FLYING SAFETY

UNITED STATES AIR FORCE

In this issue

BE PROFESSIONAL * ALTIMETER QUIZ

FLYING SAFETY

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A special study, based on the December alljet issue is available to interested USAF units.

Are you sure you can pass the altimeter quiz?



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SUBSCRIPTIONS

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BIT of sea-fog is drifting in, almost to the west side of the field. Alfa and Bravo flights have both peeled off into the slot. Now you've got the Cocoa lads to sweat out before the white stuff hits the area.

It's always like that. You plan the last strike with your fingers crossed. That crud off the Yellow Sea is a dead-cinch. You can almost set your watch by it. Two minutes, maybe three minutes late and blooie ... you have to vector the rest down to "K-2" or "K-9" and even then it's pot-luck. Somebody is always depending on a totalizer and winding up with a dead fire-pot. It's the same old story.

"Hello Quicksand, this is Cocoa Leader. We're at 30,000 and on schedule. How does that stuff look? Over."

"Cocoa, this is Ouicksand. You're cleared right on in. No reported traffic. The time is fifty-four. Weather says that you have five minutes. Can you make it? Over."

"This is Cocoa. Yeah, we'll make it but it's going to be tight. Switching to tower now. Over.'

Two minutes. Then you see 'em coming on down. They're already stacked up in right echelon and everybody's pulling just a bit of power. There's not much smoke.

"Hello tower, this is Cocoa One. How's that fog look? We're about twenty north and just passing through ten thousand."

"Cocoa, this is . . . tower. I'm reading you five square. That sea fog is moving in fast but you'll make it, I think. Use zero three. Wind west, eight. Altimeter, two nine nine five. Call gear on base. Over."

"Roger tower. Runway zero three. Two nine nine five! Okay you guys. Close it up. Regular spacing. Watch my break. Play it right. That damn fog is going to hit in a minute. Speed brakes . . . NOW!"

Sweeping around in a smooth turn the flight of four fighters come whistling upwind over runway 03. This is going to be a real squeeze-play, but they're committed.

The lead plane rolls up on its left wing tip and cuts a smooth arc through the sky. You can just see some misty vapor trails. The number two man is watching and counting. Now! The second plane heels over sharply and scoots around the 180 degree turn. Number three . . . Now!

The last of the flight, number four, hesitates for a moment, then wracks into a vertical bank. If you were up there, you'd feel the shudder. Watch

it lad - - - not so tight!

"Hey, Cocoa One to Four. Take it easy will you. Oh for the love of . . .! That's the umpteenth time I've warned you about dropping your gear on the break. What do you want to do . . . pop every line in the system? Okay guys, watch that spacing. Tower, this is Cocoa Leader on base, in the green, pressure up."

The four planes are spaced nicely now. Number one rolls onto final and comes smoking on in. He looks fast at first but as the nose comes up you realize he's right in the groove. The main gear touches lightly and twin puffs of smoke go drifting back from the tires. Real nice.

Number two is just back of the leader and lining up for the right side of the runway. He's rolling a bit from jet-wash, but this lad is sharp. Chalk a line across the runway and you'll find his touchdown spot directly across from the leader. This is good; real good formation.

The third ship is rolling around the final turn. It's pretty steep and you sort of hold your breath. Even empty the wing-loading is on the high side. Steady now boy, don't suck in too tight. Hey! Watch it. You realize that he's overshooting the turn and number four is right in his stove pipe.

"Tower from 893. Going around."

You see that tell-tale blob of smoke from the tail pipe and you watch and wonder if he's got enough go-juice. Patches of scud are crossing the active right now.

Then it happens. "Tower . . . 893 ... Mayday ... Mayday ... flame-out ... I'm ... "You see a flash of silver as a wing comes up, then the plane is gone into the gray nothingness there to the west.

Mobile Control is yelling into the mike. That's bad too for he's overmodulating until things are really garbled. Number four is wracking around on his final and sucking the stick into his guts. Maybe he's punching the pilot-type panic button a bit too for you can feel that this lad is suddenly real gone.

"Hey! Loosen up that turn. Come on boy, fly it up. FLY IT UP TO THE RUNWAY. Use that throttle. Get the nose down. DOWN!

You think of others. One second the plane's staggering along, almost up to the overrun and then . . . in he goes. There's a big cloud of greasy smoke and you know the tanks have blown. This time it's different. Number 4 comes sliding up to the runway on the belly. He's swiped off the gear but the plane is not burning. Boy! That was close. Too close.

It was a successful strike. The guys went out and did a job. They did it thoroughly, too. At least the people on the receiving end felt that it was successful. So now, how does it wind up? Everything goes according to schedule. Sure, there isn't any JP to play with when the four get home, but sometimes it seems to be that way. The leader sets up a good pattern and expects his men to follow it. Then somebody fluffs. An overshot turn or a power-off approach

and there's two perfectly good airplanes out of the picture permanently. The pilots? They were so lucky you'd find it hard to believe. They both made it, and, intact too.

Okay, maybe you'll say, "This is nothing but a hypothetical case. What are the real facts about poor pat-terns and power-off approaches?"

Read and heed. This is straight from you-know-where.

Pattern Analysis:

Admittedly the foregoing case was hypothetical. Nevertheless, in the files of the Directorate of Flight Safety Research we have case after case that parallel this almost 100 percent. And in many of them, weather and low fuel aren't even a factor. Fortunately, such instances are the exception rather than the rule, but when we dig back into the history of a pilot who is unfortunate enough to clobber an airplane, we invariably find an inherent weakness that came about as a result of early carelessness which was then allowed to become a habit.

From the time a pilot starts his initial pitch-out, until the landing is safely effected, the entire pattern determines whether the maneuver will be safe and successful or dangerous and possibly unsuccessful.

We've spent a whale of a lot of time studying landing patterns in jet aircraft. We've flown our share too, both in combat and in peace time. That doesn't necessarily make us experts, but, here's what we have done. We've gone to some of the most qualified test pilots in the country. Men who fly virtually every type of jet aircraft . . . and we've talked with them at great length on safe patterns and procedures. Flying Safety is convinced that the lessons learned by the old timers are worth passing on to you. This stuff isn't new. It's all in your dash-ones. However, our records show that a small minority must have missed the chapter on "how to fly the airplane." Follows now, a series of discussions by experienced men who really know their business. If you'll take it to heart, be you a good steady pilot or a hot-rock, we think it will pay dividends...to you!

J. J. Quinn, Northrop Aircraft, Inc.

I have long been an advocate of the power-on approach, especially since flying the F-89. This airplane, in particular, is fast and heavy for an interceptor; it weighs plenty and is a great big piece of equipment. In spite of its size and weight, it's a darn good flying airplane. However, what I try to pass along to every squadron is just this; learn to make all approaches the easy way.

Let's look over what I consider to be a normal pattern. You make a nice, easy break and slow the plane down to around 200 knots. Remember, you're going to do either two 90 degree turns, or one big 180. Either way you prefer is okay, but, this is important; you should plan for, and make, a definite downwind leg in order to get oriented and plan

the rest of the approach.

