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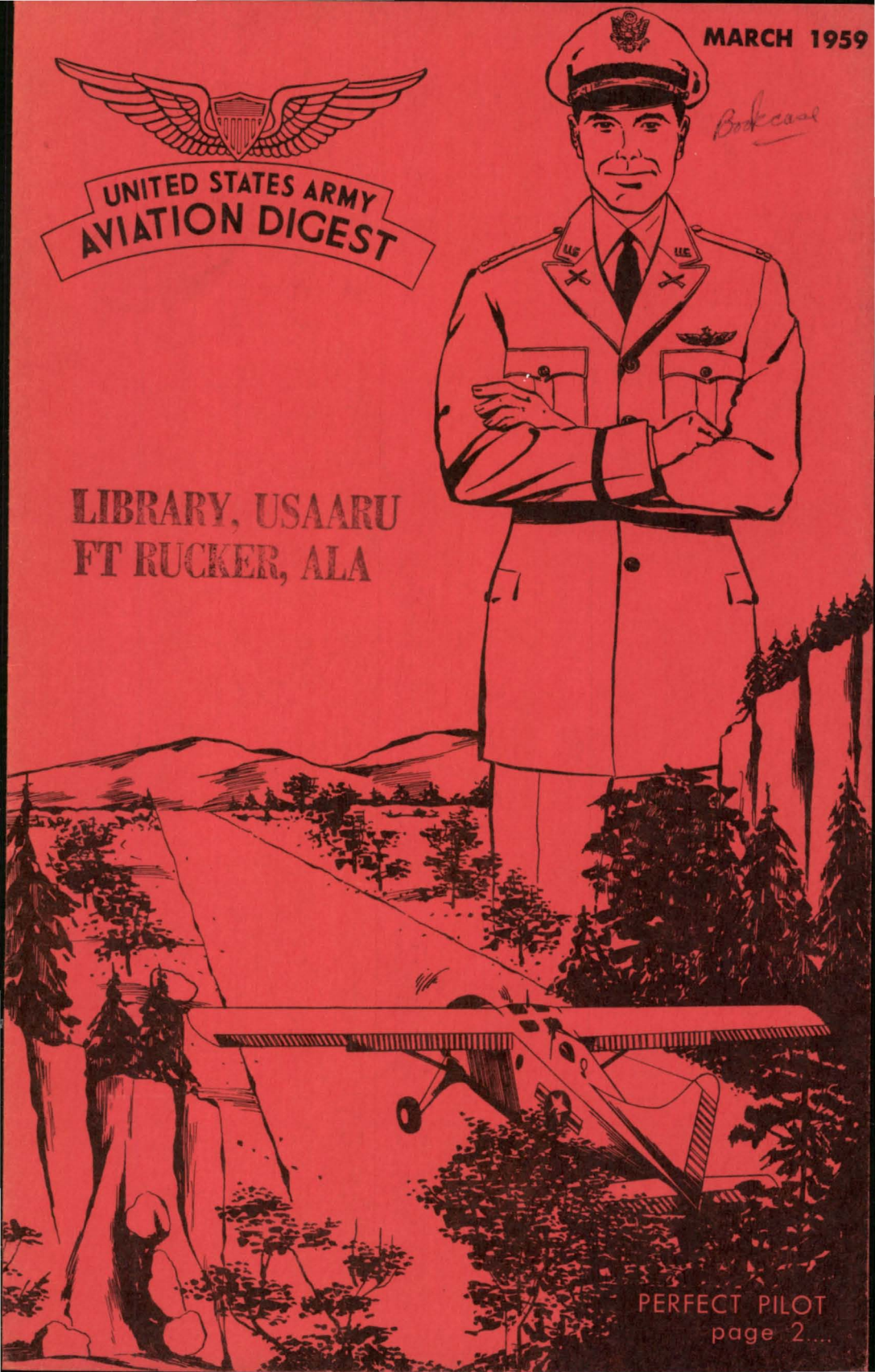
UNITED STATES ARMY AVIATION DIGEST



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PERFECT PILOT
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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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COVER

Our *Perfect Pilot* (page 2) should have no trouble making this landing, and the author, Brig Gen Carl I. Hutton, needs no introduction to *Digest* readers. A strong advocate of Army Aviation and a frequent contributor to our magazine, he was recently assigned to the U. S. Army element of the new Federal Aviation Agency. A pioneer Army Aviator, it was under his guidance and leadership that the U. S. Army Aviation School transitioned into a separate establishment. He was its first Commandant and the first Commanding General of the U. S. Army Aviation Center. His original thinking and support provided the basis for the present armed helicopter concept. (Artwork by Bill Carter, USABAAR.)

Perfect Pilot

Brigadier General Carl I. Hutton, *USA*

HAVE YOU MET the gentleman described in the title above? Although I have never met him, there is indirect evidence which suggests his existence. After years of reading the reports of accident investigation boards, I have come to the conclusion that Perfect Pilot is the model against whom is contrasted any Army Aviator involved in an aircraft accident. If the pilot had done thus and so — i.e., if he had been perfect — the accident would not have happened. Perfect Pilot is the idol of second guessers.

All of us aspire to perfection and are proud when we approach it, but since none of us have either met Perfect Pilot or have seen him in action, there is nothing for us to model our conduct after. Suppose a young aviator with about 200 hours of flying time ground-loops a Bird Dog in a good crosswind. The accident board says that the accident was caused by pilot error, because Perfect Pilot would not have ground-looped under the same conditions.

The young aviator in this case is a standard product of our whole system of selection and training. He is probably neither better nor worse than other aviators of the same level of experience. If, instead of comparing him with Perfect Pilot, we match his performance against that of other aviators of the same experience, we find that the Bird Dog has been ground-looped hundreds of times. While the student of an individual accident case is not alerted when a finding of pilot error is made, the cumulative effect of reading the same conclusion over and over is to realize that it is not logical to say so many times that the accident would not have happened if Perfect Pilot had been in the cockpit. We do not have that many Perfect Pilots.

It seems patently that something else must be wrong in these L-19 accidents. Either there is something wrong with our selection and training (namely, we do not turn out Perfect Pilots!) or there is something wrong with the Bird Dog. Although improvements perhaps could be made in training, it is highly doubtful that we will ever produce at 200 hours anything but a 200-hour aviator. Therefore, let us take another look at

the L-19's ground-looping characteristics. It is the theory of Doctor August Raspet of Mississippi State College that the ground-looping tendencies of the L-19 come from a combination of wingtip stall, the spring gear, and the conventional gear configuration. This would appear to be well worth inquiring into, for if we continue merely to attribute ground loops to pilot error, we shall continue to have ground loops ad infinitum.

Let's apply this same type of reasoning to another type of accident which in recent months has claimed a number of lives. This is the helicopter collision with power transmission lines. Superficially, these are pilot error accidents because no one was involved but the pilot, and it was his responsibility to avoid the wire. Presumably Perfect Pilot would not have hit the wire. Here again repetition brings home the point that the pilots involved in these accidents were standard Army Aviators, just like the rest of us. What happened to them can happen to any of us under the same conditions.

Under the same conditions is the nub of the matter. The aviators involved in these accidents were trying to do what was expected of them. If what was expected was inherently hazardous, it does not add to our understanding of the hazard to say that Perfect Pilot would not have collided with the power-lines.

These aviators were operating at low altitude (and possibly low visibility) because this is the part of the air and of atmospheric conditions which we like to think belong to Army Aviation. Nevertheless, the accidents proved that we are not yet equipped for this type of operation. Until the helicopter has a device which will allow the aviator to see obstacles in his flight path, regardless of the visibility, these accidents will continue as long as we continue the type of operation.

This does not suggest that low altitude operations should be discontinued, for this would decrease the effectiveness of Army Aviation. Two facets of the problem are obvious. First, we need a research and development project aimed to produce an instrument for helicopters which will show objects ahead on the flight path. Second, it is important for every aviator to realize that he is flying a machine which is inadequately equipped for low altitude, low visibility flight. Consequently, enthusiasm to complete the mission must be tempered with caution until the proper equipment becomes available.

The Perfect Pilot complex of accident investigation boards has led to the ineffective corrective measures used in dealing with another type of accident which has resulted in fatalities over the years, as well as in recent months. These accidents involve inadvertent flight into instrument conditions. The cause of these accidents is closely related to the cause of the helicopter-powerline collisions. They happen because Army Aviators are attempting to exploit the full capabilities of Army Aviation under conditions which could and should be favorable. Unfortunately, they are making

the attempt in machines which are not properly equipped. We will continue to have these accidents as long as we continue to try to exploit low visibility with present equipment.

Certainly, all of our aviators are well instructed in the dangers of instrument flight for noninstrument pilots or for any pilot in aircraft not equipped with proper instruments. There is not one among us who does not vehemently want to avoid such conditions. It does not help to say that Perfect Pilot would have done better, for he would be killed too if he were caught in the same situation. The key is the word inadvertent. In attempting to exploit the full possibilities of Army Aviation, it is certain that pilots will occasionally fly inadvertently into instrument conditions. When they do, the accidents will be immediate, inevitable, and fatal unless something is done about equipment. It is a fortunate coincidence that the long range solution of this hazard to Army Aviation appears likely to be identical with the solution of the helicopter-powerline collisions. What is needed is an instrument which will make low altitude instrument flight possible. If we had one instrument which would show obstacles ahead and at the same time give the necessary attitude indications, an Army Aviator could safely risk inadvertent instrument flight. He could always escape into instrument conditions when obstacles appeared. Airborne radar may well hold the solution for both of these hazards.

