely redesigned, Jim Cox said. The NACA

With the return of the Tiger, aircraft manufacturing comes to Mississippi. The new plant is located in Greenville, on the banks of the mighty river.

TIGER TALE

continued

> ***Light-retractable speed on a fixed-gear budget was and is the Tiger's strong suit.***

ramp air inlets on the sides of the forward fuselage did a creditable job of channeling cool air into the sun-soaked cabin, but tended to leak water into the cabin during a rain. Now a 3-inch hose feeds the subpanel outlets, instead of a Royalite duct, eliminating the leaks. Meanwhile, the heater's output is now channeled into ducts running the length of the center console, adding badly needed heat to the rear cabin.

The cabin speaker was formerly installed in the glareshield, where it did a wonderful job of assaulting the windshield, rather than directly addressing the pilot's ears. To solve this problem, AGAC has mounted speakers on the forward cockpit sidewalls, with flood lights in each housing for extra night illumination. The instruments are now all internally lit, and the old Royalite panel cover was eliminated in favor of a clean, all-metal instrument panel.

Improved canopy seals and plush soundproofing have been added to tame the Tiger's noise level and keep the cabin dry during heavy rain. The seats, carpeting and sidewalls are now luxuriously done, almost to the point of opulence in the test aircraft we flew. Five-point restraint harnesses are fitted for the front seats, with inertia-reel shoulder harness anchored at a proper height on the rear sidewalls, rather than the cabin floor or seats.

The 120-pound baggage compartment, with a hat shelf extending into the tailcone, is reached through a door on the left side of the fuselage.

A servo-action trim tab is on each elevator. The dorsal fin, as with other former Royalite components, is now made of fiberglass for better aging qualities and durability.

From nose to tail, the yellow-and-blue first production airplane we used for our test hop was a beautiful example of the new Tiger. We eagerly climbed aboard, via our separate wing walks, to sample the 10-hour-old, new-plane smell and feel; one flips up the front-seat cushion with a toe to step directly onto the main spar when boarding.

AGAC has worked out a private-label factory avionics package from Sigma Tek, now owners of the former ARC avionics line. These latest-iterations of the ARC radios are reportedly of much improved reliability, compared with the old 300-series equipment used in mid-'70s Cessnas. Dual RT-385 navcoms were on board, as was an audio panel, an automatic direction finder (ADF), panel-mounted liquid-crystal display (LCD) readout distance-measuring equipment (DME) and a 1060-series transponder, with an encoding altimeter. An S-TEC Series 50 flight control system, with an unslaved horizontal situation indicator (HSI), and a capable loran C receiver, completed the avionics list.

The empty weight was pushed up to 1534 pounds by all this gear, and the $87,400 base price was swelled to roughly $115,000.

The Tiger's slide-back canopy offers plenty of fresh air—and visibility. Improved canopy seals helps noise level and water-tightness.

With the full 51-gallons of fuel on board, some 560 pounds were available for cabin payload in the lavishly equipped demonstrator. Conversely, if four 170-pound people were carried, 31 gallons of fuel could be in the tanks, enough for three hours of endurance at mid-cruise power, or about 500 n.m. of range.

More typically equipped Tigers would probably go out the door with 50-75 pounds more payload.

The older Tiger's row of circuit breakers and rocker switches across the subpanel has been changed to combined toggle-type switch/breakers, and an enlarged row of engine instruments has been added, including a cylinder-head temperature gauge in addition to the usual fuel pressure, oil pressure and temperature gauges. The +/- ammeter has been changed to a more-functional loadmeter; buss voltage is available when a momentary switch is depressed. An electric outside air temperature gauge is also in the cluster.

The fuel gauges are located next to the fuel selector itself, near the fashionable ersatz-multi-engine power quadrant that replaces the old Tiger's carburetor heat, throttle and mixture controls. The central console holds the flap switch, pitch trim wheel and flap and trim indicators.

We flipped on the master and boost-pump switches and pressed the electric priming button for a three count. Energizing the starter brought the big-bore Lycoming to life with a fault-line shudder of the airframe. After we switched the avionics master on, Greenville Tower gave its blessing to our movement and we slid the canopy partially closed, keeping our hair unruffled yet allowing the warmth of a Mississippi spring to dissipate during taxi.