Okay, let's say that we're down to about 200 knots in the '89 and on a definite downwind leg. Right here we dump the gear and set the speed brakes the way we want them. Of course the Scorpion is a bit different than many fighters in that we can visually check the position of the main gear. You can see the main wheels and then feel the nose gear when it chunks into place. On top of that we have the visual indicators for

a further check, plus the hydraulic gages. When the pressure comes back up and all indications are normal, I know I've got wheels under me. That's important.

I advocate carrying 80 per cent power in the F-89 all the way round. This has the advantage of giving solid handling; it gives you the feel of your plane throughout the pattern. I realize that when I speak in the terms of 80 per cent power, this must of necessity apply to the '89 only because we've got the speed brakes, or as we call them, the decelerons, to aid us. I'll speak of that a bit later.

As you come in on final, you slow the airplane down to between 140 and 150 knots, but, you have power on all of the time. Of course you have the speed brakes out and the landing flaps down, too. With this sort of deceleron working you can establish almost any rate of descent you want. Remember, with full flaps you're getting a lot of drag but have complete control of the airplane.

If there is any question in your mind about landing you can continue the approach with flaps at 30 degrees and enough speed brakes to slow you correctly. As I've said, there are any number of combinations that you can



establish. The dash-one will clarify the many situations for which you must plan in advance.

One point I want to make clear, however. If you'll plan your approach for about 140 knots and power at 80 per cent, you'll have almost enough push to make a goaround, and believe me, you won't have to sweat out any thrust lag if you really need additional power.

If you learn this technique of the power-on approach in the very beginning, I can't see how you'd ever lose a thing by it. Some people still talk in terms of losing an engine while in the pattern. Well, of course it could happen, but the chances are almost nil. If that power plant functions normally throughout a mission,

and you don't manage to run yourself out of fuel, I can't believe that the engine or engines will fail just because you're over the home base. It doesn't make sense. So — depend on that available power, and use it.

Remember this too. If a pattern is learned well, it will take care of the pilot. If he gets the habit of making his pattern the easy way, and, I feel the safe way, then everything will be all right. You've got to bear in mind that some days a guy will be real sharp. On others maybe he won't be so sharp—well, if he has the habit of flying right—the easy and safe way, it won't matter too much. He'll still make it okay.

Actually there isn't much more to it. You learn to set up a good pattern. You practice until it's second nature. Then all you've got to remember is to sustain the power for the rate of descent you want. Certainly you won't be pulling enough power to fly the airplane level and you don't want complete power off. You just want an easy rate of descent once the plane is on final. I can't say definitely how many feet per minute you'll want, but you'll figure that out for



Test pilot J. J. Quinn states that power-on approaches are "the safe way and the easy way."

yourself. You don't want the plane hanging on the ragged edge of a stall nor do you want to be pouring black smoke out all over the place. Just enough power for a really easy descent.

In my own flying, I keep a little power on all the way to the deck, or just before the touch-down. I pull off the power when I have it made. That, to me means when I'm over the numbers. This may be a bit too conservative for some of the younger pilots but I think it is right, and that goes for any airplane. As far as I'm concerned, power means control. As long as I've got control, I'm not going to bust up any airplane.

Previously I mentioned the deceleron system. That means merely split ailerons. These give you drag only, no lift at all. The system is controlled by a handle that operates over a full range. We call it the third throttle. You can pre-select any amount of drag for the landing approach and have any amount of speed that you want.

In summation I feel that the whole business of patterns and approaches can be boiled to just a sentence. Plan your pattern, fly the plan, use the power you need and set the bird down where you planned. It's that simple.

Tony Le Vier, Lockheed Aircraft Corp.

In discussing this business of approaches and landings in an airplane, I feel that this combination is one of the most difficult things to accomplish. By that I mean, the most difficult maneuvers to accomplish consistently. From the time a man takes his first flying lesson until actual solo, approaches and landings seem to take up the major portion of instruction time.

You spend hours grinding around the circuit only to get back to that situation where a landing is inevitable. Maybe it is easy for some people. I don't know. For me it was plain hard work to learn. I had to develop judgment in speed and altitude and finally, depth perception. Sure, you learned a bit of everything else too, but mostly it was up and down, up

and down. Bounce. Gun it. Take it around. Down again.

In my book a landing draws more comments from onlookers and passengers than any other maneuver you might make. You bounce a little bit and immediately get comments from every witness in the area. Make a nice smooth one; grease it in, and nobody says a word. You may comment about an especially smooth one, but such remarks fall on deaf ears!

I remember when I first started flying. My instructor was very fussy about approaches. When I got the airplane on a base leg things had to be right. I had to put it in a certain position, have a certain altitude, maintain a certain attitude, keep my power right where he wanted it and above all, fly the airplane. He wouldn't tolerate any sloppy attemps. It was



darn good training too. I've never forgotten his lessons.

Of course we didn't have drag flaps and things like that in those days. The landing gear was welded down too. But those early planes were light. They'd glide a long ways and you really had to chop the power back and slow 'em down to get in. Slips and fish-tailing aided a lot too

but that sort of thing was confined to the old OX-5s, Eaglerock and Waco class, certainly not F-94s.

Well, we've progressed a lot in the last 20-odd years. We've seen airplanes get faster and faster and at the same time, a whale of a lot heavier. They're certainly fast today, but the airplanes of the future, those for the Air Force and the rest of the military, will have performance bordering on the missle. Of course a true missle is a pilotless projectile but as long as we still have pilots flying airplanes, we'll continue to improve performance. Stuff in the 2000 mph class will probably show up in the not-toodistant future, and pilots will be flying them too.

In spite of this thinking, we've got to consider the fact that airplanes will still have to operate in the 150 to 200 knot category insofar as take-offs and landings are concerned. No matter how fast a plane may fly at maximum performance, we'll still have to plan to bring it down, at rea-

sonable speeds.

We can say that 200 or so is an average figure, but that's still smoking right along. So, even at that comparative low speed, we've got to have a definite pattern and approach to insure safe operation. Okay, let's discuss those factors that make up safe operation. These will be as applicable to T-33s as stuff in the 100 series.

I believe the easiest way to define a safe approach and landing procedure is to diagram the whole thing. I've sketched out what I call the "ideal pattern." Probably there are some people who will disagree with me, but I feel this way about it. After 25 years of flying, everything from Jennies to F-94s, I still use the tried and true approach and landing technique that was taught way back when . . . and . . . I'm still here to discuss it.

Let's take a typical approach. I've been out on a mission or a training flight or maybe a shake-down. It doesn't matter. When I get home, fuel is down to critical limits. I can't fool around with more than one approach and so, I plan everything carefully before I drop off all of my altitude.

My system has always evolved around the theory that it's easier to put an airplane where I want it by using a modified approach, than any other. By that I mean it's a compromise between the true, power-off approach and the long drag-in with everything open but the windows.

One reason particularly governs my thinking along these lines. As speed and weight of aircraft continue this upward spiral, it will become increasingly necessary to utilize power for a safe approach. Sooner or later, power will be a must to complete a safe approach and landing. Therefore, while we're still on the borderline of such equipment why not learn the logical technique until it becomes second-nature? It's cheap insurance, believe me.

