FLIGHT JACKET $42.95

Made with leather-like polyurethane material, this jacket is durable, water repellent, and wind resistant. Front closure overlaps the zipper and secures with snaps. Elastic-knit wristlets and bottom hug the body and pile lining provides warmth. Fur collar and epaulets accent classic design. Available in dark brown only. Sizes: 34 to 48. U.S. orders only.

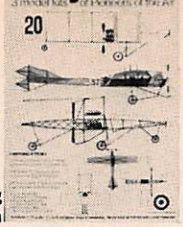
FLIGHT CAPS $4.98

Be loyal to your plane by wearing one of these handsome caps with either Cessna 172, Piper Cherokee, or Beech Bonanza patches sewn on the crown. A strap in the back adjusts to fit all head sizes. Available in blue, black or yellow linen material. Extra patches with caps are 80c each. Patches sold alone are $1.50 each. Add 50c for shipping/handling.

FLIGHT INSTRUCTION ALBUM $12.50

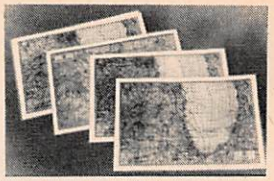
This three-record album is a comprehensive, easy-to-understand guide to elementary flight training. The clearly explained lessons cover: the effect of controls, straight and level flight, use of trim tabs, turns, banks, climbs, glides, slow flight, stalls, steep turns, load factors, takeoffs, landings, crosswinds, and emergency procedures. Add 50c for shipping.

early birds 3-IN-1 EARLY BIRD MODEL KIT $3.50



Here are three planes that made history in one easy-to-assemble model kit: the 1908 Antionette Monoplane, first across the English Channel; the Voisin Farman, set a flight record in 1909; the 1910 De-Havilland, first plane with a reversible pitch propeller. All parts are pre-colored and expertly detailed to assure authenticity. Add $1.00 for shipping/handling.

AVIATION PLACE MATS 4 for $6.00



Introduce an aviation decor to your breakfast or dinner table. These place mats are made from wipe-clean plastic and depict local flight charts. Choose from New York, Tampa/Miami, Chicago, Dallas/Ft. Worth, Los Angeles/San Diego, or San Francisco/Sacramento. Extra mats can be purchased for $1.50 each. Add 50c for shipping/handling.

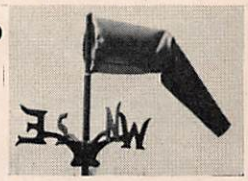
DELUXE FLYING GLOVES $12.95

Soft, yet snug fitting. These pilot gloves offer better grip, warmth and perspiration absorption without interferring with the manipulation of instrument panel switches and controls. Handcrafted from quality thin-out imported capeskin leather, they are available in brown or black, sizes: S, M, L, XL. Add 50c for shipping.

LOCKHEED L-1011 COCKPIT PUZZLE $5.95

When you're finished with this jigsaw puzzle, you'll know the instrument panel of the L-1011 TriStars as well as the pilots who fly them. Three hundred interlocking pieces fit together to form an 11"x17" full color reproduction of the flight deck in this newest and most celebrated of the jumbo jets. Add 50c for shipping.

WIND SOCK $14.95



Now, you can have your own wind sock atop your home, garage, or hangar. The sock on this miniature version of the real thing measures 14" long and 4" in diameter. It is made from durable flame orange cotton material. The two-foot high stand has a hardened steel shaft with bronze oil light bearings and cast aluminum wind directions. This wind sock is built to last. Add $2.00 for shipping.

* GREAT CHRISTMAS GIFTS *

THE FLIGHT SHOP

FLIGHT BAGS $5.95

Rugged is the word for these deluxe flight bags. Made from nylon with vinyl laminated backing and sewn with nylon thread throughout, they feature reinforced handles, a zip opening, side pocket and bell studs on their masonite bottoms. They are available with Beech, Piper, Cessna or Mooney lettering. Colors are brown, navy, red or black. Add 50c for shipping/handling.