Until such an instrument comes along, what does the aviator do to stay alive and at the same time make the maximum possible effort to exploit the capabilities of Army Aviation? He must realize that the hazards are so real and so imperative that they would trap even Perfect Pilot under the conditions in which we are trying to operate. Each individual must realize that he is only a more or less standard product of our system—say 75 percent as good as Perfect Pilot—and this is the margin which he must allow in all of his plans and decisions. Above all, each Army Aviator must fully understand that those who inadvertently flew into instrument conditions were just as eager to stay out of instrument conditions as those of us who are still alive. Each must try to avoid being caught in the same trap.

As for accident investigating boards whose accumulated findings have raised this fantasy of the Perfect Pilot, let them understand that the finding of pilot error is only the beginning of the investigation. If the pilot made an error, there must be a reason. Until the board finds the reason, it has not accomplished its mission. And until the boards find the reason for pilot errors, accidents will continue at the present rate.

Getting the Most from the Otter

Bob Fowler

I THINK IT IS SAFE to say that the human mechanism has a wonderful, and often commonsense, capacity for making any task as easy to perform as possible. While making things easy to perform, there is a strong tendency to try to make the experience generally seem as comfortable as possible. While often useful, these traits, particularly as a result of past experience, can sometimes cause great difficulty. This can occur when we introduce a pilot to an airplane like the Otter, which is designed to fly slowly.

The Otter, at a weight of 4 tons, will leave the ground at some 50-odd mph without the pilot having to employ any specialized techniques whatever. This, I realize, seems rather a pat statement. We should consider the experiences which may seem odd to the new Otter pilot and then prescribe a means by which they can be overcome.

Some STOL aircraft flying today have performance capabilities which are spectacular. If striking takeoff and landing performance is to be achieved, it must be achieved at very low speeds. Leaving aside such sophisticated control measures as blown surfaces, etc., it is obvious that, at the low speeds of the present-day STOL aircraft, positive control can be realized only through the use of large control surfaces moved through large angles. Almost any STOL aircraft using orthodox controls must have these controls moved through rather large portions of their range when the aircraft is being flown in the lower speed ranges. This can be better appreciated when one considers the turbulence encountered in the normal operation of this type of aircraft.

One of the first things with which the pilot of an STOL aircraft must become familiar is large control movements which might be required during any segment of the low-speed regime. During takeoff and landing in many older aircraft, this was often required as normal practice; however, in many instances, large control movements produced very little actual response. Today, most STOL aircraft have controls which, if freely used, produce very high degrees of response.

A great deal of the control capabilities of modern STOL aircraft is partly due to rather outsized control surfaces. While it is very desirable to produce high degrees of controllability at low speeds, side effects are bound to creep in which are not

Mr. Fowler is a test pilot for De Havilland Aircraft of Canada, Ltd.

Flown as conventional aircraft, STOL quality sacrificed

good. One of these common to most present-day STOL aircraft is control feedback. Where gust velocities reach a high fraction of the indicated airspeed of an STOL aircraft, the control surfaces, being movable and of necessity large, are bound to transmit some of these gust loads to the pilot's hands or feet via the control system. This feedback of gust forces is, at least initially, a little disturbing to pilots new to high performance STOL aircraft. Sometimes this tends to give him the feeling that the aircraft is close to stalling; however, as soon as the force causing the disturbance is removed, the control affected will immediately return to the trimmed position.

All this verbiage simply means that, when we fly STOL aircraft of any size, we must admit that certain differences in handling techniques must be dealt with at speeds which, until now, seem uncommonly slow for aircraft of this size and weight.

To apply this general reasoning to the Otter, I think the easiest approach is to run through the complete flight capability and deal with each item as it comes up.

Since the takeoff is going to be short, any tendency to wander must be corrected as quickly as possible; also, since the airspeed prior to lift-off is rather low, the aircraft cannot be expected to respond to subtle gestures made with the rudder pedals. This means big angles on the surface to produce the required correction.

A lot of pilots place their heels on the rudder pedals, with their toes well up on the brakes. In this position, the pilot can produce only as much rudder deflection as straightening his knee joint will permit; also, it is very difficult to avoid applying some brake while making directional corrections. Full rudder is much easier to apply if the heels are on the floor. Then, under extreme crosswind conditions, where full rudder will not produce the required correction, enough brake can be applied by just slipping the foot up until the heel catches on the bottom of the pedal.

While the Otter can be lifted off the deck on three points, this is a technique which we frankly do not recommend. If the tail is raised just a couple of feet, the lift-off speed is then usually well past the power-on stalling speed for the weight and flap condi-

tion. Under gusty conditions with the machine heavily loaded, this makes control much more positive.

Most pilots get into the three-point takeoff habit as the result of experiences under miserable crosswind conditions. As a general rule, a good method is to leave the tailwheel on the ground until the tail will rise easily, with only slight pressure on the wheel. By this time, rudder control is sufficiently positive. Avoid any tendency to raise the tail while the forward speed is still very low.

Wherever possible, full takeoff power as indicated in the dash-1 should be used. The first power reduction should not be made until the aircraft is established in the climb. There is a strong tendency among pilots to use takeoff power merely to get the beast off the ground, after which they sometimes reduce power to the "economical climb setting" so quickly that the poor airplane has a tough time even staying in the air.

It is permissible to use takeoff power for 1 minute. If it is left on even half of this time, in the case of a heavily loaded Otter, it will usually do much for safely establishing the aircraft in the initial climb.

We have always recommended that the first power reduction be to "max continuous," until the flaps are fully retracted, at which time power can be further reduced to the economical climb setting.

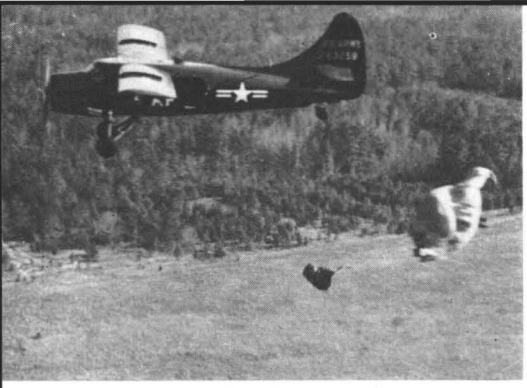
There is an old rule which says that while progressing from takeoff to cruise, "to use power for the *present* condition of flight to establish you in your *next* condition of "flight." Use takeoff power not only to get the aircraft airborne, but also to get established in the climb; use climb power to establish the aircraft at cruise before reducing the power to the cruise setting.

Three-point takeoff not recommended

Whenever flaps are retracted after takeoff or following a go-around, the nose of the aircraft must be raised so that the effective angle of attack is kept somewhat constant. If the attitude remains unchanged during flap retraction, it is very easy for the aircraft to sink until enough airspeed is gained to climb at that angle of attack. This sinking takes all the fun out of a takeoff, particularly for the passengers. During night takeoffs, this becomes even more important for obvious reasons.

The only segment of cruise flight which we need deal with here is the slow-speed phase, as applied to paratroop operations, supply dropping, etc.

Any time a pilot wishes to cruise an aircraft for any period of time at rather low speeds, it is advisable, in the STOL aircraft, to use greater amounts of flap as the speed that it is intended to maintain becomes lower. For one thing, this pushes the indicated stalling speed further away from the speed at which the aircraft is to be flown; also lateral and pitching control is very much improved. The air-



The Otter can be flown with ease at speeds down to 55 knots

craft is then maintained in a better attitude; the higher tail helps any dropping operations; also visibility for the pilot is improved with the nose being lower on the horizon. Using a little less than takeoff flap, the Otter can be flown with ease at speeds down to 55 and 60 knots, providing proper control and power are used as required. At these speeds, it is natural that all turns be well co-ordinated. Even at cruise, it is natural to expect small losses of airspeed during any sustained turn; however, these losses are not normally great enough to be of much concern. But, when flying at 55 knots, a 5-knot loss in airspeed during a turn is much more important. Therefore, the pilot should be ready to apply whatever power is required to prevent any airspeed loss during low-speed turns. I do not think that much need be said about stalling speed increasing as the angle of bank is increased. Since fairly shallow angles of bank will produce high rates of turn at these speeds, steeply banked low-speed turns are very seldom required; in fact, under almost any conditions, they could spoil your whole day. During any sustained period of low-speed flight, rpm should be increased so that, should power be required quickly, the throttle can be opened without fear of overboosting.

With any STOL aircraft, stalls, under all flap and load conditions, both power-on and power-off, are a subject with which the pilot should be thoroughly familiar. Stalls should be practiced from time to time using normal rated power, i.e. 33 Hg″, 2,200 rpm, flaps at takeoff, and aircraft trimmed for takeoff. Under these conditions, the stall should be approached by losing speed at approximately 1 mph per second. This ensures that the stall is not an accelerated one, and also gives a more valid indication of the true attitude and behavior of the aircraft during the power-on stall.

The ball should be trimmed to the center and maintained there throughout, with wings kept level with ailerons as required. At any time prior to the stall, or before the buffet range is encountered, full aileron either way can be used to maintain the attitude laterally. At the stall, with power as mentioned, the nose-down pitch will normally be quite shallow, since any slight increase in speed here, with the stick held back, will bring the nose up again.

Familiarity with the indicated stalling speed and control available under these conditions should normally give the pilot much greater confidence in the aircraft during the takeoff phase.

Power-off stalls should be practiced using landing flap and the aircraft trimmed for the normal approach speed. Here again the control available can be noted; full opposite aileron can be used up to and during the stall to prevent any wing-dropping tendencies. Full aileron

at any time prior to the stall will produce positive response.