Now, let's take a typical pattern and landing in . . . well let's say a T-33. Maybe you're just going through school. On the other hand maybe you've got several thousand hours under your belt, but it's all conventional stuff. Whether you're a student or an old hand, you still want to learn to fly this machine right.

For the sake of discussion we'll assume that you have a thorough working knowledge of the airplane. The actual mechanics of flying are things already mastered and the art of a good landing is an assured fact. But, we still have one problem to overcome. How do we consistently bring the plane into traffic, establish a good pattern and then put the buggy on the ground exactly where we want to? I don't mean a good one now and again. I mean good approaches and landings all of the time.

This T-33 isn't the hottest piece of machinery going today, but it is the transition airplane you'll be exposed to for some time to come. It's clean and fast and comfortable. You won't have any trouble with this bird upstairs or downstairs either, for that matter. It gives you good control in all speed ranges and doesn't have any nasty habits.

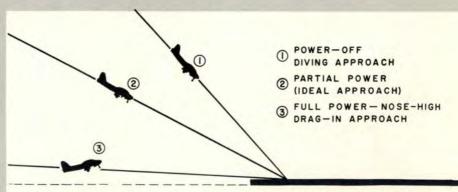
Okay, so you're coming down for a landing. What's the first procedure? Plan your pattern, I mean plan it. You've got a breeze of about 15 knots on the deck and it's almost on the runway. There's no real problem here except to establish a good pattern and follow through.

On the upwind leg, over the runway, you've already lowered dive flaps and knocked the airspeed down to about 260 knots. About a third or possibly half way up the runway you roll into the break. This doesn't have

to be violent. Just make a nicely coordinated turn and keep it going for

180 degrees.

If you happen to be of the "two 90 degrees turns" school that's okay too. No matter how you do it, make certain that you get the airplane on a definite downwind leg and then reduce power to about 60 per cent and get the gear and flaps down. Keep the altitude a constant factor and let the speed fall off normally. Above all, don't wrack around



Tony Le Vier's sketch of types of approaches. His "ideal pattern" calls for partial power.



through the early part of this maneuver like a mad-man. Sure, I know you may be hot. Possibly you even sizzle a little bit. That's swell. Save that stuff until you're upstairs. Down here in traffic, play it easy. You're not going to impress anyone with screaming tactics near the ground.

Once you're on a definite downwind and the gear and flaps have been extended keep the power at 60-70 per cent. Remember, acceleration time from 60 per cent to 100 is darned fast. Acceleration from idle to 100 per cent is damned slow. That's the most important thing to remember. Keep that mill turning in the upper speed ranges and you'll stay out of trouble.

The rest of the pattern is pretty much standard. Make a definite base leg and turn on final with ample speed. By that I mean, keep the airplane well above the stall range. That doesn't mean that you should bring the plane in like a bat out of you-know-where, but do keep a reasonable head of steam on. Fly it at 130-140, somewhere in that area. Keep enough power on to steady the airplane all the way down.

Here's something else to remember too. You who have been flying conventional aircraft are generally used to having the nose of the airplane pretty much follow the actual flight path. In the jet however, you'll find that the relation of the horizontal axis of the plane to the actual flight path is considerably in variance to that which you expect. For example, in a true power-off glide, the nose will be tucked down at an alarming angle. The rate of sink will curl your hair and you'll be quite concerned as to where to start breaking the glide for round-out.

In the full throttle type of approach, gear down, flaps down, speed brakes open and throttle at or near 100 per cent, the nose will be high. You'll feel as though you're hanging on the ragged edge of nothing. It just isn't comfortable, Bear in mind, I do not imply that this sort of approach is dangerous. I certainly do not. In fact, there may come a time when you'll have to drag one in, but, at the moment we're kicking around the subject of normal approaches.

Okay, now for the normal, partialpower approach. With the throttle set at between 60 and 70 per cent you'll find that the plane is extremely stable. The nose of the ship appears to be following the actual glide path



"On a landing...no real problem except to establish a good pattern and follow through."

and the rate of sink is minimized. Control is good and the airspeed is within tolerance. You have the feeling that you're flying the airplane correctly. Know why? Because brother, you are! That's the way the plane should be brought in. I think my diagram explains the approach clearly.

Right here I'd like to inject some positive thinking about glides. Every airplane has a definite glide factor. By that I mean a factor that remains constant. You should take this into consideration each time you set up a pattern.

Suppose, for example, the stalling speed of your airplane is 100 mph and factory tests have established a glide factor of 1:35. Here's what you do. Multiply the stall speed by the glide factor and you come up with the ideal approach speed. In this case, it would be 100 x 1.35 or 135 mph. Then, should you lose an engine or find it necessary to make a power-off approach, you'd still have the correct speed to assure a safe round-out and touchdown.

Every pilot should be familiar with the glide factor for the particular airplane he's flying.

Now it's just a case of holding power, speed and attitude right on down to the deck. Hold it until you've got it made. I mean, hold things constant until you are assured of making the runway, then, as you start to ease back on the stick, ease back on the power. Learn to cordinate this action and you'll never go wrong.

About the only other thing I'd like to mention is the effects of wind. I don't care whether you're flying a Cub or the latest blow-torch, you've still got to consider the breeze when you're ready to set down. Of course a strong wind has compensating factors. It automatically stretches the runway, but, you've got to allow for it in any plane.

Let's say for example that you're coming in with a stiff breeze right on the nose. You may get the impression that the plane is stalling because you're not making normal progress in relation to the ground. The rate of sink appears to be excessive and finally you start jamming on more power. That's okay, up to a point. It's best to be a bit on the high side in a heavy wind, especially if it's gusty, but too much power can mean too much speed and then you're laying yourself wide open for a galloping or porpoising ride down the runway when you try to get stopped. So you say, "Well, what is safe then?"

Here's a good rule-of-thumb: Take the known wind velocity and add 50 percent of that factor to your approach speed. If the surface wind is 50 knots, add 25 knots to your approach speed. This will take care of any sudden changes, such as gusts above or below the average velocity.

Use flaps and power as needed. Stay a few jumps ahead of the airplane, and stay loose. I mean it. Make yourself be relaxed and anticipate the little buggy. After all, it's a mechanical thing at best. You are human.

That's about all I have to offer on this subject. Learn to fly your airplane right and it will take care of you. Don't ever run out of altitude and brains at the same time. Use that old throttle to get you down just the same as you use it to get upstairs. It's a two-way proposition.

Rusty Roth, Republic Aviation Corp.

As far as I'm concerned, good traffic patterns and power-approaches are completely synonymous. The two tie together right straight through.

There's one thing about using that engine that too many pilots overlook. I'm speaking now of present-day equipment. If that engine is going to function for an entire mission, it's going to run for the landing pattern.

Originally, when we first started flying fighters, they used to load up like mad when you closed off the power. Naturally you always assumed the worst situation when planning the approach and made a pattern that would insure getting in even if the mill quit. If it suddenly became necessary to get some power out of the engine, especially the in-lines, it was strictly nip and tuck. If the power plant was loaded up, well maybe you got some push in time, maybe not.