KNEEBOARD $6.99

Here is a versatile clipboard that can be used for inflight computations, notes, charts, etc. An adjustable elastic band secures the clipboard to the pilot's leg to provide a stable writing surface. Included are a log pad, pen and WAC/sectional scales. Essential for pilots. Add 50c for shipping.

SURVIVAL KITS

Survivor I $24.95
Survivor II $29.95
Survivor IV $99.95

No pilot should fly without one of these exhaustive survival kits. Each package contains provisions for shelter (tube tents and space blankets), food (3 days per person), first aid (plus water purification), water (by means of a solar still), fire (under all conditions), rescue signals, a 40-page survival manual and nearly every other imaginable necessity. Kits are for one, two or four persons. Each is packed in a waterproof container and ranges in weight from 2¾ lbs. to 3¼ lbs. to 15 lbs. They're a pilot's life insurance. Add $2.50 shipping/handling for Survivor I & II; $5.50 shipping/handling for Survivor IV.

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PLANE & PILOT REPORT

GRUMMAN AMERICAN TIGER no. 100

By MARTIN BLACK

USUALLY, BY THE time an airframe manufacturer makes 100 of anything, the bugs are out of the product, on-line improvements have been made, and the results can be regarded as the manufacturer's best shot. N75023, the 100th Grumman American Tiger to come off the Grumman American assembly line, represents this bugs-out, improvements-made refinement of product.

N75023 also represents 1976, and the Spirit of '76, as the aircraft carries an Old Glory paint scheme in red, white and blue, in honor of the United States' bicentennial celebration — sort of No. 100 for No. 200.

Getting a day's flying time in the 100th Tiger built was luck of the draw. A phone call to Bill Gordon of Star Aircraft at John J. Montgomery Field, San Diego, Calif., resulted in assignment of N75023 for the sultry, muggy, 90-degree early fall Saturday. The airplane was factory new, with only ferry time on its recording tach, and had already been sold to Don Henkel of Van Nuys, Calif., who agreed to permit the spanking new Tiger to be put through its PLANE & PILOT Report paces.

Gordon, pleased with the new Tiger, was eager to show it off, and to point out improvements and places where bugs that have plagued earlier Grumman American Travelers and Tigers have been carefully engineered into oblivion.

The majority of General Aviation pilots think that the Grumman American Tiger is a Traveler with 30 additional horses under its cowl — but that's not all! The added power is in the form of an Avco Lycoming O-360-A4K powerplant, rated at 180 bhp at 2700 rpm. The 30 hp, over and above the Traveler's 150, puts fact to the term performance. However, it isn't necessarily a simple case of more horsepower doing the job, creating the impression of performance. It's horsepower plus . . . .

The Tiger has a Traveler fuselage and wing, in the now familiar idiom of honeycomb box section, extruded tubular alloy wing spar, and virtually rivetless resin bonded skin that have marked the American/Grumman American line since its introduction.

What's new are things that only come with time. For example, the Tiger's cowl can be viewed as an exercise in refinement. Lift-open cowl sections that once were flimsy and difficult to re-latch when raised now are stiffened to smooth rigidity with insertion of honeycomb material doublers underneath the formed metal skin. Spring loaded latch pins guide the cowl securely into place for easy lock-up and security in flight. The latch levers themselves are inset, flush with the skin of the aircraft for reduced drag. The inside of the cowl and engine compartment have been given the zinc chromate anti-corrosion treatment. Moreover, the left-hand cowl section has been fitted with an oil level inspection access door — which Travelers and early Tigers lacked. What's old is the ease of Tiger preflight inspection of engine and accessory areas.

The entire spinner/cowl area has been subtly sculptured and re-contoured for

lowered drag. The single landing light, on the nose section to the right and below the prop spinner, once located in a cupped indentation, now is faired over with a disc of clear plexiglass, again in the interest of drag reduction.

The smoothing of air flow for increased speed performance also is the chief influence in new fairings for the Tiger's main landing gear. Aerodynamically slick neoprene boots now encase the aircraft's laminated fiberglass landing gear struts. Full wheel speed fairings are retained, but with a difference — axle and brake areas of the wheel assemblies now are faired over for improved airflow. Grumman American claims a 4-mph speed increase with the new cowl contours and wheel fairings.