The nose-down pitch with power-off is much more positive, and recovery can be effected by a slight relaxation of the pull force at the wheel. A positive forward push is not necessary to cause recovery; indeed, this can add to the natural pitching motion at the stall to such a degree that the nose-down pitch is made steeper than necessary. Here again, the indicated stalling speed should be noted. In the STOL aircraft, adding 5 mph for every member of a large family can make its whole short-field mission look very different from what it really is.

APPROACH AND LANDING

It is a well-known fact that half the battle in performing a good landing in any aircraft is accomplished by first performing a good approach. In the Otter this is particularly true. Once the aircraft is turned onto final, the flaps should be at the setting intended to be used for landing and the aircraft trimmed to the proper approach speed, as recommended in the dash-1.

From here on in, these two controls need never be touched again. This leaves the right hand free to adjust power as necessary to make the airplane describe a straight line to a spot just short of the intended touchdown point.

We have never encouraged the long flat drag approach technique. Under gusty conditions, the reasons for this are obvious. The type of approach where the approach speed is only partially dependent on power is safer, particularly when landing over obstacles. When approaching with a heavily loaded Otter under these conditions, there is often a great deal of controversy as to the point at which the power is cut. A small amount of power present during the initial part of the flare prevents the aircraft mushing into the ground during this change of attitude. By the time the aircraft is completely level, power is not required; from here on, it only remains for the pilot to keep coming back on the wheel prior to the aircraft touching down on all three points.

PREDICTABLE TOUCHDOWN

At this point it is very important that the wheel be held fully back. There seems to be a great tendency among pilots to release the full force on the wheel, or at times to even push it slightly forward once contact has been made with the ground. This, particularly under gusty conditions, usually tends to encourage the aircraft to become airborne again. The most predictable touchdown is where the Otter is about one foot off the ground, fully stalled, with the pilot holding the stick fully back.

Another tendency among pilots is to try to grease the thing on three points while carrying just a touch of power. This usually squanders sizable amounts of available runway; in addition, any premature contact with the ground, or once again that sudden gust, really puts the aircraft back into the air.

I realize that this whole bit on landings is strictly from a powered approach view. The reason is that the Army's stock

in trade in STOL performance is short takeoffs and landings. With this in mind, I think it is true that the precision type of short landing must be performed from a powered approach condition, at an airspeed which rules out any large amount of float once the power is cut.

GLIDE APPROACH

Glide approaches, particularly as outlined in the forced landing procedure in the dash-1, should be well practiced.

Wheel landings are something which we would just as soon never see performed with the Otter. It is a fallacy to think that an aircraft with a lockable tailwheel can be kept straighter by means of rudder with the tail up in the air, than with this tailwheel held firmly on the ground by up-elevator.

A lot of people tell us that they use wheel landings to avoid taxiing the full length of a particularly long runway. It is far more expeditious to land as close to the turn-off point as possible, than to gallop along a few thousand feet with the tail in the air. Wheel landings, since they make the landing itself easier for the pilot, can easily become a habit which is very hard to break, and does not help his proficiency at all when he is carrying a full load and is confronted by a strip of 1,000-foot length or less.

Another strong tendency is for pilots to get into the habit of using little or no flap at all. This applies equally to takeoffs and landings. The reason for this is, once again, the tendency to make an airplane feel more comfortable, in addition to making the speeds at which it is flown appear more familiar by being higher. The only hitch here is that the stalling speed is also higher, which makes the ground roll, both on takeoff and landing, longer.

When this airplane is to be used for any low-speed job, and particularly the takeoff and landing phase, the pilot tailors the airplane into a tool which will better do this job by lowering the recommended quantity of flap for the job in hand. As in all aircraft, extreme crosswinds dictate less flap, which is mainly to allow for more effective use of rudder. However, rudder must then be used for a greater length of time, since the ground roll and the touchdown speed will both be greater. Therefore, it behooves the pilot to use as much flap as his own proficiency and existing conditions will allow. His performance in the short-landing phase will vary directly with the amount of familiarity he has with landing, using full flap.

GREATER STOL FORECAST

In the years to come, I feel sure that we are going to see more and more fixed wing aircraft possessing ever-increasing STOL and low-speed performance capabilities achieved by many ingenious aerodynamic devices now being developed.

More demands are going to be made on the pilot who flies these aircraft to make him fly them as prescribed—and not as he would like to fly them to make them seem more orthodox. When this is done, performance too becomes orthodox and we have not progressed at all.

I think that the U. S. Army will continue to be the pioneers in the utilization of this type of performance. At the present time, their pilots possess a versatility difficult to find in military aviators anywhere. As a result, these are among the most interesting individuals in the flying business.

YOU ARE A PILOT newly checked out in the L-23D Seminole. On your first administrative cross-country flight, you are flying on an IFR flight plan, VFR conditions on top at 10,000 feet. Outside air is 3° C. Approximately 15 minutes prior to your ETA over Atlanta omni, you suddenly notice that the cylinder head temperature gauge for the right engine has risen 30° above the reading for the left engine and is continuing to rise, with all temperatures at or near the upper extremes. All other instruments are reading normal. You immediately diagnose the trouble as:

Indicate by a √ the solution or solutions which you think would best fit the situation.

- ☐ **Number 5 cylinder on the right engine misfiring.**
- ☐ **Mixture control at full rich position on the right engine.**
- ☐ **Carburetor icing on right engine.**
- ☐ **Automatic mixture control inoperative on the right engine.**

Your immediate corrective action is:

- ☐ **Feather right engine.**
- ☐ **Manually enrich right engine.**
- ☐ **Decrease manifold pressure on right engine.**
- ☐ **Continue flight until receiving further indication of malfunction.**

Next, you should:

- ☐ **Make a normal approach to Atlanta airport and have ignition system checked on right engine.**
- ☐ **Request an emergency single-engine approach to the nearest appropriate airfield.**
- ☐ **Continue flight until detonation results, then feather the engine.**
- ☐ **Continue flight to destination as this is normal fluctuation in cylinder head temperature between engines.**

The recommended solution to the PUZZLER may be found on page 21.

Flying Proficiency

Captain E. H. Edmonds, *Inf*

NOW, IF THIS HASN'T HAPPENED to you, don't feel left out—sooner or later, you'll receive a set of orders that ends something like this: "rotation to ground duty for the purpose of branch qualification. Flying proficiency will be maintained." So you bid adieu to operational flying and assume or resume this role thrust upon you with a great deal of negative enthusiasm. You start to command a company or battery, serve on a battalion or regimental staff, or you may even pull a slot at the Pentagon or the U. S. Army Aviation School. In a short time, as any well-rounded officer should, you become acclimated, engrossed, and even enthusiastic in your new job.

WEIGHED IN THE BALANCE

You are completely adjusted when one day, while checking through the filing cabinet, you come across your Flight 201 file. You pull it out and decide to check the entries to see if your Combat Readiness time is up to date. As you read the record, your smile becomes a scowl, for it informs you that you are short of your required minimums by quite a few hours. You think back, trying to find where you forgot to enter some CR time in your records, but you decide that the record is correct after all.

Now this revelation is really not "earth-shaking" until you steal a peek at the calendar, and it silently screams back at you that the end of the fiscal year is almost here. It seems hard to believe that you need "x" hours of night cross-country, "y" hours of instrument time, and "z" hours of helicopter time, especially since you've always flown enough to collect flight pay! After all, only 80 hours per year of this proficiency time are required.

A meticulous check of the records indicates no mistake has been made. Well, it's virtually impossible to accomplish this flying time now. The outfit leaves for spring maneuvers in two weeks. It was impossible anyway. Look at all the jobs you had to do during the past year! Didn't your shrewd leadership guide "A" Company to the top slot in the battalion? Wasn't it your master coup of staff planning on the last CPX that brought a commendation to the entire regimental staff? And what about those last four staff

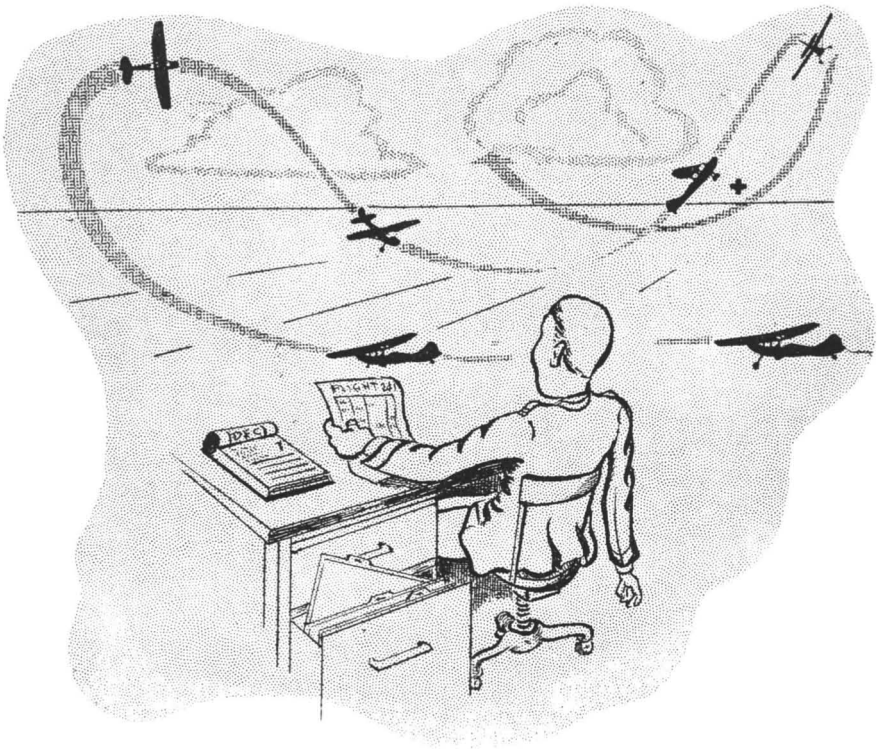
Captain Edmonds wrote this article while at Fort Rucker. He is presently stationed in Formosa.

studies you "ramroded" en route to DA? Furthermore, is it to be considered lightly that you completed four college extension courses at night in the past year and satisfied the DA prescribed educational level requirement for all officers? Then, too, think of the many times you called and could not get an aircraft. What about the times you were forced to cancel your flight because a high priority "crash" project was thrust on you. And after all a man does need a little time to get acquainted with his wife and kids, right?