In any jet engine that I know of. you already have that worst condition if you pull it back to idle. It's automatic, and I don't mean it loads up either. It's just that it's going to take time to get that power back on. You've got a built-in lag, starting from idle, that can get real deadly unless you play your cards right. How do you draw a good hand? Well, let's analyze the situation:

First, we have to remember that in a jet airplane the power response of the engine at partial power is much better than with the throttle in idle. Right there is the first good card to play. Why select a power setting that automatically puts you behind the eight-ball?

Next, and this is mighty important, you're going to draw that next card on the break. Your speed has got to be right for the particular airplane you're flying and you've got to fly it around cleanly and smoothly. Once that break is made, you've established many things to come.

At this point I advocate pulling the power off until the horn blows. Double check this with the power setting to insure that the horn doesn't blow prematurely. You've got to kill off some speed anyway. Get that warning horn blowing while you're



rolling around from peel-off to down wind, then, as your speed falls off you can dump the gear. One advantage here is that when the racket stops you know that the gear is ready for business. Of course you check the indicators too for there's no use in getting careless at this point.

After you've checked the gear, you've got adequate time to start easing on power again. I usually use between 60 and 70 percent. The amount of power you put back on is again dependent upon the speed at which you initially broke-how far out you had to go to slow down and so forth.

Once you have the power that you feel is necessary, hold it as a constant factor and plan the rest of the pattern. Keep everything right in the groove and work your way around

to final approach.

Now here's another card for that pat hand you're working up for yourself. As you come around on final, you can start to ease off slowly on the power. Normally you'll find that the power you used on downwind and base is a bit excessive for final approach, but better too much than too little. After you've got the runway lined up correctly, you'll be continually bleeding off all the way in until you finally reach the idle stop. Of course you're still carrying power down to the deck because of the inherent lag in jet engine deceleration.

What that boils down to is this: In the same way it takes time to get

thrust in a jet engine, it also requires a little time to lose that thrust once you chop it. With practice you can anticipate ahead of time and chop it a little sooner than you normally would

in a conventional engine.

Now here's another card you'd better be holding. Keep this in mind and you'll be increasing your longevity by the numbers. The biggest difference between the old World War II fighters and the airplanes we're flying now is the gross weight. The old tonnage has gone up tremendously and consequently when you put the gear and flaps down and haul that power off, your rate of descent, just from gross weight alone, is almost double that which it used to be. And in order to make a round-out at a terrific rate of sink, you need a great amount of airspeed.

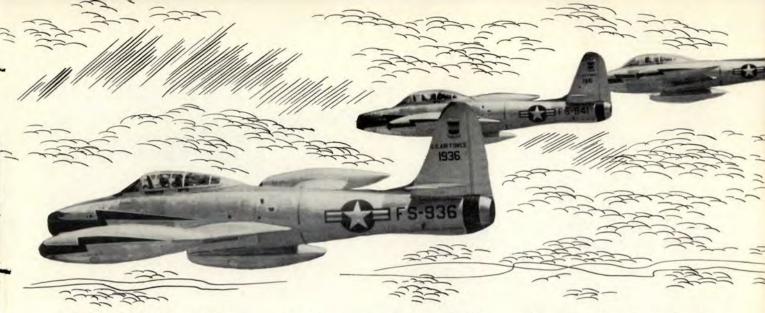
If you're planning to flatten out that glide on final approach, there's just two ways to do it-you can keep the airspeed well above stalling so that you make your flare short of the end of the runway and then coast up to it; or you can use a reasonable amount of power and maintain a nice shallow rate of descent and thereby eliminate that sharp corner where it's necessary to get the nose

up-but fast!

Getting back to the pattern business for just a moment, I find that if I play a pattern right, again comparing it with the old propeller driven airplane, I'll dump my gear and flaps down on downwind. Then I regulate my power for desired rate of descent all the way in to the end of the runway. With a properly executed pattern I never worry about losing an engine. Incidentally, in several thousand landings with jet aircraft I've never lost an engine. In any event, if that ever happens, I know that I can suck up my flaps to compensate for the power loss and still make the grade. Safely too.

Here's one more card for that pat hand you're trying to build. Draw this one and you'll be holding a royal all the way through. Accident reports show that even on short runways where individuals set up an undershoot pattern, they sometimes hit the

jackpot and overshoot.



Why? Well let's look at it this way. Take a theoretical case of a pilot attempting to crowd a modern fighter into a short strip.

He sets up a landing pattern and is trying to slap the wheels right on the end of the runway. Okay, everything is going along pretty good until he suddenly realizes that his pattern is leading to an undershoot. At this point he's in real trouble. He's waited too long to correct the situation but goes ahead and slams in full bore anyway. Unfortunately this hypothetical soul is about three steps behind the airplane and by the time he feels that he's got it made, it's too late.

He's neglected to take deceleration time into consideration and even with the throttle in idle, the old mill is still delivering push. End result? Chalk up another overshoot. In other words, you've got to lead a jet airplane all of the time. You can only get the know-how from experience. So-play it cool and get sharp.

George Welch, Senior Test Pilot

I recommend the use of power with speed brakes extended during the landing pattern. As to the amount of power, its benefits, and the type of patterns to practice, here's how I feel about the subject.

I prefer to use about 65 per cent rpm, with speed brakes extended, during the landing pattern. This gives me good control on my speed and altitude. If I don't maintain up to about 60-70 per cent rpm, the engine acceleration times becomes noticeably poorer. For instance, the time to accelerate from near idle to 100 per cent is about 16 seconds—which is much too long for safety in the event of a go-around. However, the time from 65 to 100 per cent is about five seconds, and this seems to give adequate response when I need it.

Patterns are a little difficult to define, but I generally prefer one that is a compromise between the tight pattern and the long or very loose "gooney bird" type. This appeals to me because there is less chance of



stalling out in a tight turn, and also because I don't like to be too far from the field in the pattern. However, I'd certainly recommend practicing both the tight and loose patterns since they both will be necessary under certain circumstances.

The use of power in the approach pattern is mandatory if effective wave-offs are to be accomplished. Since the engine acceleration is so long from idle, it is best to maintain reasonably high power and control airspeed by keeping gear and flaps down and controlling with the speed brakes, or attitude changes.

The approach pattern is also an important aspect in achieving a good

North American Aviation Corp.

approach and landing. If the downwind, base and approach legs are long, excess fuel will be consumed in the landing. On the other hand a tactical approach gets you on the ground rapidly and conserves fuel. However, this latter pattern calls for precision flying with little margin of error. As a consequence, routine landings should consist of a modified pattern where adequate spacing is alloted to allow for an easy approach. Keep the power up until you're close to the fence and almost ready to touchdown. If this is done you'll have it "made" every time.

It is important to practice tactical approaches so that when weather moves in or an emergency occurs, a rapid descent and landing can be made. This goes for the extended patterns that might be required at some civil or military fields.

Get to know your airplane and always keep the power up until you are certain that the landing will be accomplished safely. •

"The crash of such an airplane is a tremendous tragedy...costs run into seven figures."



Professional skill is a must for crewmembers.



Your approach to flying should...

Be Professional

Carl M. Christenson, Director of Safety, United Airlines



It was quite some time ago that Mr. C. M. Christenson, Flight Safety Engineer for United Air Lines, Inc., decided to get a lot of his safety ideas in print. FLYING SAFETY recently reviewed his article and decided that it was still very timely. As a consequence, we're reprinting it in this issue. You should give this article some serious thought. It applies to every one of us.