Another refinement displayed by Tiger No. 100 is a re-designed castering nose wheel strut. The strut's forward angle has been increased to provide almost 11 inches of unloaded ground clearance for prop tips, which, to say the least, is advantageous in making use of rough fields that the Tiget's husky glass main gear can easily accommodate.

Most noticeable difference between Traveler and Tiger is the horizontal stabilizer. The Traveler's horizontal tail-plane is made up of two tapered vertical stabilizer sections to form a relatively narrow span. For reasons of aerodynamic inefficiency, Travelers were fitted with a ventral fin. The Tiger boasts a stabilizer of 12 feet, 8 inches, span, with the elevator vane extending almost the full width of the plane, except for its narrow end cap fairings. Anti-servo trim tabs extend along almost 80 percent of the elevator vane. And that ventral fin is gone, indicating some cleaner aerodynamics.

The 150-hp Traveler is hampered in terms of flight endurance by 37 gallons (222 pounds) maximum fuel capacity, for 520 sm with 45 minutes reserve. The Tiger offers 51 gallons (306 pounds) of usable fuel for the thirstier 180-hp engine. The increased capacity produces 650 sm range, with 45-minute reserve. The Tiger won't make it from Los Angeles to El Paso in one jump, but Tucson is a nice place to re-fuel and get a cup of coffee.

The Traveler offers 30 degrees maximum flap extension. The Tiger's electrically operated flaps appear almost Cesna barndoor-like at their full 45 degrees. But more of flaps later, as they're more part of flying than the mechanics of the aircraft.

One convenience feature the Traveler carries is a fold-down rear seat back to provide an enormous (for lightplanes) cargo bay, great for the salesman with sample cases, or the sportsman with guns or golf clubs. The suitcase-sized luggage door is there for stuffing things inside up to a useful load of 1,019 pounds.

All other systems, dimensions and so forth, are identical to those of the Traveler/Tiger of 1974-75. All this Tiger, and one radio, a transponder and instrumentation, goes for about $26,000, flying it away from the factory.

This day, however, it was to be flown away from Montgomery Field. Bill Gordon put CFI Ben Ethan in charge of checkout chores. Under Ethan's eye, preflighting the Tiger appeared identical to preflighting the Traveler, but was essentially different. The Grumman American canopy unlatched easily and slid rearward without a hitch. Amazing! Likewise, it slid forward to be easily latched from inside — another bug de-bugged.

Other than that, the preflight inspection was a by-the-book walkaround. The 100th Tiger was full of fuel, its tires were inflated. There were no gnats in pitot tube or static air sources. Tiger No. 100 was ready to go.

Climbing into the Tiger is a step-over-slide-it-around-the-posterior move, characteristic of all Grumman American aircraft. Front cushions may be raised for use of the seat base as an entry step, but if the pilot's legs are long enough, the cushion-lift gimmick really isn't necessary.

Seatbelts and shoulder restraint are of the single quick-release buckle variety, moderately fumble-prone, as one is in the navel contemplation position for hooking up the lap and shoulder belt tangs, and joining them to the center latch buckle.

The normally aspirated O-360, cold, was a bit reluctant to start with only two shots of primer, but a third squeeze of raw fuel brought the engine to life.

Some background in taildragger flying is healthy for the would-be Grumman American Tiger pilot because taxi maneuvering this airplane, with its castering nosewheel, requires brake-and-power combinations similar to those necessary for putting a tailwheel airplane in a desired location. What the castering nosewheel does is make a pilot aware that a steerable nosewheel is not absolutely mandatory for precision ground handling of a tri-gear airplane. It just takes getting used to, that's all.

Montgomery ground control cleared Tiger N75023 to the run-up area, where no surprises were encountered. The airplane's checklist would do for a broad variety of other airplanes — no tricks, no special tweaks, just straightforward look-see at controls, engine performance and gauges.

Then the tower said, "Go," and the white dashes of the runway centerline started to roll up under the plane with easy and full application of throttle. Surprise! With takeoff trim rolled in, the Tiger was off the deck and flying at about 65 mph, well before the anticipated point on the runway. Trimming the nose down to just below the horizon brought the best rate of climb speed, 104 mph IAS (best angle is 81 mph).