Taxiing is simple enough when headed into the wind, while a bit of brake is required when taxiing crosswind, due to the nonsteerable nosegear. In

Entry is easy, too—and the interior features a new opulence. Front seats have five-point restraint harnesses.

TIGER TALE

continued

Sports-car handling is still a Tiger strong suit. Private-label Sigma Tek avionics offer improved reliability over the old ARC line.

return for this minor hindrance, one is spared the weight and expense of a complex, steerable oleo nosegear assembly and gains the ability to pivot away from the fuel pumps with all the aplomb of a taildragger.

Preflight chores are simple enough: controls and trim are checked, instruments set, throttle advanced to 1800 rpm for the runup to test magnetos, carburetor heat and suction checked. The canopy is snugged shut and the boost pump is switched back on. Flaps are left at zero.

Lined up, we opened the throttle to begin the takeoff roll, with a toe-tap or two required until the rudder became effective at 20 knots or so. Liftoff came at 60 knots about 1000 feet down the runway, and we transitioned directly into a 90-knot V_Y climbout, which registered 900 to 1000 fpm on the warm, turbulent day; we were loaded to about 200 pounds below max gross.

We leveled out at 3500 feet in a relatively smooth layer of air, left the throttle open to let the airplane stabilize in a full-power run and saw about 133 knots on the airspeed indicator, some 141 knots of true airspeed with 2600 rpm on the tachometer. A more typical 2450 rpm have us 124 knots IAS, or a true of 132 knots, and a quiet 2350 rpm showed us 117 knots, for a TAS of 125 knots.

The Tiger's quickness has always been its forte, and the 1990 version has lost none of the marque's appeal in that regard. Light-retractable speed on a fixed-gear budget was and is the Tiger's strong suit.

The cockpit seemed quieter than before, especially at moderate power settings, but then, the new airplane factor can't be disregarded. Older airplanes also tend to have leaky windows and doors, mufflers that are no longer as efficient as when new and creaks and groans that come with age.

The Tiger's light controls are like a sports car in comparison to the rest of the fixed-gear competition, even though we found stability at our forward C.G. range quite acceptable. Dihedral effect allowed us to pick up a wing with rudder when making notes, to the discomfort of rear-seat passengers, of course.

Slowing down for stalls took some time. We started extending flaps when we got into the white arc on the airspeed indicator below 104 knots and found 60 knots still offered a modicum of control. With power at idle, the stall horn came on at 55 knots and a mild break occurred at 51 knots indicated. Flaps up, the warning and stall came about 5 knots higher on the scale. We tried stalls with partial power and flaps down and in a turning departure configuration, all with little effect on the stall break. The stall strips do their job well, evidently.

Back at the airport, we renewed our acquaintance with the Tiger's traffic-pattern manners, finding it more like a sedate family sedan than the sports car it resembled in the air. Power off, it floats along with a mild sink rate until the flaps are deployed, at which time the nose falls away and one sees the whole airport in the windshield, a very comfortable approach angle for obstruction clearance.

We trimmed for 90 knots initially, slowing to 80 on base leg and using 75 knots down the final approach. We could have used 70 at our light weight, as we floated 500 feet or so down the runway before touchdown came at 50 knots.

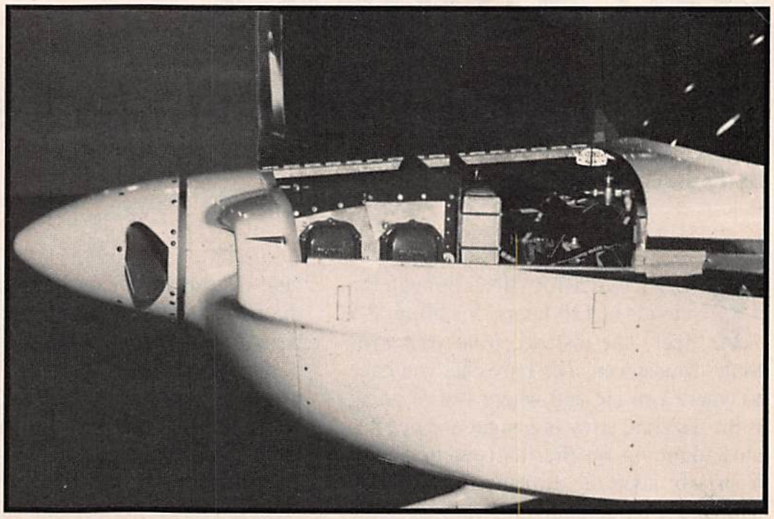
Runway distance requirements of 1500 feet seemed achievable, and the Tiger demanded little expertise to get an acceptable touchdown. The hydraulic snubbers added in 1979 tamed the porpoising tendency encountered by pilots who insist on landing nosegear first.