THE AWAKENING

Armed with all these "20-carat" reasons, you'll have no trouble explaining the sad state of your proficiency flying to DA and your CO. In fact, you always did maintain that a man couldn't remain proficient if he were rotated to ground duty. And, by golly, this proves it! Two hours scribbling and two "draft" tablets later you realize the "old man" is not going to buy these explanations — nope!

You have heard him say to too many other officers, who attempted to explain their failure to produce, that he firmly believed "the degree of effort put out to accomplish a task is inversely proportional to the effort needed to rationalize failure." Thus the most elaborate excuse for failure usually indicates the least effort for successful accomplishment.



Boy, this fits your case perfectly! Here and now you realize there's only one thing to do: tear up this realm of excuses and do the impossible! You tie yourself to an airplane every minute you can and, with a broadminded operations officer and a good watch that puts the minutes in your favor, you accomplish your annual flying proficiency minimums! "Jeepers! I'll never do that again!" you vow. But will you? How do you stand right now??

Who is this officer depicted? Recognize him? He may be any Army Aviator now on ground duty directed to maintain flying proficiency, EXCEPT you and me—and I'm not too sure about you.

WHAT IS PROFICIENCY TIME?

When the Army rotates an aviator to ground duty and directs him to maintain flying proficiency, such orders indicate that he has definite potential value to Army Aviation in some future flying assignment. The authorization to maintain flight proficiency was not for "easing the pain" of leaving operational flying nor "because somebody up there liked you." In these days of tight money, balancing the budget, and austerity drives, you were directed to maintain flying proficiency only because it was intended that you return to operational flying after this stint of ground duty.

The Army is certainly aware that the 80 hours per year of proficiency time required by regulation will not keep you on par with your buddies who are assigned regular flight jobs. However, if the time is utilized in the true spirit of the directive, you will remain proficient enough to return (with minimum difficulty) to normal operational flying at the end of your ground duty.

The degree of proficiency the Army expects of you while on ground duty can be attained only by some sacrifice and diligent effort on your part. Some aviators seem to think that it is unnecessary to retain "needle-sharp" flight techniques, since their duties on return to operational flying will probably be planning and commanding. While this seems logical, it doesn't show the whole picture. The attitude with which you maintain flying proficiency during your tour of ground duty may indicate the exact calibre of commander you will be on return to operational flying.

IF THE SHOE FITS

Will you be the commander who is compelled to listen to junior officers expound because you realize you are slightly behind the times? Or will you be able to join the conversation with confidence, fully capable of leading parts of the discussion?

Will you be the commander who has to find a tactful way to assign Lieutenant Brown or Captain Smith the mission of flying the Commanding General into a confined area because you are dubious of your proficiency?

Will you be the commander who has to grab the right seat on a flight to pick up the Senator because of an unfavorable weather report? As the chief "honcho," your subordinates will naturally expect you to grab these jobs. Your juniors may

outwardly indicate that they understand you're really a right guy for not grabbing these "glory" flights, while smiling knowingly at each other with a look that says, "The 'Old Man' can't fly instruments, huh?"

Or while riding along in the copilot's seat under instrument conditions, your junior first pilot is in a bind because of a change in flight plan received over a busy intersection. Must you pretend to be "dozing," engrossed in your ARMY AVIATION DIGEST, or assume a severe facial expression to create the impression you're going to sit back and see how well the poor fellow copes with this situation? OR will you speak up confidently, "Relax son; I'll handle the radios; no sweat," and proceed to give a good assist?

These are some of the things that only you can know initially, but they remain hidden only a short time. Junior officers are seemingly born with a knack of spotting these weaknesses.

Yet, these are the very things that help to determine the degree of confidence placed in you by your subordinates. Whether you are the commander whose opinions and advice are sought because you are a sharp, up-to-date commander, or whether you are the last one to know because everyone realizes you're just a little behind times, can be determined by the impressions your subordinates and superiors receive on your initial return to operational flying duty.

It is a fact that the capability and efficiency of a unit is directly proportional to the confidence and loyalty given the commander by his subordinates.

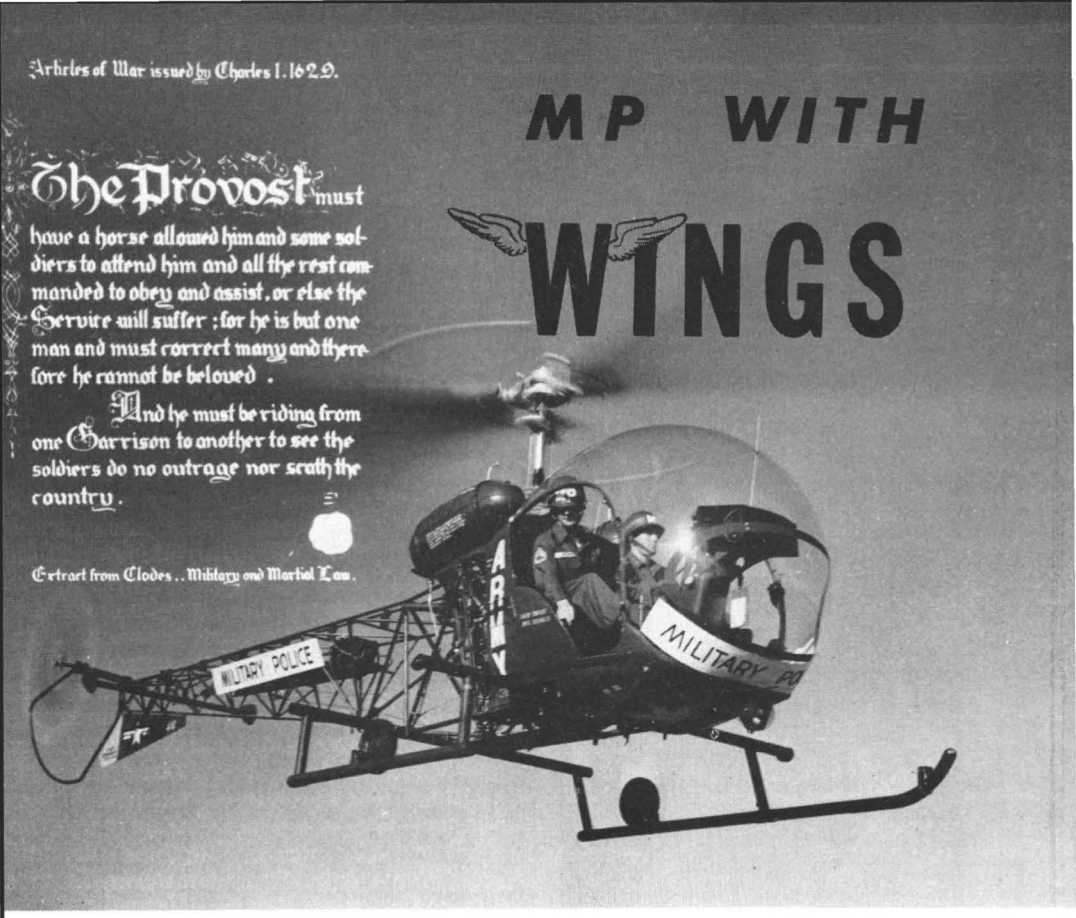
THE TEST

Before reading any further—stop! Look to your right; look to your left; make sure no one is around. Now, ask yourself this: How long has it been since you shot an autorotation or worked a confined area? In fact, how long has it been since you've been in a Sioux or a link trainer? When did you last bother to put on that "troublesome" hood when flying instrument proficiency? Fortunately, only you can answer these questions. When you do, you may feel the heat of an embarrassing flush creeping out from under your collar.

The officer we've discussed could be any Army Aviator chained to a desk or doing a tour of ground duty—except you and me. And frankly, I'm still not convinced about you.

The many Army Aviation friends of Major Vernon R. Stutts, USAF, will be saddened to learn of his death in an aircraft accident near Dayton, Ohio, 14 February 1959. Major Stutts was editor of the Air Force FLYING SAFETY magazine.

MP WITH WINGS



IN 1629 Charles the First of England issued the initial instructions concerning the office of the provost marshal and military police in an armed force and directed that the provost marshal be provided with a horse. From that time military police have always required mobility in the performance of their assigned missions. Military police duties were once confined to policing the military forces and preventing looting; however, the development and employment of modern military forces have placed many added responsibilities upon their shoulders.

The Military Police Corps has always been in the forefront to adopt new modes of transportation which yield greater mobility. It has progressed from the horse, to the motorcycle, to the jeep, and finally to the airplane, which frees the Corps from being roadbound. Each new means of transportation not only increased the mobility of the Corps, but also added to its responsibilities; as the over-all mobility of the Army increased, additional control measures became mandatory.