ET'S take a look at flying this way. You are a businessman with a million dollars invested in a business enterprise upon which 50 to 60 employees and their families depend for their livelihood. You're in the position of finding a manager for your organization. What kind of a man are you going to look for? I am sure of one thing; you will carefully check his character, ability, integrity, and loyalty as well as his enthusiasm and personality. Why? My guess is that you want to guarantee the safety of your investment, the well being, happiness and safety of your employees and the continued satisfaction of your customers. The chances are that he will be a man who has made business management a career. In other words you are looking for a top-notch man who knows his business. Such a man is hard to find. In fact, as hard to find as a good pilot.

Men of high caliber are required to handle safely and efficiently a million dollar investment in industry because the demands of the job are exacting and tough. Likewise, the caliber of a pilot in command of a one to ten million dollar airplane must be high because the demands of his job are just as exacting and tough as the manager's job and when the chips are down, sometimes those demands are a great deal more critical than similar situations on the ground.

In military flying, as in commercial aviation, the pilot of a C-54 or a C-118 is in command of a million dollar airplane. He is directly responsible for the safety of many passengers and his crew. The crash of such an airplane is a tremendous tragedy and the dollar costs can run into seven figures.

Handling the controls is but one small part of the overall job of the pilot. The art, as such, requires an extremely high degree of skill and that skill has to be maintained through practice and training. How-



ever, there are other "tools." They are just as important as the skill of handling the airplane. We could write a book on the details of the "tools" a good pilot should have at his command, however, the purpose of this short discussion is to consider the more important aspects of a good pilot's qualifications. In the order of value, according to our opinion, they are:

- Excellent health and psychological balance.
- A sound sense of stability and judgment.
- A basic knowledge of aerodynamics.
- A complete knowledge of weather and the atmosphere and the effects of terrain upon them.
- The fundamentals of the performance data and the characteristics of the airplane he flies.
- A basic knowledge of navigation and the facilities required to complete the kind of flying he will be called on to perform.
- A sound understanding of crew management and discipline.
- A love of flying and a real desire to make a career of the profession.

When we speak of judgment we approach a very serious, touchy and complicated subject among pilots. Nevertheless it is important because it simply means doing the right thing at the right time. The capacity for good judgment is not some mysterious thing that only a few people enjoy. It is a rather common attribute of a great many people. It can be developed or warped or destroyed. By continually keeping abreast of current developments, knowing himself and using tools available, any good pilot can stay proficient. He will develop great confidence in his ability and judgment. Through lack of fundamental knowledge and particularly through a failure to frequently exercise it, we can warp judgment into just plain stupidity.

All this adds up to making a career of flying. To do so is not as simple as a lot of people are inclined to believe. It is time and energy consuming and the demands are critical to the extreme. Each new aircraft design has made greater demands on the pilot, particularly in the field of judgment. As the size of an airplane increases, the size of the crew, the cargo or passenger load or the bomb

load, as well as the technical objectives of the equipment, go up. This just means that we have a bigger job to do. The responsibility and judgment required are greater because of it.

No businessman or military commander is in a position to accept any pilot who does not measure up to the high standards required of the modern professional pilot. This modern professional pilot, if he is to be successful, must be a career man. We are not speaking here of success as being measured by simply getting an airplane off the ground and back down again, but of the pilot who, day in and day out, good weather and bad, completes his trip or mission with safety and efficiency. The pilot who successfully completes a lifetime of such flying is no "small lad," but a man who can be rightfully proud of the accomplishment.

Flying a modern airplane is a full time job. It requires the undivided attention of even the best pilot. As long as a pilot has a good healthy respect for his personal limitations and the limitations of his equipment, he will seldom get into serious trouble. But it takes a lot of tough,

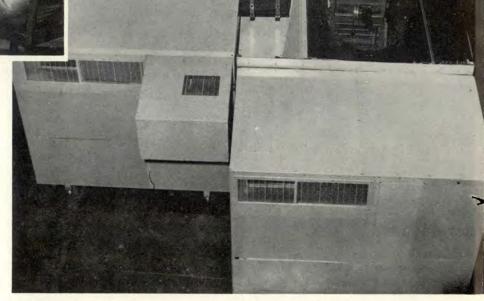


hard work to elevate these limitations to a point where he can get the most out of the airplane and do it safely.

By this we mean there are a lot of pilots who can fly an airplane from one point to another and get by with it, but, in so doing, safety and economy can be seriously jeopardized if that pilot doesn't know his business. That doesn't mean that the simple act of flying isn't done properly, but to get performance, efficiency and safety out of a particular flight, it takes more than just handling the controls. It takes planning, anticipation and full command of the tools of the profession. Modern flying is big business, be it military or commercial. The professional pilot can no longer afford the luxury of not accepting the full responsibility of the job.

All of these things enter into one of the most important phases of our job... SAFETY! They enter flight safety because the human element enters into every accident. This means that the pilot, as a professional man, must take into consideration all those things that could some day be contributing factors to an accident.

In every accident there are two important factors — the machine and the man. True, there are equipment failures which will cause disaster irrespective of the qualifications of the men involved. However, in the great majority of cases, both elements are involved in varying degrees. No accident is the result of any one single



"By continually keeping abreast of current developments, knowing himself and using tools available, any good pilot can stay proficient, develop confidence in ability and judgment."

factor. Such accidents are the results of combinations, which compound to eventually exceed the ability of the pilot and crew.

We have learned the hard way that the critical element of safety is exposure to the known contributing factors of our accident history. A constant watch must be followed religiously of all known contributing factors, and remedies applied before those factors multiply into the kind of a situation that ends in the death of a passenger or crew member. This is true for both military and commercial flying. The difference between a major and a fatal accident is more or less chance. And the margin is slim.

To achieve genuine *safety* we must have teamwork. That begins with

supplying good, well maintained airplanes for the highly trained, conscientious pilot to fly. It continues only by maintaining the standards we know to be necessary. If every component part of an airplane would function all of the time, as it was designed, we would probably cut our accident rate down quite a bit. If we could maintain an airplane to absolute perfection, the rate would drop still lower. If the weather was CAVU all of the time, we could whittle it still more. And, if pilots and crew members never made a bad decision or mistake, well, then our rate would be to an almost absolute zero.

Okay, so that's an impossibility you say. Maybe you're right, but, we can keep right on trying. Remem-



"Each new aircraft design has made greater demands on the pilot, particularly in his judgment. As sizes increase... technical objectives increase."

ber, the honest and sincere endeavor on our part can never be "love's labor lost!"

Our business requires that we translate safe thinking into action. How? First, we can ignore the problem or meet it head on. Accidents are not accidental. They happen because somewhere along the line someone has failed to do a job. Teamwork is basic and all good teams must be trained and properly managed or they break down in the clutch. It is the little things that count and no one thing is too small to ignore. All "little things" if neglected will grow into big things, and more particularly, the neglect of little things can soon create an attitude that will in time develop into sheer carelessness.