The VSI showed 850 fpm in the soft, mushy air as the Tiger climbed straight out for the Pacific shoreline. During the climb there was an opportunity to try some Dutch rolls. With no special effort at coordination, the black ball could be kept centered.

Over the coastline, the Tiger encountered some turbulent updrafts, product of the wierd weather, and showed itself to be without wallow or pitch in the rough going. The airplane just takes the bumps, then levels itself without pilot assistance.

Turning north, over land and out of turbulence, trimming for straight and level flight proved more difficult than expected. This was mainly a result of the down slope of the Tiger's cowl which initially presents a sight picture of nose-down flight. This causes the pilot to carry too much elevator back pressure or nose-up trim to hold the nose up unnecessarily. Facility in getting things leveled comes with familiarity.

Then it was time for some turns, 45 degrees of bank to the left, 45 degrees of bank to the right. Easy, ball in the center, self-coordinating, are about what can be said regarding the Tiger. One sloppy chandelle, and one not so bad, plus a couple of still better lazy eights induced a growing sense of being in control, the man/machine knowledge that the Tiger does of it what its pilot demands. If the Tiger does not respond to control inputs altogether quickly, it certainly does so with a crisp, positive smoothness.

A straight-ahead, flaps-up, power-off stall with the Tiger is about as exciting as a hand of Whist with one's great aunt. The airspeed indicator needle dips to an indicated 60 mph, the aircraft shudders mildly, then the nose dips gently. If up elevator is held, this cycle is repeated as the aircraft sinks slowly, about 500 fpm, to earth.

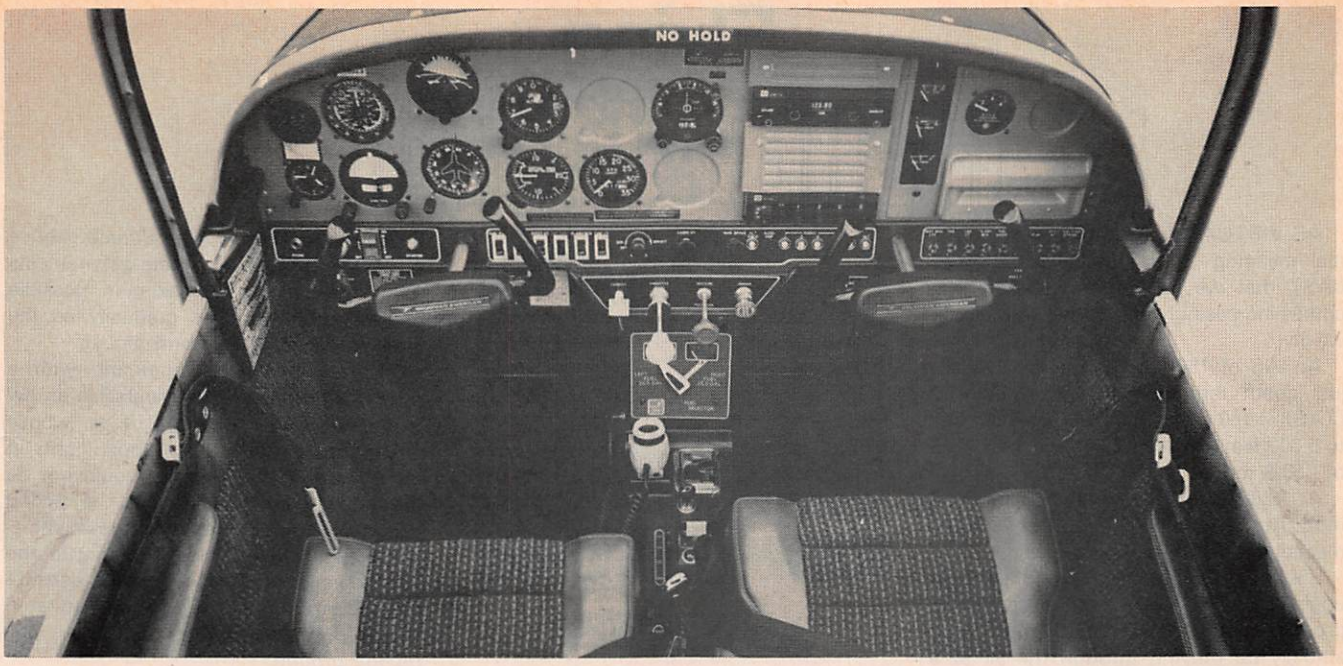
With full flaps, that new 45 degrees, the stall syndrome occurs with the needle well below the white arc. Recovery is simply a coordinated addition of power and release of back pressure on the yoke.