The new Tiger falls right into the same market niche it vacated 11 years ago—a family and business runabout that offers efficiency and low upkeep, although AGAC plans to offer variations of the airframe for a trainer and other roles.

The airplane had few shortcomings evident on our short visit. We did find the tachometer, located in the top center of the panel, to be partially hidden by the glareshield, probably due to a surfeit of foam in the seats, and the front-seat shoulder harnesses were ready to snare the feet of back-seat passengers climbing in and out over them.

A network of dealers has already been set up to distribute the new Tiger as well as AGAC's follow-on products, and the American Yankee Association, anxious to see its favorite airplane return to production, is the design's biggest supporter. If you have a requirement for a fast, simple, four-place airplane, check into the American General Tiger. It will take good care of you.

FOR MORE INFORMATION, contact: James Cox, American General Aircraft Corp., P. O. Box 5757, Greenville, MS 38704; telephone 601/332-2422.



The new Tiger has a 180-hp engine and a 76-inch Sensenich propeller to eliminate the caution range of operation.

The Tiger's uniqueness always hinged on two features: the nonsteerable nosewheel and the sliding canopy.

1990 American General AA-5B Tiger

Prices

Price, standard equipment, faf	$87,400
Price, equipped as flown (estimated)	$115,000

Specifications

Wingspan	31.5 ft.
Wing area	140 sq ft.
Length	22 ft.
Height	8 ft.
Wheel track	8.25 ft.
Wheel base	5.33 ft.
Landing gear type	fixed, tricycle
Tire size, mains	6.00x6
Tire size, nose	5.00x5
Seats	4

Weights and loading

Maximum gross weight	2400 lb.
Empty weight, standard	1311 lb.
Empty weight, as tested	1534 lb.
Useful load, standard	1089 lb.
Useful load, as tested	866 lb.
Wing loading	17.1 lb./sq ft.
Power loading	13.3 lb./sq ft.
Fuel capacity, total/useful	52.6/51 gal.
Baggage capacity	120 lb.

Engine

Lycoming O-360-A4K four-cylinder, normally aspirated, carbureted, horizontally opposed, 180 hp at 2700 rpm. Recommended TBO 2000 hours.

Propeller

Sensenich two-blade, fixed-pitch, 76-inch diameter.

Performance

Maximum speed	148 kt.
Cruise speed, 75% power, 8500 ft	139 kt.
Range, 75% power, with reserve	554 n.m.
Stall speed, flaps up	56 kt.
Stall speed, flaps down	53 kt.
Rate of climb, sea level	850 fpm
Service ceiling	13,800 ft.
Takeoff ground roll	865 ft.
Takeoff over 50-foot obstacle	1550 ft.
Landing over 50-foot obstacle	1120 ft.

Bad Attitudes

There's a simpler way to manage instruments for IFR flight.

By Robert N. Rossier

YOU'RE SCREAMING through the clouds at 120 knots. Visibility: 2.5 feet—the distance from your eyes to the windscreen. The only clue you have to where you are and where you're going is the dazzling array of gauges and needles slow dancing on the instrument panel. Your job: keep the airplane right side up and find a cloud-blanketed runway some 100 miles distant and 3000-5000 feet below.

"Now, let's see. We want a climbing turn. So, the attitude indicator is primary for pitch as I begin the turn. No, wait, is this going to be a constant-speed climb? Then it would be supporting. But that's only as I'm establishing the climb, after that it's supporting. No, is that right? Maybe it's the turn indicator that's primary."

