power is reduced to idle. If pitch attitude is not reduced immediately, a stall or high sink rate may develop. Once best glide speed is obtained, execute a 180 degree turn and note the total loss of altitude. CAUTION: Avoid practicing these procedures in very cold weather due to rapid cylinder cool down.

Flaps for Take Off ?

by Mike LeTrello, PFP Instructor

As an instructor in the AYA's Pilot Familiarization Program (PFP), I have noticed that some pilots use a small amount (5° to 15°) of flaps for takeoff, a procedure I do not believe is proper.

When asked why they use flaps for takeoff, most pilots say, "It gets me off the ground sooner and helps me climb more quickly." That is correct, but after nearly twenty years of flying and instructing in Grummans, I have four reasons you should not use flaps for takeoff.

1. Most of our single engine Grummans, whether two- or four-place, are under-powered for takeoff because they are turning a cruise prop. Using flaps for takeoff delays acceleration to best-angle/best-rate airspeed, and also limits RPMs (horsepower thrust) from the engine. Most of our engines are turning only about 2200 RPM on takeoff. The horsepower for your engine is determined by RPM. Noting the actual horsepower at 2200 RPM reveals why not to delay the conversion of RPM to horsepower.

   Here are a few examples of horsepower versus RPM:
   AA1: 108 HP at 2600 RPM
   91.4 HP at 2200 RPM
   (at takeoff)

   AA5A: 150 HP at 2700 RPM
   122.2 HP at 2200 RPM
   (at takeoff)

   AA5B: 180 HP at 2700 RPM
   146.6 HP at 2200 RPM
   (at takeoff)

2. If you had an engine failure just after takeoff, using partial flaps, you would need a greater pitch-down attitude (angle) than with zero flaps in order to regain best-glide airspeed. You would lose too much altitude as well as create a high sink-rate/low airspeed condition.

3. Using flaps puts you in greater danger of getting behind the power curve.

4. If you had an accident during takeoff, your insurer may attempt to deny coverage because you were using a takeoff procedure not recommended in the Pilot's Operating Handbook.

Anyone wishing to discuss this issue or other flight procedures is welcome to call me at (314) 298-3435.

Flaps on Take-Off

by Jim Gates

At the risk of beating a dead horse, I would like to suggest a different angle on the issue of using flaps on take-off.

The main purpose for using flaps on takeoff, in my opinion, is not to wring the last 1% of performance from the aircraft, but to make a pleasant flight for my passengers. Nothing seems to get a flight off to a worse start than a frightening departure. With flaps up, when the aircraft is rotated at 55 knots, the stall warning horn bleeps and the aircraft assumes a nose high attitude and waddles off the ground. This usually evokes some jaw-clenching and eye-widening reactions from my favorite and most frequent flying companion, Miss Doris.

The flaps of my aircraft appear to be slightly past neutral when fully retracted, which may account for the high angle of attack. In any event, this is not an auspicious beginning for a flight. I find I can avoid the negative reactions and the need for oblique explanations of obscure aerodynamic theory (for which I have a great reputation) by deploying a little bit of flaps. Before takeoff, I rotate the control wheel fully clockwise, which puts the left aileron down. I then line up the trailing edge of the flap with the trailing edge of the left aileron. This barely registers on the flap indicator. Using a normal takeoff technique, the aircraft lifts off at a lower angle of attack, with no stall warning horn noises, and a solid feel. Once out of ground effect, I retract the flaps and the aircraft accelerates to climb speed with little trim change.

I must confess, I did not discover this technique on my own, but can't recall who suggested it. Whoever it was, my passengers certainly thank them for years of less-daunting departures.

Flaps For Take-Off Revisited

by Ken Blackman

The following article, which appeared in a previous issue of the Star, has been updated by the author.

Should flaps be used on take-off, to improve performance, even if the Grumman Pilot's Operating Handbook (POH) says to use no flaps? The debate on this issue was renewed by Mike LeTrello's article, "Four Reasons Not To Use Flaps on Takeoff," in the May/June Star.

The POH is intended to be taken as gospel, right? Well yes, but... Some things are a mystery and the issue of whether to use takeoff flaps is one of them. The POH for the AA5A Cheetah, consistent with the books for all other GA singles (except for the AA1A), recommends using zero flaps for take-off in all situations. Some other aircraft manufacturers suggest some flap extension for short and soft field departures and many call for a 10 to 15 degree setting for even normal take-off. Why American, Grumman American, etc., don't recommend flaps is a question frequently asked but seldom clearly answered. I called an old friend who was involved in the design and certification of our airplanes to refresh my memory of discussions on the subject many years ago.