Power on, clean or with flaps extended, stalls in the Tiger are in the pussycat category.

Ben Ethan urged a couple of accelerated stalls out of 60-degree banking turns, so the Tiger was cocked up into the steep bank, and the yoke was yanked abruptly rearward. In some aircraft, this would be an invitation to the first half-turn of a spin, over the top maybe, plus a grevious loss of altitude and full pucker. With the Tiger, the abrupt maneuvering stall entry results in the aircraft falling away from the direction of the turn to resume level flight — all by itself. This is a Tiger feature that can well save many a green (or careless) pilot's fanny.

Straight and level slow flight of the slowest variety is easily achievable with the Tiger. Something under 1800 rpm, full flaps and full nose up trim resulted in another below-the-white-arc demonstration of in-flight capability and stability. The Tiger just seemed to hang there on its 75-inch fixed pitch prop and dawdle along. Again, amazing, particularly in a 160-mph cruise airplane.

Fooling around had brought the Tiger into proximity with Palomar Airport at Carlsbad, Calif. So what to do but shoot



some touch and go landings, just for practice.

The Tiger was at 3,000 feet, so a slip was in order for pattern entry. A steep slip to the right bled off altitude at 1500 fpm, easily, right into the 45-degree right-hand entry. And, 1800 rpm produced level flight at 100 mph; 1600 rpm gave level flight at 90; and power off for a windmilling prop presented a 400 to 500 fpm descent rate on base leg and final for the first no-flaps approach.

The Traveler, at an airspeed just above touchdown velocity, exhibits undue elevator sensitivity that can balloon the airplane and initiate an unsightly porpoising effect. The Tiger's broad elevator, with its anti-servo system, simply doesn't do this. A main gear landing can be managed through the simple expedient of holding the aircraft off the asphalt with ever more rearward pressure on the yoke — nose up trim, too — until the airplane settles its main wheels on the runway with that beautifully satisfying squeak-squeak.

The next trip around was an examination of one-third flaps for 90 mph on downwind, two-thirds flaps for 80 mph on base, and full flaps for 75 mph on final and over the threshold to another glassy touchdown. The flaps follow-through varies only in the finger flick of the flap switch to clean things up for almost immediate liftoff.

The Tiger was next flown to Fallbrook, Calif., where there's a narrow 2,000-foot strip on a hilltop. This runway is blessed with a perpetual crosswind from the right that burbles and rolls merrily over rough ground and hangar buildings. But the Tiger handled the crosswind with merely aileron to dip the right wing into the wind and a bit of rudder to keep things in alignment.

Then it was time to return to Montgomery Field. On the way home, cruise was established at 75 percent power by the book — which means 2600, with some mixture leaning for the hot day and altitude. Indicated airspeed at 3200 MSL was a fraction over 150 mph. Taking into account the 90-degree OAT, the Tiger's calibrated airspeed worked out to 162 mph — by the book.

In writing about Tiger No. 100, nothing has been said about control pressures. That's because there are no untoward control pressures to notice, to remark upon or write about. Tiger aileron, elevator and rudder are equally light, equally responsive, with just enough balanced "feel" for some sensitive flying. The Tiger never demands the effort of push, pull or shove. Nice.

What it boils down to is that the Grumman American Tiger for '76 is ridiculously easy to fly. The pilot who has flown the GA Trainer, the Cessna 150 or Piper Cherokee 140 can transition into the 180-hp four-placer without the least difficulty. Indeed, the novice pilot may even find the larger four-placer less difficult to manage in some situations than his former primary training aircraft.