Secondly, we must train, educate and provide an incentive for all personnel. In this business of flying, a pilot, if he is to be a safe pilot, can never grow too old to learn or train. There is a great tendency to let down periodically during our career. It is a serious mistake, but it does happen.

It is in this field that demonstrated supervisory or command interest in safety can do the most good for both the pilot and the industry or service. The pilot who is the career man can slide with time, just as far as a commander or his supervisor will allow.

On the commercial airline it is the Flight Manager and his assistants who give periodic hood and route checks. They perform the very vital function of maintaining pilot interest and proficiency. Within the structure of the military, it is the IP and other supervisory personnel who are charged with keeping pilots at peak proficiency. Here again it is the little things that count.

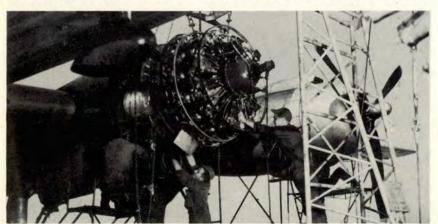
"Creeping Habit" is by far the most critical and insidious thing we have to watch. It is very easy to deviate from good, practical procedures by neglecting minor phases of procedure and thereby giving rise to the new and sometimes dangerous habits that manage to sneak up on most of us. Little deviations creep into practices without our knowing what is going on. When these minor deviations start, they must be nipped in the bud. But, nipping without explanation or logical correction can destroy confidence in any effort along this line.

Thirdly, the team as a whole must know the rules of the game. A good team or team member cannot remain good by constantly changing the rules, particularly the rules of good practice. Stable rules of the game mean continued good teamwork.

In closing let me say that as both a pilot and as a part of management, the future of aviation is probably the brightest spot in the field of transportation. Any man who chooses a career as a professional pilot has an unlimited and brilliant life ahead of him. I am proud of being a member of this great team, but more than that I find that the men and women in this business of flying are the finest group to be found anywhere.

Ours is the youngest of professions and with us rests the great responsibility of carrying human beings and cargo to all corners of the earth. And in peace and during war we carry the burden of protecting our homes and our country.

"To achieve genuine safety we must have teamwork—begin with well maintained airplanes."





ACH flight crewmember should have a personal copy of the Flight Handbook and should take the responsibility for securing one

responsibility for securing one.

The new Flight Handbook (dash one Technical Order) has many and extensive changes. A great deal of effort has been expended to provide flying personnel with the kind of operating data they want and need. A look at the factors involved should convince all crewmembers that they are missing a good bet by not getting a personal copy and making sure they get the latest revisions.

AFR 5-13 issued in August, 1953, distinctly states that personal copies are authorized for each crewmember, other than administrative. This copy may be retained by the crewmember as long as he is attached to the issuing

base. However, he must turn it in upon leaving the base and draw a new one at his next base. Each base should develop a system of feeding these books to its flight crewmembers so that each will have the latest data. Some bases have found that the local Flight Standardization Board is an excellent agency for controlling the distribution. Other bases should develop whatever system is best suited to their operation.

The new Flight Handbook is easily distinguishable from the old. The new one has a full page illustration on the cover and consists of exactly nine sections and an appendix; the old had only a "spot" shot on the cover and a varying number of sections.

Preparation of the handbook is extensive and thorough. Initially, it

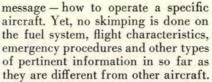
is prepared by the aircraft manufacturer in accordance with specific requirements established by the USAF. After the aircraft is in use for a while (usually a year and never more than two) a handbook review is held. Representatives from each command using the aircraft attend this conference. Each member of the review team has two or three weeks to study and mark his draft copy of the book before the conference is held at the contractor's plant. The book is discussed page by page and the final results reflect the best opinions of the people flying the aircraft, the company that built it, the engineers who designed it and the Air Force engineers who have been assigned the responsibility of making sure every need is satisfied. The book is easy to

read because it is arranged for maximum convenience of reading and locating material. Any given question can be answered by referring to one paragraph without the necessity of digging through a lengthy discussion

of a whole system.

Not only is the information well arranged but it is the straight scoop. The new book concentrates on telling the user all about one specific aircraft and particularly on what makes it different from others. However, the book does not include a complete set of operating instructions for highly specialized equipment such as radar or bombsights. If it contained all that information it would be too bulky to be practical. The book contains one

"A representative of each command using the aircraft has time to study and mark draft copy before the conference."



The diagrams and text are designed so that they are understood easily by non-technical people. A full section is devoted to the limitations of the aircraft; another section covers theory of operation and peculiarities of new or unusual systems; and another is devoted entirely to the flight characteristics of the aircraft.

While using the old book, many flying personnel complained that changes or supplements were always late and sometimes not received at all. The new program seems to have this problem whipped. It provides for Safety of Flight Supplements to be issued as integral parts of the Flight Handbooks.

There are two types of supplements:

1. Interim. A TWX sent out within 48 hours, used only when loss of life is involved.

2. Formal. A distinctive sheet of paper, bearing bold, red printing indicating that the supplement concerns safety of flight. This type is used when serious damage to aircraft is involved and is issued within six working days. The formal is used also to replace the interim as soon as possible. Supplements will not be used to cover information that simply improves efficiency of operation.

These supplements have the same number as the basic handbook with the addition of a suffix letter. The suffix letters are assigned in alphabetical order from C to Z, except for I, and O. A and B are reserved for confidential and secret, respectively. If the complete alphabet is exhausted, AA, BB, CC, and so on will be used. When the flight safety data are applicable to two or more Flight Handbooks, individual Safety of Flight Supplements will be issued to each handbook.

The title page of each Flight Handbook includes a list of all outstanding and currently replaced supplements. For example, one of the books might read: "This book is not complete without Safety of Flight Supplements 01-32 BAA-1R, T and W.'

Re-issues include the list in the following manner: "This publication replaces 01-27FAA-1, dated 7 February 1953 and supplements thereto: C-G and K-M. Supplements H-J remain active as well as any new ones

issued subsequent to M."

Revisions state: "This publication replaces supplements 01-47CAA-1F, K-P and T. Supplements G-H, and Q-S remain active as well as any new ones issued subsequent to T." If there are no supplements, the title pages read: "This book was complete at time of issue since there were no outstanding Safety of Flight Supplements."

It is the responsibility of the recipient of each Flight Handbook to keep the printed list current. T. O. 00-5-1 instructs that the number of each new supplement be entered on the title page of its respective hand-

book as it is received.

There should be no difficulties encountered in securing the handbooks, which are distributed through the tech order system. Frequently, however, base personnel do not take the few, simple steps that are required to make this system work. T. O. 00-5-2 explains the easy means by which the automatic machinery is set in motion. Actually, all that is necessary is to reflect the required quantities on the Publications Requirement Table, T. O. 00-3-1, and all the revisions, reissues and supplements will be forwarded automatically. It is the duty of the base supply officer to fulfill all tech order requests.

The originators of this book have tried to cover every possible consideration of the flight operating instructions problem. However, some new or special problems may arise. If so, users should call, write or visit the following address for the answer to

their problem:

Commander Wright Air Development Center ATTn: WCOSS-5 Wright-Patterson AFB, Ohio.