The results of my call to Bob Hummel, former test pilot, engineer, and divisional sales rep for American and Grumman American (and former honorary AYA member), was fruitful. The following answer is somewhat paraphrased, for the sake of space, but clearly explains the reasons things are as they are.

Certification requirements call for an aircraft, at gross weight, to meet specific rate-of-climb (ROC) numbers during normal take-off and balked landing situations. These requirements are based on sea level standard conditions, which must be extrapolated from data taken at various altitudes. The normal ROC minimum is 10 times stall and balked landing recovery ROC is 5 times stall. These rates must be achieved with the aircraft in the take-off configuration.

While an airplane may benefit from flap extension while in ground effect, the climb rate thereafter will usually suffer. Using the Yankee as an example, the clean stall speed of 69 MPH requires a sea level ROC of 690 FPM. Extending half flaps drops the stall to 68 and the ROC minimum to 680 FPM. During certification flight testing, ROC results graphed down to sea level standard day came out to 710 FPM. The same tests made with one-half flaps, however, fell below the 680 FPM minimum. Although they knew that the thing would, in fact, get off the ground much better with half flaps they were forced to go with no flaps in order to certify the airplane.

This was also true with the later two-place models, the Traveler and the Cheetah, and probably with the Tiger, although Bob was not involved in those flight tests. Bob went on to say that unfortunately, they had to withhold valuable flight information from the aircraft owners and pilots because of FAA regulations. He knows for a fact that the use of partial flaps enhances take-off with all our planes, and explained why.

Ground effect is measured by the wing span of an airplane, i.e., if your wing span is 31.5 feet, as in the case of the AA5 series, you benefit from ground effect until you are 31.5 feet in the air. Using flaps during this stage really helps. Beyond that altitude, however, flaps hurt your airplane's ability to climb in most circumstances and should be retracted.

Soft field take-off will be greatly improved using flaps because getting the weight off the wheels reduces ground drag, allowing you to accelerate to rotation and climb speed in a shorter distance. Reaching rotation speed, allowing the nose wheel to be lifted clear of the ground, further reduces ground drag, and lift-off in ground effect (especially with flaps extended) will be below the actual stall speed of the aircraft. (Don't get caught dumping flaps before you have accelerated to the best angle of climb speed or you might fall out of the sky onto the obstacle you are trying to clear.) Keeping the nose down during the first moments of flight allows quick acceleration to safe flying speed, when the flaps can be retracted and climb-out initiated.

Bob noted that many limitations, such as gross weight, take-off performance and procedures, et cetera, result much more from regulations than from structural or actual flight considerations. It's the old "Catch 22" (also known as FAR Part 23) that we are forced to contend with under FAA certification guidelines.

I do suggest using some flaps for take-off on all two- and four-place Grumman models, even tough the books say otherwise. I have experimented with flap settings, using runway markings, and proved to my satisfaction that flaps do help. My own findings are consistent with the statements of other Grumman pilots' experiences.

To look for the reason let's review basic aerodynamics of flaps on an airplane's wing. Flaps increase the lifting ability of the wing, to a certain point, then increase drag as well as lift beyond that point. Our planes do not have the kind of flaps, found on some airplanes, that extend aft before beginning their downward movement. Such flaps actually increase the chord of the wing and open a slot between the main wing section and flap. Large airplanes have segmented flaps, as well as leading edge flaps, to drastically increase wing area as well as to change the airfoil section. This greatly lowers the stall speed and makes fast airplanes able to maneuver and operate at much lower speeds than possible in the cruise configuration. This allows such planes as the Boeing 727 to take off and land at reasonable speeds while retaining high-speed cruise capability.

Incorporating exotic flap designs requires many moving parts and very complex systems. Our airplanes were intended to be "simple" and are blessed with "simple systems" requiring minimal maintenance. Using more complex systems, such as "fowler" flaps, leading edge devices, et cetera, would decrease our stall and approach speeds, but we would pay for it in higher purchase and maintenance costs. This was a tradeoff chosen by

Jim Bede on his original BD-1, and it remained as part of the concept throughout all GA light aircraft development.

Looking at a typical Cessna single, with flaps that extend aft before starting much downward travel, they increase lift more than they add drag at the 10 degree setting, which is recommended for take-off. The stock airplane suffers beyond 10 degrees. My own flight tests in the C-152 with my Sparrow Hawk conversion (125 HP and Sensenich propeller) shows much more benefit at 20 than at 10 degrees. Our airplanes, with larger engines installed, could probably pass FAA certification with partial, or even full, flaps extended for takeoff. The same is true with gross weight increase potentials.