During World War II, military police utilized Army aircraft in all theaters of operations. With

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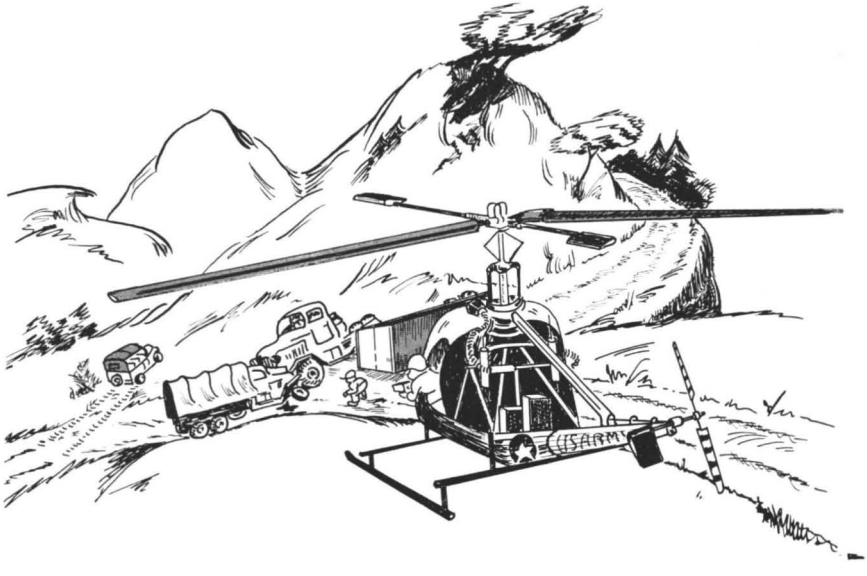
This article was submitted by the U. S. Army Military Police Board, Fort Gordon, Ga.

fixed wing aircraft, they established the first known control of military traffic from the air. When aircraft were used by military police in conjunction with ground traffic control posts, traffic jams became a rarity. If traffic congestion did occur, its solution was expedited through aerial reconnaissance.

During the Korean conflict the helicopter was found to be admirably suited to military police requirements. The complexities of modern warfare demand that military police employ such a vehicle in the control of ground traffic, particularly in the control of movements of combat organizations within the combat zone.

Military police employment of Army Aviation reached a new peak during this period. The versatile helicopter was used for aerial control of ground traffic, to establish and relieve traffic control posts in remote, critical areas, to reconnoiter and patrol critical routes, to aid in the control of disturbances in POW camps, and for other missions. Helicopters were employed far more than fixed wing aircraft; the latter were used primarily to coordinate large-scale military police operations.

A march of the 7th Division during the winter of 1952 carried the division through some of the most rugged terrain in Korea and over substandard roads which required the maximum control of traffic. The route reconnaissance was made by military police using helicopters; during the march, traffic control of the columns was performed by helicopter-borne military police. On one occasion, when the



17th Infantry Regiment was rerouted onto a road of unknown condition, the entire length of the road was reconnoitered from a height of approximately 6 feet in a matter of minutes by the division provost marshal in a helicopter. This operation was indicative of the additional support possible when aircraft are used by military police.

The Military Police Corps realizes that the use of Army Aviation during recent wars was merely the beginning of a new era, one which promises even more effective performance of missions. The Provost Marshal General, Major General Haydon L. Boatner, has intensified study in this field and is leading the way in developing new uses for Army Aviation vehicles in support of military police activities.

EMPLOYMENT BY MP

The U. S. Army Military Police Board, located at Fort Gordon, Georgia, is studying the employment of Army Aviation in combat operations and in support of peacetime activities. There, new ideas and concepts which are developed throughout the world are evaluated for use by military police. An example of a new use of aerial vehicles studied by the Board is the photographing of traffic accident scenes from helicopters. These photographs show clearly in one view the complete scene of an accident and simplify investigative analysis.

Experience indicates that as combat operations become more flexible, dispersed, and isolated, the capabilities of the Corps must increase. Present concepts indicate that future combat operations will consist of rapid, individual actions of relatively isolated combat units rather than contact of massed forces. Units will cover far greater fronts than before, and the number of hostile forces bypassed within the battle area will be increased. Military police of combat elements will be required to operate within larger areas and at the same time contend with larger hostile forces. Within these concepts, the Military Police Corps and Army Aviation find great challenges: Army Aviation in the movement of personnel, supplies, and equipment, and the Military Police Corps in controlling the movement of personnel and vehicles within the combat zone.

ADDED RESPONSIBILITY

The employment of atomic weapons will add the responsibility for control of devastated and contaminated areas. This will also make necessary the use of multiple routes of supply and advance, rather than the use of a minimum of such routes as in the past. These complications will exist not only in the combat zone but also throughout the combat area.

The rapid movement of combat elements will require that military police assigned to each element relieve the combat troops of the responsibility for the custody of prisoners of war, other than those in intelligence and medical channels. This same condition demands that prisoner-of-war evacuation from the capturing unit be accomplished expeditiously. In such circumstances, air evacuation of POWs may become mandatory, partic-

ularly if the capturing unit is isolated by hostile forces. Air evacuation of POWs would aid the military police in maintaining their custody and relieve the capturing unit of their burden.

Refugees have always presented a serious problem in the combat zone. In many instances, they have hindered effective combat and supply operations by blocking routes of transportation. Because of the necessity for rapid movement of combat elements, this cannot be permitted in the future. Aircraft will be used by military police to locate groups of refugees and to channel their movement into avenues which will not impede combat operations. This will be possible through use of the "herding" technique and the dissemination of information and directions by means of loudspeakers mounted on aircraft or by dropping leaflets. Here also, the versatility of the helicopter will be necessary to place military police at critical points to expedite the control of refugee movements.

Control of stragglers will normally be performed concurrently with other missions when aircraft are employed by military police. Because of the superior observation of terrain afforded, aircraft will be needed for the prompt location and return of stragglers who might otherwise fall prey to hostile forces operating between combat elements.

As noted before, route reconnaissance can be performed much faster and more efficiently with aviation vehicles than with surface transportation. Though many future combat operations will utilize air-dropped or airlifted units, surface routes will be required for certain combat and logistical operations. When surface routes are used, convoy escort will have to be performed by aircraft, both to conserve manpower (by reducing the lost time of escort personnel) and to provide observational security for the convoy's flanks and route of advance.

The future of the Military Police Corps with Army Aviation support presents a promising picture. When equipped with Army Aviation, military police will be capable of maintaining the effective support of combat units under the Pentomic and other concepts of future combat operations. Provisions for the establishment of direct aviation support of military police activities and new concepts for the employment of this support are now in the planning stage and can be expected to be implemented in the future.

Beware the 1,000-Foot Forecast

"I can make it!"
"I've got to get through!"
"I know this route like the palm of my hand!"
"No sweat; it's still VFR!"

Familiar phrases? Probably *you* have used one or more at some time in your aviation career. While you were able to survive a marginal weather VFR flight, many others were not.

Investigation of aircraft accidents that occur as a result of weather generally reveals a lack of understanding, or disregard of the importance of weather briefings and advisories.

The science of meteorology has advanced rapidly since the invention of the aircraft. Greater knowledge, better instruments, improved techniques, and a vast network of observation posts provide an ever-increasing reliability for weather services. Properly used, these services are a tremendous asset to flight planning.

An aviator departed his station for a 100-mile flight. Weather at point of departure and destination was reported (and forecast to remain) 1,000′ overcast, 6 miles visibility. Weather reports and forecast proved accurate; yet, the Bird Dog crashed near the top of a 1,200′ peak. This aviator ignored the rising terrain along his flight path. Why he failed to turn back when he found the terrain rising into the overcast will never be known.

An instructor pilot departed for a routine night cross-country with two other pilots and two passengers aboard. Rain and thunderstorms were encountered en route to the second refueling stop. During this stop, the pilot was given a weather briefing concerning heavy thunderstorms and the likely formation of low stratus along the flight route. The pilot elected to continue the flight, and the Shawnee crashed in a misting fog, 15 miles from destination, killing all aboard.

These are but two of many accidents that can be directly attributed to a lack of understanding or disregard of weather.

Army Aviators are thoroughly trained in the fundamentals of weather while attending flight school. However, this training must be supplemented by additional individual study and use before an aviator can develop mature weather judgment. A newly graduated aviator cannot be considered proficient in all phases of Army Aviation. He must continue to train and practice to acquire proficiency. It is no less important that he learn to understand weather.

As in learning the other facts about flying, acquiring weather knowledge takes time and ap-

This article was prepared by the United States Army Board for Aviation Accident Research.

plication on the part of the aviator during his whole flying career. Weather elements cannot be read on a dial. Such things as cloud forms, temperature, and turbulence have the same relation to weather as instrument readings have to aircraft equipment. An aviator who does not understand how to use the information gained from these "weather instruments" is in about the same predicament as one who does not know the meaning of the information given by the aircraft instruments.

Some steps that will help develop good weather judgment are:

FLIGHT PLANNING. Always get a complete picture of the weather that is reported and forecast for the whole area that may be covered during the flight. This does not mean just the weather along one line at a certain altitude, but the weather over the whole area at all operating altitudes. Determine what action will be taken if unexpected weather is encountered.

IN FLIGHT. Constantly make visual observations to determine the accuracy of forecast. A good aviator acquires the habit of being constantly alert to the weather around him; on the ground or in the air, he subconsciously notes changes in weather elements. By this method, he can quickly determine when a forecast has gone wrong. He is able to recognize marginal weather quickly and understands the situation well enough to make an intelligent and accurate decision. He does not permit over-confidence or hopeful guesses to delay this decision.

AFTER FLIGHT. Make accurate and intelligent reports of the weather encountered during flight. These reports are valuable to forecasters and other aviators operating in the same area.

In time of peace, an accident that results in injury to personnel or damage to equipment is regrettable. In combat, loss of trained personnel and irreplaceable equipment may represent a major tragedy.

Now is the time to develop weather judgment.