The Tiger is gentle and forgiving, yet fast and strong. It is a sophisticated design, yet lacks the complexities and maintenance problems (and costs) of retractable landing gear and constant speed propeller. It is economical in initial purchase price, and in operating and maintenance costs.

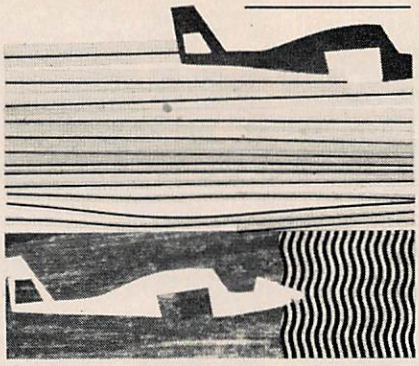
The Traveler's boxy jaw has become the Tiger's smooth nose. This airplane looks *right*, and flies as right as it looks. What more could the prospective owner ask of a midrange lightplane?

Certainly the bugs are out of the product, on-line improvements have been made. Tiger No. 100 is Grumman American's best shot, and it's well taken.

One hundred Tigers have been manufactured, now. It's safe to predict that No. 1,000 isn't far in the future. •

Aircraft Name: Grumman American Tiger
Base Price: $26,000
Year/Series: 1976
POWER
Engine: Lycoming O-360-A4K
Horsepower: 180 at 2700 rpm
TBO: 2,000 hours
Power Loading: 13.3 lbs./hp
Min. Aviation Fuel Grade: 100
Normal Cruise rpm: 2600
Oil Capacity: 8 quarts
Supercharged: No
Fuel Injected: No
SPECIFICATIONS
Wingspan: 31'6"
Wing Loading: 17.1 lbs./sq.ft.
Length: 22'
Height: 7'8"
Wing Area: 140 sq.ft.
Max. Cabin Width: 41"
Seating Capacity: 4
Baggage Capacity: 120 lbs.
Gross Weight: 2400 lbs.
Empty Weight: 1,381 lbs.
Useful Load: 1,019 lbs.
Payload (full fuel): 713 lbs.
PERFORMANCE
Standard Fuel Capacity: 51 gals.
Max. Range, 75%: 752 sm (no reserve)
Max. Range, 65%: 755 sm (no reserve)
Optimum Range: 800 sm (no reserve)
Rate of Climb: 850 fpm
Takeoff (50 ft. obstacle): 1550 ft.
Landing (50 ft. obstacle): 1120 ft.
Normal Rotation Speed: 60-65 mph
Normal Landing (approach speed): 75-80 mph
Stall Speed, Clean: 65 mph
Stall Speed, Flaps: 61 mph
Service Ceiling: 14,600 ft.
Max. Flap Extend Speed: 120 mph
Normal Cruise Speed: 160 mph
Maximum Speed: 200 mph (red line)
SYSTEMS OPERATION
Flap Operation: Electrical
Trim: Elevator, Manual
Auxiliary Fuel Pump: Electrical
Number of Generators (Alternators): One
Cowl Flaps: No
Resettable Circuit Breakers: Yes

Flying HIGHER & FASTER



By PAUL GARRISON

AS VIRTUALLY ANY pilot knows, the real meaning of the indicated airspeed (IAS), that we read in the cockpit, becomes increasingly impressive, the higher we fly.

An IAS of 150 mph at sea level means just about that, namely a true airspeed (TAS) of 150 mph. Once we have climbed to 5,000 feet, that same IAS means a TAS of 163.8 mph.

At 10,000 the figure increases to 177.6 mph. At 15,000 it's 194.9 and at 20,000 a respectable 216.7 mph.

If we could climb to 30,000 and force our engine to still generate sufficient power to produce that same IAS of 150 mph, we'd actually be moving through the air at a phenomenal 259.3 mph.

The reason is obvious. The density of the air decreases considerably with increasing height, striking the inlet of the pitot tube with less force at a given speed, thus producing a lower IAS reading in relation to the velocity of the aircraft.