All of our airplanes have only a 30-degree down travel of the flaps, except for the Tiger and Cheetah, which have the stops set at 45 degrees. Serious drag does not show up until you pass about 30 degrees of flap extension, which explains why it is said that our flaps are not very effective. If you are looking for "speed brakes" — which most "brand X" pilots think they should find with flaps — you won't find them on our airplanes, not even with full flaps on the Tiger and Cheetah.

Don't assume that using flaps on our planes is a waste of time! Take a good look at the difference in stall speed at steep angles of bank. The things do work for what they were intended for and add lots of solidity and safety to the low speed maneuvering of all our planes. In a two-place (the Yankee especially), when I am below 100 MPH in the pattern, I use full flaps! With a 60-degree-bank stall speed of 91 MPH (standard day/sea level), I want all the cushion I can get if I suddenly have to do something radical.

Another tip dealing with ground effect and landing: you can limit float by dumping flaps just before touchdown. Remember the rule of thumb that wing span equals the altitude through which you experience ground effect. Below that altitude is where you will float if you are a little fast on landing. Extending flaps reduces stall speed and is amplified in ground effect. If you retract the flaps (and in our airplanes they come up slowly and consistently), it will tend to set you down easily and keep you out of the fence at the end of the runway. Just make sure you are only a few feet above the surface and above indicated clean stall speed.

Use Of Flaps On Landing

by Steve Peach

I tend to use flaps during all approaches and landings. I wait until the aircraft is below its flap speed of 105 knots to begin the flap deployment and do not select full flaps until 85 to 90 knots. I use flaps because I prefer the aircraft's pitch attitude with flaps during the approach and final phases of the flight and that little extra aerodynamic braking that one gets with full flaps once on the ground.

This habit has recently cost me some money. During final approach to Wisconsin Rapids last year, we encountered a squall line. The winds were gusting 10 to 30 knots and switching directions. During a missed approach (due to the wind conditions), we encountered significant gust loads while retracting the flaps — how significant I am not exactly sure, but the left flap flexed enough to hang as it was being retracted. I did a go-around with about one-third flap and made a safe landing.

Once on the ground I tried extending the flaps and the hung flap popped free but was left with a permanent one-quarter inch bow (the bow is so slight that I didn't notice it for several months). In addition, the actuating arm that ties the flap to its torque tube was buckled enough to make the left flap trail a little higher than it should.

It was David Fletcher at AYA '92 who pointed out why the left flap appeared a little out of rig. I have had to replace the left flap and its actuating arm to prevent wearing of the aileron torque tube that travels through the flap.

From now on I will be taking gusting wind conditions into consideration when making the decision on whether or not to use the flaps for landing.

Fuel On Board

by Bill Marvel

Question: How much usable fuel do you have?
Usual answer: Whatever it says in the Pilot Operating Handbook. Well, maybe, but are you willing to bet your airplane on it?

In another article (September/October *Star,* p. 18) I related my experience in trying to fly our Yankee on a maximum duration leg only to find on arrival that the destination airport had been plowed into non-existence for resurfacing. As a result of landing on fumes at the next available airport, I have taken a careful look into what we normally think little about how much fuel we *really* have if the chips are down.

Usable fuel has been in the aviation news recently because of findings in the Cessna 210 that nearly ten gallons of the important stuff can be missing when the tanks are topped off. This has prematurely (and quite unexpectedly) put a number of these aircraft into the trees or worse due to fuel exhaustion. That said, I thought I would do a real-life test on both my Yankee and Tiger to see how their usable fuel compares to book values.

Since usable fuel is by definition the amount that is available to run the engine in a normal flight attitude, determining it for each aircraft is easy. All one has to do is burn out each tank fully in flight (but please not both on the same flight!) and then look at the number of gallons it takes to top off the empty tank. The resulting number is usable fuel for that tank and that particular airplane. As I wrote in an article several years ago, I intentionally burn out one tank on a maximum endurance leg so that I know where all of my remaining fuel is. Since you will essentially be doing this on your own usable fuel test, please note the following. When you perform this test, start including the fuel pressure gauge in your scan as the tank nears empty. The fuel pressure starts heading down for about 30 seconds before the engine actually quits, and that is close enough. If you miss the drop in fuel pressure and the engine really does quit, just switch tanks and turn on the boost pump. It takes only a few seconds for the engine to restart a little longer for your heart rate to slow to normal.