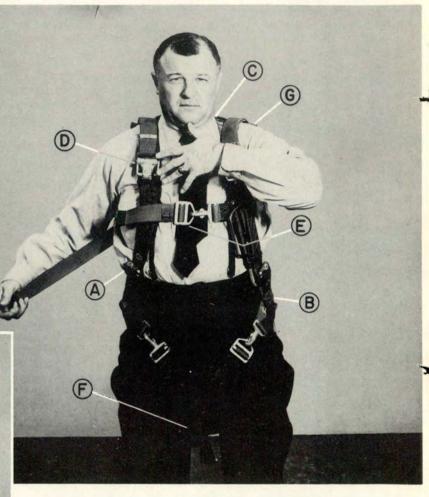


Above, wrong fit. Cross straps too low on back, canopy release riding high on shoulders.

Below, right fit. Cross straps meet slightly above shoulder blades, preventing slippage.



If the CHUTE fits...



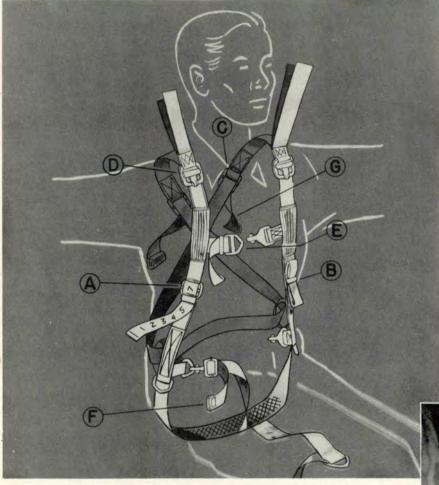
Steps in Fitting Your Class III Harness

A. Prefit your harness to your sling length by setting to proper number.

Set the index number by turning the quick-fit adapter on the sling 90 degrees to the webbing and pull until your number shows.

Height	Index Number
Up to 5' 6"	7
5' 6" to 6' 0"	6
Over 6' 0"	5

B. Tuck excess webbing into elastic keepers. Loosen back straps to insure that you will be able to get sling under buttocks. It is possible to fall out of a Class III harness during bailout if it is not fitted properly. Adjustments for individual fit are made easily. Always play it safe and be sure that your parachute fits you.



- C. Put the harness on. Fasten the chest and leg straps. Tighten the leg straps in back.
- D. Canopy release should be below collarbone. If it is any place else, your harness is not adjusted properly. Loosen back strap again. Reset index number and retighten back strap.
- E. Slide chest strap up or down the sling to the proper distance below your chin. (12" below chin.)
- F. Tighten leg straps by pulling down on loose ends.
- G. Adjust and tighten chest straps.
 - After fitting, loosen leg and chest straps by merely turning the quick-fit hardware 90° and pulling gently, making yourself comfortable. Tightening again requires only a few seconds.
 - The Class III harness will fit men 5' 2" and 110 pounds to men 6' 4" and 240 pounds wearing heavy Arctic clothing.

FOLLOWED the ejection procedures and everything went as I expected with the exception of the harness of my parachute. First, I jettisoned the canopy; then I lifted the arm rests and pulled the trigger without hesitation. After kicking clear of the seat I was falling toward the ground upside down and head first. This was my position when I pulled the ripcord. I lost my left shoulder strap and only retained the right one because I had held it with my left hand in anticipation of the opening shock.

"I feel that pilots should be better informed on proper fit of the

chute . . ."

The above statement was made by a pilot who knows how important the parachute—its proper fit and use—can be. This particular pilot was lucky. Others have not been so lucky because they did not pay attention to the details of fitting the harness.

There have been cases of pilots falling out of their chutes during a bailout. This sort of mishap is not restricted to jet pilots. In other words it is not necessarily the violence of the opening shock alone that causes such accidents but rather the fit of the chute.

Below, note harness modified in accordance with the tech order. A piece of triangular, reinforced cloth helps hold straps in position.



Shown below, the first two steps in operating the canopy release. Clasp the safety clip between the thumb and index finger, pull out, down.

Next, squeeze both buttons and rotate the latch arm out and down. This releases canopy while retaining harness and attached equipment.











Above, canopy release is closed, safetied. Below, closed canopy release is unsafetied.



Below, opened canopy release. As hardware disconnects, canopy comes free from harness.



The pilots encountering this difficulty were wearing the Class III harness. The adjustment of the Class III as quoted in T. O. 13-5-1 is not difficult. In fact anyone can adjust any USAF harness if he knows its design features. Proper fit, however, depends on knowing how a harness should look and feel, as well as how it adjusts.

All USAF parachute harnesses are built much the same way. Each starts as a loop of webbing called the sling, both ends of which are attached to the parachute suspension lines. The sling is designed to take the greater part of opening shock.

If the position of the body during bailout could always be controlled, nothing but the sling would be needed for a safe jump. However, the sling will not stay on by itself and other straps are needed for the harness. The only purpose of these straps is to keep the user from falling out of the harness. To accomplish this, the straps must be adjusted.

The Class III harness is designed to be put on quickly, and adjusted solely by the wearer. Webbing, though 20 per cent stronger, has been reduced in weight for more comfort, and the hardware has been redesigned for minimum size. In addition, the harness is equipped with canopy releases. The canopy may be released without losing the harness or any emergency equipment attached to it.

This canopy release replaces the shoulder adapters on the older harnesses, and thus connects the canopy and risers to the harness. The purpose of the canopy release is the same as that of the older quick-release box—to prevent high winds from dragging its user on land or in water.

The release should be in a locked and safetied position when the harness is drawn for use. To inspect the releases, make sure the safety clips are snapped closed and check for possible mechanical damage to the safety clips or release arms from careless handling. The releases should never be actuated until the ground is reached. Then, if the user is being dragged, he can release the canopy. For water jumps, the user should place his hands on the safety clip about 1000 feet above the surface. The release must not be activated until the feet contact the water

T. O. 20B-5A-21 provides the user of the Class III harness with some additional insurance. This T. O. provides for modification of the harness to help prevent slippage of the straps from the shoulders. It calls for a triangular fabric section to be installed on the diagonal back straps of the harness. However, this modification does not replace the necessity for getting a good fit and adjustment of the harness.

This harness is made for comfort and safety, but it is up to the individual user to make sure that he gets the maximum benefits of all the safety features.



PILOTS frequently complain that the widths of the courses of one range are too great, while those of another are too narrow. Neither has a true or measurable course width.

The so-called "on course" is truly a point along a line in space. As you are aware, a line has no width. The apparent three degrees course width is the result of aural phenomena and the inability of the pilot to hold his aircraft perfectly stable in space with the result that an average deviation of one and one-half degrees, plus or minus, is required before the pilot notes a change.

Low frequency radio ranges commonly are thought to produce legs or beams, having an angular width of three degrees. That is a fallacy. The "on course" signals are found at points in space where signals of equal strength are received from separate transmitting antennas at the range station. These "on course" signals may be proved graphically to be along lines tangent to fields of radiation from those antennas. The true "on course" does not have a measurable width.

The apparent three degrees course width is created primarily by the human ear. The ear detects changes in sound levels at a logarithmic rate. Thus, a fairly large change in the sound level is required before the change is detected by the ear. It has been established that the smallest sound-level change noticeable by the average human ear is one decibel. That means that the power level of the audio signal must be increased by a ratio of 1:25 before the average ear can detect any change.