Solution to PUZZLER

On the basis of the factual information contained in the PUZZLER on page 11, the recommended solutions are as follows:

Automatic mixture control inoperative on the right engine. (May cause either excessively rich or excessively lean mixture; however, problem indicates excessively lean mixture.)

Feather right engine. (To prevent detonation and resulting damage to the engine.)

Request an emergency single-engine approach to the nearest appropriate airfield.

NOTE: *You are encouraged to submit comments to the Editor-in-Chief of the U. S. ARMY AVIATION DIGEST on the contents of the problem or on any of the material appearing in the magazine.*

Memo from Flight Surgeon

SOME 48 YEARS AGO, Lt John P. Kelly was assigned to College Park Army School and thereby became the Army's first air medical officer. In those 48 years the air medical advisors and flight surgeons have made themselves valuable helpers for human factor problems in flight. As the Navy's safety magazine APPROACH put it: "If there ever was a man made to order as a teammate of the safety officer, the flight surgeon is it." Say what you will about strategy, tactics, combat procedures, flight techniques, checklists, SOPs — cranked into every plan is that urge to prolong our own worldly existence as long as possible. And that is right down the flight surgeon's alley.

Most of us are all too prone to get wrapped up in our own little ball of paperwork and never know what is going on elsewhere. How many commanding officers or aviation safety officers regularly enlist the flight surgeon's services in solving various problems concerning their aviators? Not many. Yet, here is a man whose training was designed to make the human machine operate better and last longer.

One good way to get the flight surgeon into the act is to stuff him into an airplane and shove the throttles forward. Let him see and feel for himself just what your particular problems are. There have been cases wherein pilots suffered eyestrain, excessive fatigue, or headaches from flying certain aircraft. It might have been the cockpit lighting or ventilation, or maybe carbon monoxide was getting in somehow. The flight surgeon is just the man to help you with such cases. Give him a chance.

Call in the flight surgeon occasionally and let him tell the troops just how and why the body needs the proper amount of food, sleep, and maintenance. Many times a person will resist instruction or education until he thoroughly understands the whys and wherefores. Let the flight surgeon tell 'em—it's his job.

It is a recognized fact that repeated flights take something out of a man. Yet, it seems that sometimes crew rest and scheduling policies just don't come for an ambitious commander or op-

erations officer who tends to push his crews just a little to meet programmed commitments. The flight surgeon can be a great help and a sobering influence if he is given a chance to work with the flying safety officer in recommending safe and adequate crew-rest policies.

DISASTER AWAITS

Psychogenic influences which occur in normal people with ground jobs can be disastrous in flying. These failures include: passive - aggressiveness (trying to get in the pattern before the other fellow, failing to give way when "I'm on my side of the road" and meeting another car head-on), forgetting (gear not down), psychomotor reversal (moving a control the wrong way), perceptual reversal (reading the attitude gyro backwards), and impulsiveness (no flight plan or alternate plan of action). Although occurring in normal people, the frequency of these failures is aggravated by emotional disturbances. Army Aviation, by its very high conflicting demands, is an emotional disturbance factory. This is another area of the flight surgeon's usefulness. Given the opportunity to be in constant close contact with pilots, he may be able to assist greatly in correcting such tendencies. A word to the wise should be sufficient: Don't let your emotions rule you; keep them under control, and let off steam in some form of physical activity. Regularly performed and supervised physical training for pilots, preferably at the end of the day, will do more to relieve tensions that are built up during the day than any other means that might readily be employed.

CASE FOR HEALTHY LIVING

There is a fallacy in assuming that a pilot does not want to kill himself. A person may have the desire to survive yet lack the motivation to do the things necessary for survival. For the pilot, these include constant practice, gaining experience, and maintenance of physical and mental health. To remain professionally qualified, an aviator must have the initiative to do all these things. In some assignments, especially in remote areas, motivation becomes more difficult, and so demands special attention to such little things as regular habits and healthy living. In any case, command supervision is indicated in the case of an exuberant young aviator whose limited experience may impel him to extreme action.

Supervision is an admitted necessity, and if wisely used those being supervised are not even aware of it — until they themselves reach an experience level where they can see and appreciate the need for overseeing those with less experience.

The good supervisor is a teacher as well as a policeman. He's there to help and advise as well as deter and admonish. A good supervisor means less work for the flight surgeon—and the accident investigation board.

Procrastination is said to be the thief of time. Equally trite but no less true is the old adage *haste makes waste.* Initiative and studious application to duty are traits greatly desired and encouraged—but not at the expense of personal welfare. Either should be tempered with more than a dash of prudence and sound judgment. Otherwise . . .

Anxious to return to his home station to complete some scheduled official business the following day, the pilot took off about dusk in marginal weather. A short time later, the Shawnee encountered heavy misty rains. The pilot decided to continue, hoping to maintain VFR at an altitude of 150 feet, but this proved impossible. He then made a 180, and continued meeting low ceilings, poor visibility, and rain. Coming in over a house at 50 feet, the pilot made an approach to a large field but aborted the landing because of excessive speed and poor visibility. The aircraft climbed up over trees on the edge of the field and disappeared into the clouds. Emerging from the clouds a short time later, the pilot was confronted with a tall tree barrier to his front. He applied abrupt rear cyclic stick, resulting in a nose-high attitude, and the aft rotor blades struck a tree. The aircraft began a nose-high climb. The aft rotor system struck a second tree, while a third tree sheared the horizontal stabilizer. The shock of striking the trees plus the unbalanced condition of the aft rotor system dislodged the aft transmission and it was thrown from the aircraft. Still climbing, the Shawnee began a roll to the right, and the front rotor blades hit some trees and began to disintegrate. It then rolled 90°, the cockpit broke open, and the yellow blade of the front rotor struck the ground. Bouncing and sliding, the Shawnee finally came to rest on its side, completely demolished. The pilot is assumed to have died instantly upon impact. The copilot and crew chief received serious injuries and were trapped in the wreckage until their rescue the following morning.

The Gray Hair Department is prepared by the U. S. Army Board for Aviation Accident Research with information from its files.

In his anxiety to return to his home station, this pilot operated the aircraft at night under conditions that made it impossible to maintain visual reference with the ground. There was also supervisory neglect in not enforcing an existing directive on night flying, plus lack of clearly defined regulations for night VFR weather minimums operation during nontactical and administrative flights.

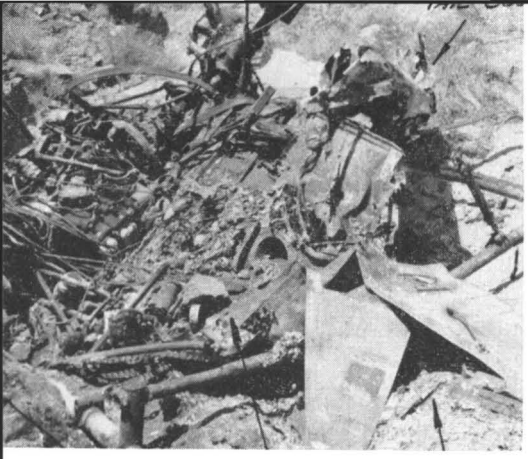
The next day, an operations office received a call requesting assistance in evacuating casualties of a car-train collision. Prior to takeoff, crew members of a Chickasaw were briefed on the terrain hazards and the existence of overhead wires unmarked on the aeronautical charts. Nearing, but unable to identify his destination point, the pilot entered a valley at a fairly low altitude. Landing lights were on, with searchlight extended and sweeping from side to side. Suddenly, a bright light illuminated the skies as the Chickasaw struck a seven-strand electrical transmission line. The forward momentum of the aircraft forced the blade-plane to tilt to the rear, and a blade severed the tail boom. The aircraft struck more wires, somersaulted, and dropped vertically to the ground. Rescue personnel found the aircraft demolished. Three crew members perished. Even with advance warning and the best available lighting, wires remain the most formidable foe of low-level operations.

CRACK THE WHIP GENTLY

Even though constant advances are made in improved aircraft design and operating ease, an aviator's job is a serious one, to say the least. His profession places him in daily combat with forces of nature that were not intended for him. He is provided the machine and the best available know-how for overcoming these forces, but his is the responsibility for efficient operation.

Exceeding limitations imposed by existing conditions and allowing the desire to finish a job influence his judgment can be

A "hope to maintain VFR" ended in this wreckage



Landing on rock formation fatal

an expressway to destruction.

The terrain was rocky and mountainous. Surrounding peaks reached upward to 5,000 feet. Winds in the area were variable; their direction was unpredictable. As on several previous missions, the Raven's pilot and surveyor-passenger were making an aerial reconnaissance of a ridge to determine how to occupy it. An eyewitness reported seeing the Raven circle the area where the fatal accident occurred. As the aircraft came in close to the ridge, it disappeared momentarily but appeared later as it turned away from the mountainside. The aircraft repeated this maneuver three times. Then, disappearing from view, a change in sound was noted, which is believed to have been caused by a collective pitch change. Immediately following the change in sound, a crash was heard. During the next 5 minutes, observers on surrounding mountain tops saw smoke rising from a gorge.

Reconstructing the events, based on known facts, aircraft accident investigators concluded that the rock formation on which the pilot attempted to land gave way under the left skid, causing the Raven to pitch to the left and forward down the steep slope of the ridge. The aircraft rolled 250 feet down the almost vertical slope and crashed in an upright position in a narrow wash, bursting into flames. The two occupants crawled from the wreckage and down the ravine for 20 feet; both suffered burns and injuries that later proved fatal. Though conscious when rescuers arrived, neither made any reference to the accident. Later, when asked if he had experienced any material failure, the pilot answered that he had not.