Learning to fly an airplane under IFR conditions is considered by many pilots to be one of the true challenges of aviation. The fact of this is borne out by the requirements for the instrument rating—40 hours of simulated IFR, or as much again as the requirements for a private-pilot certificate. Compare this with the mere 10 hours required for the commercial-pilot rating, or the fact that there is no minimum time requirement for the multi-engine rating, and it becomes apparent that earning the instrument rating really is a major challenge and accomplishment in our pilot-training system.

As with all flying, our goal in instrument flying should be to keep it simple. After all, if we keep things simple, then our workload is reduced. And if our workload is reduced, then we are less likely to get behind the airplane and into trouble. The ideal situation for the IFR pilot is simply to monitor the airplane—its performance and systems—to make sure that everything is going right. Our job is easiest when we scan the instruments, find that the airplane is doing what we want and don't have to make any control inputs. This sounds great, but how do we make it happen?

There are two skill areas that lay the foundation of IFR flight. The first is basic attitude instrument flying and the second is what I call aircraft management. Master these and your ability to monitor the airplane improves greatly.

The generalized concept of basic attitude instrument flying includes scanning the instruments, interpreting the indications to understand what the airplane is doing and applying the proper control to make the airplane do what we want.

There are two basic attitude instrument flying techniques taught today. One is endorsed by the Federal Aviation Administration (FAA); the other is used by the military. Because both methods address the same task, they are each adequate for flight under IFR. However, one technique is easier for the student to understand and implement.

The FAA method divides the instruments into direct and indirect instruments, and then further into primary and supporting instruments. This can become quite confusing. For example, the attitude indicator is considered a direct instrument because it tells us the pitch attitude of the airplane directly. The vertical speed indicator (VSI), on the other hand, is considered indirect because we infer from it that the aircraft must be pitched up, down or level.

The differentiation between primary and supporting instruments isn't always simple. In basic terms, primary instruments give us the most pertinent information at the moment and the supporting instruments provide a cross-check on the primary instruments. The differentiation between primary and supporting instruments gets tricky because for nearly any change we make—climb, turn, descent or straight-and-level flight—the role of each instrument also changes. In some cases, instruments change from primary to supporting, or vice versa, as we initiate a change and then stabilize in the new flight configuration.

For example, as we enter a constant-airspeed climb, the attitude indicator is primary for pitch control and the VSI is supporting. As we reach a stabilized climb, the airspeed indicator becomes primary for pitch and the attitude indicator and VSI are supporting.

For a turn, we have a similar situation. The attitude indicator is primary as we initiate the turn, but once the turn is established, the turn gyro is primary and the attitude indicator is supporting.

This all makes sense when we reason it out, but it's difficult to remember what's primary and what's supporting for all the different scenarios. This makes learning basic attitude instrument flying more difficult than necessary. If all this primary and supporting instrument stuff seems confusing to you, you're not alone.

The military approach to basic attitude instrument flying is much easier to understand and to apply than the FAA technique. The instruments are divided into two categories—control and performance. Performance instruments tell us whether the airplane is doing what we want. If not, the control instruments are used to make necessary changes. These unchanging categories simplify the task of understanding your instruments during IFR flight.

The control instruments are the attitude indicator and tachometer (manifold pressure for constant-speed-propeller-equipped airplanes). Altimeter and VSI measure up and down performance, the directional gyro and turn coordinator measure directional performance and the airspeed indicator serves as a cross-check on both pitch and power.

Let's take the case of a standard-rate, constant-altitude turn. The military or control/performance technique starts with the attitude indicator—roll in the required bank on this instrument for a standard-rate turn. Now scan the turn coordinator to see if we have standard rate. Scan back to the attitude indicator and make any necessary adjustments. Next check the altimeter to verify constant altitude and scan back to the attitude indicator to make any required pitch changes. Scan the airspeed indicator, and then go to the tach to make any needed power adjustment. Again, the control instruments are used to make the adjustments (control inputs), and the performance instruments tell us whether the airplane is doing what we want.

The simplicity of the control/performance technique stems from the understanding that pitch plus power equals performance. For example, at a specified pitch angle and power setting, an airplane will climb at a known airspeed and rate of climb. So, using the control/performance method to initiate a climb, all we do is pitch the nose up to the proper angle, adjust the power to the proper set-