But not only the pitot tube is subject to this effect, the entire aircraft experiences less drag, the importance of which can be understood when we realize that the average high-performance single-engine aircraft must displace 10,000 pounds (five tons) of air when traveling one mile at sea level.

Therefore, just as the decreasing air density at higher altitudes reduces impact pressure on the pitot system, thus producing a lower IAS for a given TAS, so it reduces overall drag. Therefore, with a steady amount of power available, the airplane can achieve greater TAS.

The trick then, in trying to take advantage of increased speed due to low air density, is to find a means to have constant power available as we continue to climb. But engines breathe air in a fixed proportion to the gasoline they burn: one pound of gasoline to about 15 pounds of air.

Therefore, as the air gets thinner it weighs less, thus permitting less gasoline to be burned, resulting in a proportionate reduction in power.

To overcome this self-defeating chain-reaction of events it is necessary to provide the engine with the equivalent of sea level air. In other words, air that is compressed to sea level density and, in turn, weight. This is what turbocharging is all about.

Turbocharging compresses air by a centrifugal pump driven by a turbine that is propelled by the exhaust gases. The energy that is produced by the escaping exhaust gases is normally wasted, so using it for this purpose puts no added strain on the engine except for a negligible increase in exhaust backpressure.

The typical turbocharger is a small but tough unit in which a shaft with compressor wheels spins at up to 100,000 rpm while immersed in exhaust gases at 1500 degrees F.

It's operation is modulated by a control, called a waste gate. The waste gate, in effect, is a controllable relief valve installed in the pipe that carries the exhaust to the turbine. When little or no boost is needed, the waste gate is open, and exhaust gases escape through it rather than through the turbine.

As added boost is needed, the waste gate is gradually closed and more and more exhaust gas is forced to go through the turbine which spins at increasingly high speed, producing more and more boost, until its full output is reached with the waste gate fully closed.

The maximum compression available from a turbocharger is limited to about 2.2 times that of the ambient air because of the increase in the heat of the compressed air being fed to the engine which, when exceeding 200 degrees F., could cause detonation and result in engine damage.

A compression of 2.2 times ambient air produces sea level pressure at about 16,000 feet, meaning that this is the maximum altitude at which the engine will be able to develop 100 percent of power. It is referred to as the *critical altitude*. Above this critical altitude the waste gate remains fully closed and the maximum possible power output reduces gradually as the airplane climbs higher and higher.

The advantages of operating with a turbocharged aircraft are negligible at low altitudes. Therefore, those of us, whose flying consists primarily of short flights in the 300-or-less-mile range, should not be tempted to get involved in the added expense unless, of course, these short-range flights take place primarily in the Rocky Mountain area where high-density-altitude airports prevent normally aspirated engines from developing full power, even on the ground.

The ideal flight with a turbocharged aircraft involves a continuous climb, after takeoff, to a cruising altitude somewhere above 12,000 feet, in many cases, especially when talking about a west-east flight, to the rarified realm between FL180 and FL240.

(From 18,000 feet on up altitudes are designated as flight levels — FL — leaving off the last two zeros. Thus 18,000 feet is FL180 and 24,000 feet is FL240.)

The reason is that at these altitudes we are likely to be able to take advantage of the jetstream which often moves eastward up there at speeds in excess of 100 knots, thus resulting in some rather spectacular ground speeds.

The question of leaning the mixture during climbs of such long duration takes on more than average importance. the principle is the same as it is with normally aspirated engines, namely, do NOT lean, regardless of altitude, when the engine is being operated at more than 75 percent of power.

Any time the engine is operated at 75 percent or less, it is sound practice, both from the point of view of fuel economy and of engine (and spark plug) health, to lean to the degrees recommended by the engine manufacturer.

The actual percent of power produced by any given combination of manifold pressure and propeller pitch (rpm) can be found in the owner's manual.

When climbing with the maximum permissable turbocharged power, the percentage is probably above 75 percent all the way up to approximately 16,000 feet. In that case full rich mixture should be used.

Adding A Compressor To The Engine Results In Supercharged Performance