Like charity, accident prevention begins at home. Your body, too, has limitations beyond which it will not respond to natural reflexes. Crossing a mountain range at 3,200 feet, the pilot simulated a forced landing and glided in. After refueling, he and his passenger were again in the air. Climbing out with 30° flaps, he turned out over a river and made a descending turn to the left. At this point it is assumed that he intended to level off and proceed up the valley. Due to calm wind conditions, the surface of the river was extremely smooth. As the pilot continued his descent, he apparently failed to note land marks and lost depth perception. The aircraft hit the water at a high rate of speed, remained near the surface momentarily, then sank. The passenger managed to free himself from the wreckage as the Bird Dog sank to the river bottom. The pilot's body was not recovered until the aircraft was salvaged.

When you exceed the limits of either your aircraft or yourself, you reduce the margin between pilot-capability and work-

load; an accident is usually the end result. Get to know these limits and don't push past them.

EASIEST COURSE?

Just let the boss go out of the office—ostensibly to keep a business appointment but actually to get in a few rounds on the green—and he is no sooner out the door than Susie digs through the "A" file and comes up with "Amorous Lady." She pops a stick of gum in her mouth and sits back. The switchboard operator says, "Might as well call Lucy and yak awhile." Elmer Tipples breathes a sigh of relief and riffles through his desk for an aspirin. "Boy! Shouldn't have taken those last three for the road last night. Hmmm . . . there might even be time to slip around to Joe's for a quickie before old Simon Legree gets back."

The tendency of some individuals to follow the easiest course, barely sliding by in their work, is the bane of business everywhere. Of course, the majority of people don't follow this lackadaisical manner in performing their job. The small percentage who do, however, are cause for grave concern.

A stock joke around the line shack is *kick the tire and light the fire*. If you stop and look at the number of accidents that are precipitated by aviators who do just that, the joke ceases to be funny. All of you have heard about the aviator who hopped into his whirlybird and attempted to take off with the skids tied down. Another thought his chopper would fly with its main rotor blades tied. And how about the mechanic who installed a Sioux' rear rotor blades in reverse? This act was followed by a hurrying test pilot, with obvious results.

Have you heard this one? While demonstrating a properly executed takeoff, the instructor and student were no sooner in the air than the aircraft began a turn to the left. Immediately the instructor began yelling, "You've got it. My stick is out." The student in front managed to level off and parallel the strip as a wing struck a tree on the edge of the strip, causing the Bird Dog to become uncontrollable. The aircraft continued forward as the wing struck several more trees, turned farther to the left and assumed an extreme banking attitude. It then pivoted to the left, nosed down, and crashed into the ground, a total loss. The IP escaped without harm, and the student sustained minor injuries. Accident investigators found a bent rear control stick retaining pin which prevented it from locking in place and securing the stick. Both maintenance personnel and pilots had overlooked it.

And another: On a cross-country flight, the Bird Dog instructor pilot and pilot neared their destination and noted that the weather was clear. The pilot elected to land at a field other than that originally filed to and failed to notify FAA of the change in destination. After circling the airfield twice, the pilot saw the runway lights come on. (They were turned on by a night mechanic who was unaware that the runway was under repair.) Lights on, the pilot assumed he was cleared to land. A normal touchdown was per-

A mechanic failed to tighten a locknut

formed with landing lights on. During the landing roll, the pilot switched off the landing lights. About this time, he saw an obstruction in front reaching across the entire width of the runway. Too close to avoid it, the aircraft struck head-on, shearing both main landing gears. It slid down the runway on its belly and stopped. Luckily, the instructor and student were uninjured.

Aviation accident investigators don't always find cause factors as clear-cut as the above, but the following is a good example of dereliction of duty on someone's part. On a solo training mission, the Bird Dog failed to respond to an application of throttle by the pilot. The tachometer indicated 1,000 rpm. Due to a fairly strong prevailing wind, the pilot estimated his glide path to an open area would be short. He immediately selected the only field available: a large clearing in a wooded section. The pilot performed all emergency procedures, and set up his approach. During final, he discovered that the field was being freshly cleared and was filled with logs stacked in piles. He applied 45° flaps, locked his shoulder harness, and went in. The right wing struck a tree; immediately following, the left main gear was shorn by a stump. The right gear was the next to go, and the aircraft went up on its nose. The pilot was, fortunately, uninjured. While installing a new carburetor, some mechanic failed to tighten the lock nut which fastens the throttle control rod end to the carburetor arm. This allowed the lock nut to become unfastened and the rod to separate from the arm. Apparently no inspection had been made after the work.

Susie's stealing a few minutes of the boss' time and aviation personnel's inattention to duty may seem an incongruous analogy. Each, however, represents inefficient service to their respective organizations. The only difference is that Susie's action is not going to cost her boss nearly so much as the laxness of aviation personnel.

FILL 'ER UP

Reluctantly tooling his jalopy toward the city lights, Willie McOut wondered disconsolately why every time, just as he was rounding second base, Flossie Mae would call time and remind him that mama had said 11 o'clock. Suddenly his troubled thoughts were broken by the sputter of a fuel-starved motor.

The car rolled into a side road and stopped. He cautioned the cutie that it might be some time before anyone came along. In the meantime . . .

This backseat casanova probably made out okay, experiencing no worse than a dressing down by Flossie Mae, Sr. On the other hand . . .

Warned beforehand that the Sioux was low on fuel, the aviator landed, but found the tank trailer had been moved to another field. Estimating that he had sufficient fuel to reach his destination, the pilot was again on his way, but not for long. One mile after takeoff, the engine stopped. The pilot selected the best landing site available and went into autorotation. Everything was progressing satisfactorily until a few feet above touchdown point a group of children ran onto the landing area. Fearing he would hit them, the pilot applied collective pitch and tried to land on a nearby road, but the rotor rpm had dropped to such an extent that the controls were no longer effective. The Sioux settled rapidly in a nose-down attitude, inclined to the right and crashed on the road, turning over on its side. It was damaged beyond repair.

The Bird Dog climbed to 3,500 feet and the aviator performed a cockpit check, noting that the main tank indicated less than full. After switching to the auxiliary tank, the gauge of the main tank continued to register less while the auxiliary remained on full. Cross checking, the pilot determined that something was definitely wrong, but decided to continue his flight. A short time later the engine began to cut out. The pilot selected a corn field for his forced landing and went in. The aircraft struck the ground, bounced 30 feet, slid forward and nosed over inverted. A total loss.

Another Bird Dog on a flight training mission coughed once and stopped. Unbuckling safety belt and shoulder harness, the pilot prepared to abandon the aircraft only to discover that he had insufficient altitude. The aircraft was completely demolished in the ensuing crash. The aviator and copilot fortunately received only minor cuts and bruises.

A cool cat may be able to make the most of the situation if his gas buggy runs short of petrol. On the other hand, an aviator has the darndest time finding a suitable parking spot.

LIGHTLY SPEAKING

A hefty aroma of snack bar coffee seems to permeate the cockpit as familiar objects around home base loom on the horizon. It has been a long day and you mentally relax as you enter the downwind leg and perform prelanding checks. Relax carefully—your biggest chore of the day is still ahead: setting her down in one piece, lightly.

Entering the traffic pattern, the pilot completed his prelanding check while on his downwind leg. After turning final, flaps

Faulty fuel estimate caused this

Result of hard landing

were applied to the takeoff position. Airspeed was 70-75 miles per hour. Twenty feet above the runway, the aircraft began an abrupt descent. The pilot applied full throttle and the engine responded normally, but the Beaver continued its accelerated descent. Even though the pilot managed to bring the aircraft in to a three-point attitude, it made an extremely hard landing. Winds were gusting 20-40 knots at the time of this landing.

An Otter made the final approach with an airspeed of 65 knots and flaps lowered to climb setting. At 1,500 feet and 2 miles from touchdown, a slight crosswind was noticed. The landing lights were turned on, and the throttle was held at a sufficient power setting until the aircraft was 15 feet above and 300 feet past the approach end of the runway. The transition student was warned by his instructor to round out but interpreted from the tone of the voice that he was too near the ground. He pulled back abruptly on the stick. This sudden change in attitude resulted in a quick loss of airspeed and a gain in altitude. Corrective action taken by the instructor came too late and the Otter struck the ground. Damages amounted to $8,000.00.

Old hands at the flying game like to place most hard landings at the feet of students and inexperienced pilots. This doesn't always jibe with accident statistics.

JOT 'EM DOWN

After turning final, the approach was set up to clear a terrace on the end of the strip. The approach was slightly below normal glide path and the landing gear struck the terrace. With addition of power, a go-around was executed, and another landing attempt was successful. The two occupants of the aircraft got out and conducted a visual inspection, but found no visible damage. They re-entered the Bird Dog and continued normal operations, making several power approaches and landings prior to returning to the home field and parking the aircraft. No entry was made in Form 781, Part II, other than this flight okay, because no apparent damage had been seen. When the aircraft was later postflighted, several rivets were found missing from the underside of the fuselage between the main gear. Further inspection revealed the skin wrinkled in the vicinity of the left gear box, and the left gear retaining bolt was partially sheared.

This pilot oversight was luckily caught and remedied in time. How many have not been and resulted in accidents, is a matter for speculation.

Stop!

IT IS A WISE Sunday night sofa pilot who knows just how far he can go with his girl friend before coming to a halt, especially if mama happens to be lurking around in the background. The same applies to the Army Aviator making a short strip landing. If you go too far in either case, you are apt to end up behind the eightball.

Many factors affect the braking of your aircraft. Some of them can be changed by you; some cannot. The first factor is the coefficient of friction, which may be defined as the measure of the relationship of frictional force between an object and the surface upon which it moves. This coefficient of friction varies with the type and condition of the runway, the speed of the aircraft, tire tread pattern and material, inflation pressure, temperature, and the presence or lack of ice, snow, and rain.