What I learned in doing this test was particularly instructive, and certainly so in the Yankee. The Tiger's usable fuel in each tank was within one tenth of a gallon of the advertised amount. But in the AA1 I found that I had 0.8 gallons more usable in the right tank and 0.7 more in the left than the book said. This totals one and a half gallons, which may not sound like much until you think about it. First off, that is the amount of fuel I had remaining on my nearly-ill- fated-flight, the difference between making it to the runway versus rolling my airplane and me into a ball in the New Mexico desert. Second, it is an increase in the usable fuel of 6.8 percent, which is a significant number given the scant 22 gallon usable fuel of the two-seaters. And finally, for those who may scoff at the apparent insignificance of a gallon and a half, think about this at 6 gallons an hour and 110 knots true airspeed, in a no-wind condition, this extra fuel translates to 27.5 nautical miles. When was the last time *you* walked that far after crash-landing your airplane in the desert?

After due consideration, assume that you accept my suggestion and actually determine the amount of usable fuel in each tank of your airplane. You should also take time to note the position of the empty tank float gauge on the two- seaters or the fuel needle on the four-place. In my Yankee, the float balls are totally invisible for ten minutes before the engine goes into silent mode. And in the Tiger, the gauges are already touching empty with an *hour* of fuel remaining in each tank! Thereafter, they are pegged on the big "E" long before fuel exhaustion. This is nice information to know if you encounter a situation where you are really pressing your fuel quantity to the limit.

Let's take things one step further. Now that you know how much usable fuel you really have in each tank and what your fuel quantity indicator shows when the tank is completely filled with air, how many minutes of burn time do you have in "survival mode"? We'll consider "survival mode" to be a maximum range or maximum endurance power setting, whatever you pick. Why not determine this on your next long trip? Plan for takeoff, climb, descent, landing and reserve on one tank and use the entire second tank at your chosen cruise power and mixture setting. Not only will this yield your actual burn time for a given power setting, but you will also know *for sure* what your fuel consumption rate is for that power setting. After all, known usable fuel quantity divided by known time from tank-on to burnout yields fuel consumption rate far more accurately than does any power table ever published.

OK, so I know you always land with at least an hour's fuel reserve. So do I and everyone else I know ... except for sometimes when we don't. Unless your airplane has a tendency to turn left because it spends its entire life in the traffic pattern, you use it for transportation. And transportation means pointing the nose at a distant horizon and heading there. In the process, things don't always go as planned. You can arrive at your destination and find, as I did, piles of dirt where the runway used to be. You can encounter big-time headwinds, as we occasionally do coming out of Mexico when no weather reporting is available (standard in Mexico). You can encounter the only runway closed because of a gear-up landing in the center of the concrete. And, as I ran into at midnight in Blanding, Utah, last year, you can find that pilot-controlled lighting isn't working and have to divert to somewhere else when you have precious little gas to do so. The list goes on and on, and chances are that eventually, you will encounter a situation that presses your fuel requirements to the last drop. Having some of this knowledge in your bag of tricks may very well make the difference between taking a cab from the airport to the hotel or walking there after landing 27.5 miles short.

How Much Ice Is Too Much?

Laurie and I make regular weekend trips up to her father's cabin (a converted 20 X 20 barn) on Lake Superior's shore. Fall provides the changing colors, grousing and getting ready for deer season. The trip is 200 miles and about one and one quarter hours in the Tiger. Late October and November is transition time in Minnesota, with lots of clouds and a "chance of icing."

The weather report this day is 4000 overcast, 5 miles in haze and a pirep of tops at 6500 with known light to moderate ice in the clouds as reported by several aircraft on descent into Minneapolis/St Paul. Well, I make the mistake - file for 7000; I don't like to fly in haze and traffic. Anyway, the deck isn't too thick, so up we go. We begin to pick up ice and I increase our climb angle, eventually reaching 85 knots IAS.

Now the altimeter is at 7000 feet and we aren't out of either the clouds or the ice. We press on to 7500 and I can't get any more climb out of the Tiger. We have a load of ice with a little more than an inch on the leading edge. It does not roll back over the wing surface; it just extends forward from the leading edge, ominously!

I try some tricks to get additional quick altitude - nose down, a little airspeed - then up. A chunk of ice flies off the prop with a bang that tends to jolt the heart. Then the autopilot lets loose with another bang. Either I am forcing the yoke or the wings have become ice laden and "auto" can't hold direction. In any event, it is really time to get the hell out of this. A call to center for lower gets 6000 but I can't push the nose over! The plane remains configured in climb -with a frozen elevator!

Both of us have entered near hysteria, adding some stress to my decision making and flying skills. More working of the yoke results in a "pop" sound as it breaks free. Down we go to 6000 and, of course, are still not out. Hysteria dictates looking for the ground, so we ask for lower and find the bottom and a little more sanity at 5000. We still have a good load (on the wing and elsewhere), but we continue the trip without event, landing with the ice at a high airspeed.

So when they say "icing reported by an XYZ," we don't fly. How much ice is too much? ANY!

Quick Tips

In icing conditions, the first place to look for a problem should be your OAT probe. It will collect ice much sooner than the wing. Also, a real danger is freezing of the elevator trim and/or the space between the elevator horn and the stabilizer. If you are in icing conditions, move the control wheel fore and aft on occasion to keep those areas free.

Microburst Experience

by Bill Hendrix

I was flying my Cheetah about 10 miles south of Sedona, Arizona. I could see the airport through a light rain shower just ahead. It appeared the rain was moving east to west and that I would catch the trailing edge. I called unicom and asked about the shower and the winds. Naturally, I wanted to know if it was raining at the airport. They reported the rain had already passed through and the winds were light, and recommended left traffic for runway 3.

I was descending through 7500 feet, a little higher than normal for this distance from the field, but I knew I could easily lose the altitude once I was through the rain. Sedona's field elevation is 4827 feet.

I entered the shower and my vertical speed went from 500 FPM down to 1000 down. I thought, "no problem - I'm a little high anyway and I'll be through this downdraft in a few seconds." I glanced at the airspeed and instead of indicating 110 knots as it had a few seconds earlier, it was now indicating 90 knots. I looked back at the vertical speed, still 1000 FPM down, and then back at the airspeed, which had decreased to 80 knots. Another glance at the VSI showed the same 1000 FPM descent, but the airspeed was now at 70 knots and still falling! This had all taken maybe three to five seconds and I was getting a little spooked. By this time I had gone to full power, was still losing 1000 FPM, had 55 knots airspeed, and was way too far from the airport. Suddenly, I cleared the rain shower and a moment later, the airspeed jumped back up to 100. What happened? You might be thinking microburst since, after all, it happened in a rain shower. But I'm pretty sure it wasn't. Frankly, I don't think any Grumman could survive a real microburst very close to the ground. Here are my reasons for thinking this was not the cause.

First, on thinking back, I believe the engine was turning up fairly high RPM judging from the engine noise. I'm not sure what the RPMs were because during the actual event, I never looked at the tach. I reasoned that at 60 to 70 knots the engine should be laboring like in a climbout, and I don't recall hearing that sound. The second thing I believe rules out a microburst is that the controls felt absolutely normal. It stands to reason that if you're just above stall the controls are going to feel pretty mushy.

My best guess at what happened is that the pitot tube got water in it and the water fouled the airspeed reading. After leaving the rain, the water cleared and the system returned to normal.

I've flown through rain before and never had this problem, but I can't come up with a more logical explanation for what occurred. Maybe others have had a similar experience. I'm having the pitot system checked out for any kind of blockage and will report what we find.

NASA Spin Test Results

A recent inquiry to NASA for information about spin tests of a Grumman American AA-5 conducted by the NASA Langley Research Center brought the following response from H. Paul Stough, III, Assistant Head, Flight Research Branch, Flight Applications Division.-Ed.

During the 1970s and 1980s, the NASA Langley Research Center conducted a comprehensive General Aviation Stall/Spin Research Program, which included flight tests of single-engine airplanes typical of light general aviation configurations. Although derived from production airplane designs, none of these research airplanes corresponded directly to a certificated airplane, as tests were intended to produce results applicable in general to light airplanes, rather than to improve upon specific models of airplanes. The four-place AA-5 was not tested as part of this program; however, a somewhat similar configuration, the two-place AA-1, provided the basis for the first configuration tested as part of this program.

The NASA Program was intended to provide guidelines and techniques for designing in improved stall/spin characteristics so as to increase the safety of light airplanes. Flight tests were conducted in conjunction with an extensive series of wind-tunnel and free-flight model tests and were used to validate the model test techniques and to investigate areas that could not be adequately addressed through model tests.

Flight tests of a production version of the AA-1 were not conducted by the Langley Research Center. The modified AA-1 tested by Langley incorporated four interchangeable tail configurations (none of which corresponded to the production tail configuration), cockpit-mounted instrumentation and fuel systems, ballast mounts to vary mass distribution, cameras to record motions and airflow, and a spin-recovery parachute system. A variety of minor fuselage and wing leading-edge modifications were also tested on this airplane.

The modified AA-1 exhibited both moderate (about 45° angle of attack) and flat (about 60° angle of attack) spin modes, depending upon the tail configuration and control input used.