Generally, the cheapest materials obtainable are used in making runways. Consequently, the material used will vary from one installation to another. To further complicate matters, you cannot say that a particular type of material has a definite coefficient of friction. Though made of the same material throughout, runways may vary in coefficient of friction from one section to another. You can, however, expect dry concrete and asphalt to run from about 0.5 to 0.85 coefficient of friction, using a scale of 1.0 as a whole.

As a pilot, you have little control over the tread material and pattern of your tires, but you can check before takeoff to see how much tread you have. On an icy or wet runway, a smooth tire will not give the same braking action as a tire with a good tread. Tread design of your aircraft tire is a compromise between the best design and one that will best stand up under necessary landing speeds.

Inflation pressure will vary with the different types of aircraft. Generally, lighter aircraft require lower pressure. Lower pressure usually generates greater friction between the runway and the aircraft (see fig. 1). An exception is a runway with water on it. Water on a runway can cause an almost complete loss of friction when

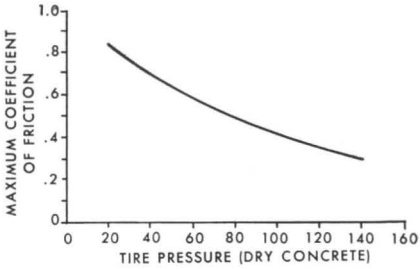


Figure 1

This article was prepared by the United States Army Board of Aviation Accident Research.

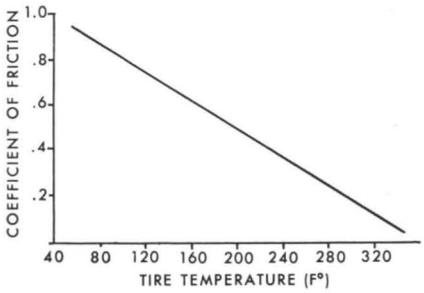


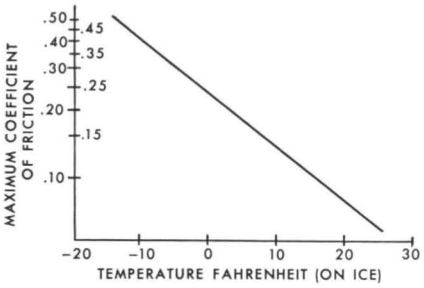
Figure 2

the "cushion" of water causes tires to act as hydroskis. On a wet runway, the high pressure tire tends to give better braking as there is less contact area to cut through to contact the runway surface (see fig. 3).

Higher temperature produces weaker braking action (see fig. 2). Wide variations in coefficient of friction are also caused by snow and ice.

Ice, surprisingly enough, provides a good coefficient of friction, almost equal to dry concrete or asphalt. Trouble develops when ice is heated to a thawing point, as by tire friction. The thawing effect produces a thin layer of water on

Figure 3



which the tires skid, causing loss of braking friction.

Braking force is equal to the coefficient of friction times the weight on the wheels. Maximum braking is obtained with 15 to 25 percent slippage. For example, if the aircraft is making 100 knots and the outside circumference of the tire is doing 75 to 85 knots, maximum braking is obtained. More than 15-25 percent slippage results in skidding (see fig. 4).

In a skid the rubber on the

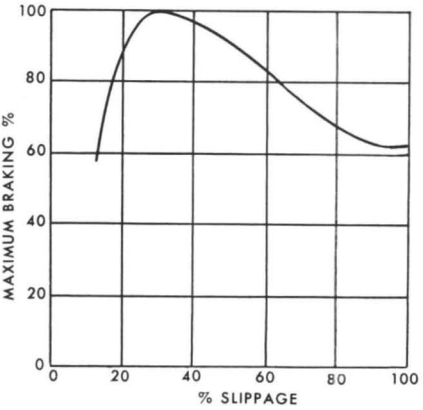


Figure 4

tire is apt to melt, giving the tire a liquid surface to slide on, which greatly reduces necessary friction. Even if the heat is not great enough to melt the rubber, friction will be appreciably reduced by small particles torn loose by shearing, which act as rollers.

Loss of friction, however, is not the worst part of skidding. Very little skid is necessary to cause a blowout. After the tire blows, it disintegrates quickly, leaving you on rims; and metal sliding on concrete has an ex-

tremely low coefficient of friction.

If your emergency brake is the type that locks the wheels and the normal braking system is working, pulling the emergency is one of the worst moves you can make. The resulting skid will probably blow your tires.

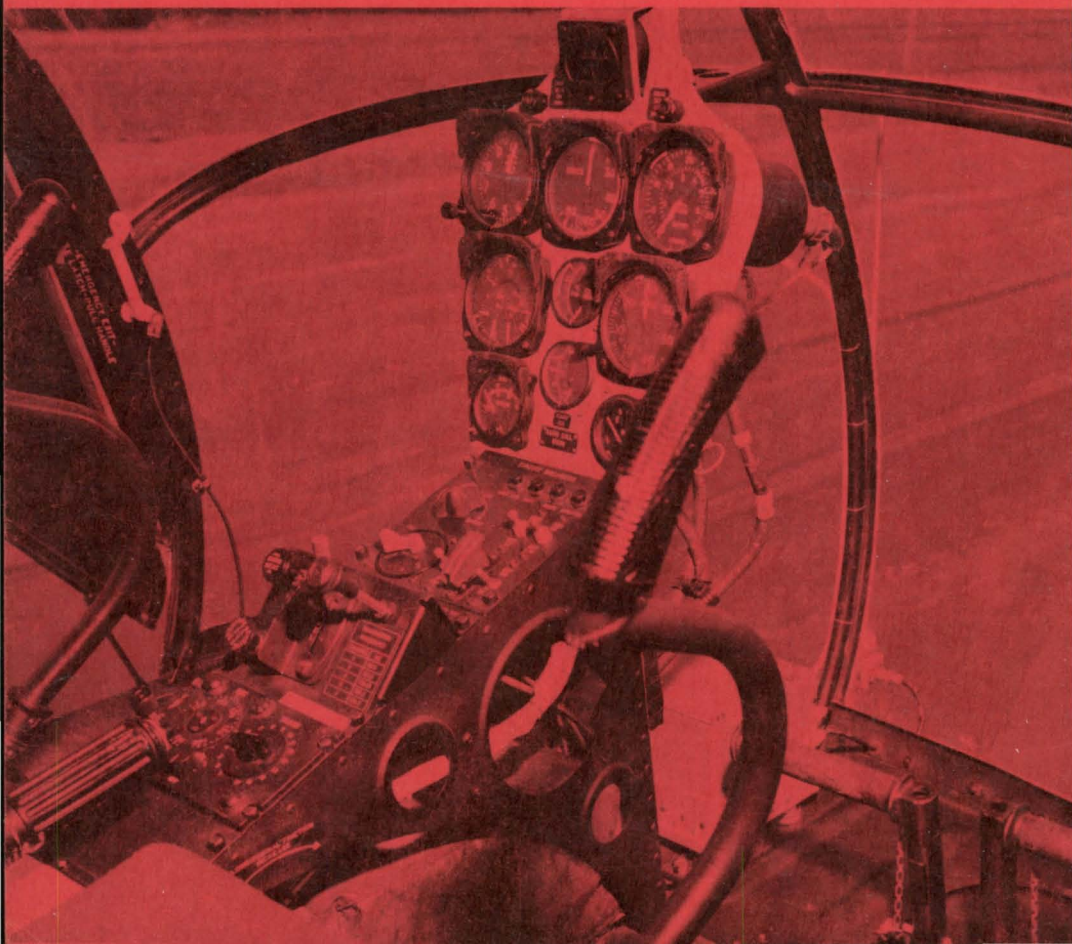
One method of reducing landing roll on an aircraft with a tricycle gear is application of up elevator just after the nosewheel touches down. The amount of up elevator used is necessarily limited or the nose gear will rise. A correct use of elevators will transfer maximum possible weight to the main gear, saving up to 25 percent on the landing roll on dry concrete, up to 30 percent on wet concrete. Elevator overcontrol can create another problem if your aircraft has a steerable nosewheel by causing you to lose some directional control.

Touchdown speed is important in reducing the landing roll. The slower the better, within safety limits. Slower approaches can be made with full flaps, atmospheric conditions and personal capability permitting.

If your brakes are the type that will fade, techniques must be determined that will provide effective braking for your particular aircraft. Proper braking technique is vitally essential; you want about 20 percent slippage. Next, you must decide whether or not you can come close to 20 percent slippage by a steady or intermittent application of brakes. If upon steady application a skid is produced, braking will be poor, possibly followed by a blown tire or other complications. When you apply pressure, striving for a steady braking force, there are numerous patterns that can be followed.

When quick hard applications of brakes are made, followed by rapid easing of pressure, there can be no more than a momentary skid, and your chances for a blown tire are slim.

No one system is the best method for stopping in the minimum distance. Each aircraft braking system, both wheel and aerodynamic, must be considered, as well as the strip surface, temperature, and the altitude for touchdown groundspeed. It is your responsibility to decide which is better for use in any specific landing situation.

Normal landings will not be a minimum distance landing. Saving of brake pucks, tires, and other considerations will affect techniques used in stopping. It is to your advantage to learn methods that will provide minimum distance ground rolls. Poor braking action on a short strip can be fatal.

Dubbed the "Yo Yo" by US Army Aviation Board pilots, the Hughes 269 is presently undergoing evaluation. Designed with an eye to low initial cost and low maintenance, the two-place helicopter is powered by an 0-360 Lycoming engine developing 180 h.p. It cruises at 75 mph and has operated at 1750 pounds gross weight.