The ear creates the so-called three degrees width of "on course" signals of radio ranges because of its insensitivity to the small changes in the sound level of those signals when the aircraft drifts back and forth across the true "on course." This phenomena is proved quickly by connecting an audio output meter, having an undamped movement, to the receiver and noting that the meter registers sound level changes al-

though the ear still indicates to the pilot that he is "on course."

When the range legs are so adjusted that there is a 90-degree separation between all adjacent legs, the "on course" appears to be broadly defined. However, when the angular spacing between adjacent legs is reduced to less than 90°, the apparent "on course" becomes sharper and more care is required to hold the aircraft "on the beam." The reason for the latter condition is that the sound level changes at a more rapid rate for a given angular displacement of the aircraft.

The "on course" signal of an Adcock or SRA type range is produced by the heterodyning, or aural beating, of two radio transmitters having a frequency difference of 1020 cycles per second. (This heterodyne is similar to the "whistling" that sometimes can be heard when one broadcast station interferes with another.)

One of the range transmitters is continuously energizing an antenna that radiates a non-directional pattern. The output of the second transmitter is alternately keyed or transferred from one set of towers to a similar set. At a given moment in time, this second transmitter radiates a bi-directional signal. The direction of this radiation is alternately switched by a mechanism which transfers its power to the other set of towers. The "on course" appears at points in space along lines tangent to the fields of radiation of these alternate sets of towers. Thus, when the pilot hears the "on course," he actually is hearing the audio product of two heterodyning transmitters, and the antenna system of one is being rapidly alternated.

This antenna switching creates a little known kink that may be used to advantage by the pilot. The output of the range transmitter (as distinguished from the "broadcast" or non-directional transmitter) physically is disconnected from both sets of towers during the switching interval. Thus, for a fraction of a second, there is actually no heterodyne or audio signal from the receiver.

If an aircraft is precisely centered "on the beam" a weakly discernible "plucking" sound can be heard. This sound is caused by the antenna switching during the formation of the code characters for the "A" and "N."

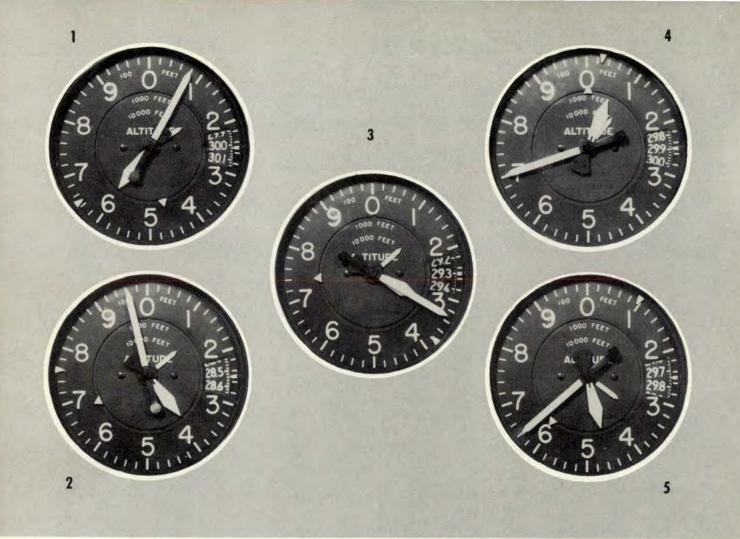
The "on course" is, of course, the point in space where the "A" and "N" signal strengths are identical and the characters thus blend into an apparently steady tone. It is not a steady tone. There are brief interruptions in that tone because of the antenna switching. This "plucking" may be found only dead-center in the "on course" since any movement of the aircraft towards either the "A" or "N" quadrant immediately causes an increase in the sound level of the signal in that quadrant. This increased signal level masks the diminishing level of the adjacent quadrant; thus the other signal starts to fade out.

A pilot can split the "beam" by flying his aircraft so that he constantly hears the faint plucking of the code letter "X" which is formed by the blending of the "A" and "N" characters in the true center of the apparent "on course." This sound appears there, and only there.

The ease with which this "plucking" may be detected depends upon the mechanic at the range station. The antenna switching is accom-plished by a mechanical device called the link circuit relay. This same relay produces key clicks when its contacts are dirty or pitted and thus produce small arcs as the relay transfers the output of the transmitter from one set of towers to the other. The spacing between those contacts, however, governs the period of time and audibility, when neither set of towers is energized and thus no beat occurs between the two transmitters and the 1020 cps tone is not heard by the pilot. If the relay contact spacing is increased, the no signal period is increased and vice versa.

So remember, for accurate beam flying, a pilot must stick as closely as possible to "a line in space."





READ IT and KNOW!

Reading an altimeter ought to be as easy as telling time, but is it? Studies by the Aero Medical Laboratory show that at certain settings, the three-pointer altimeter is particularly susceptible to readings of 1000-10,000 feet too high.

This is most likely to occur when the sensitive pointer is approaching zero on the scale. If a pilot misreads his altimeter by a wide margin the results are obvious. And recent accidents prove how easy it is to do just that. Don't be a statistic. Be sure you know how to read your altimeter correctly.



A LL too often, the altimeter is the neglected step-child in an instrument panel. Too many pilots give it a cursory glance in their panel

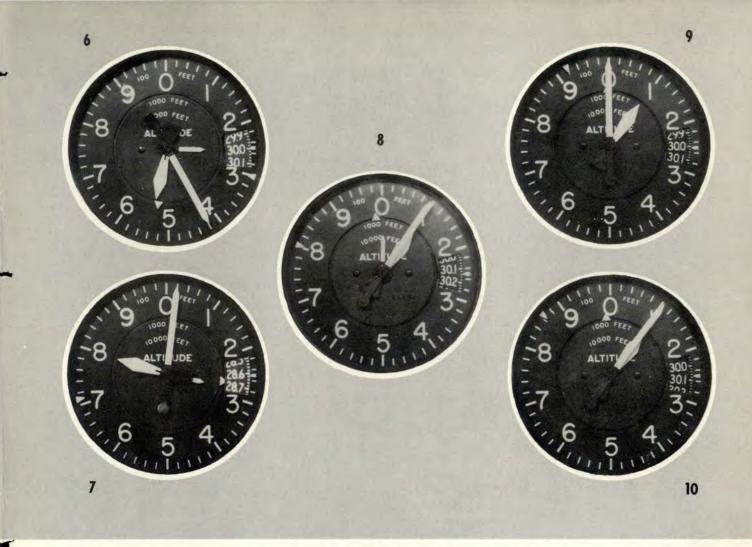
cross-check and then don't bother to be sure they read it correctly. The dangers of misreading the altimeter came out clearly in a series of studies by the USAF Aero Medical Laboratory at Wright-Patterson Air Force Base.

Two investigators, Fitts and Jones, asked several hundred pilots to tell about accidents or near accidents resulting from misreading the instruments. From these verbatim pilots' reports many helpful leads were obtained as to how aircraft instruments can be improved. One of the most surprising and significant findings, in adding up the results, was the number of pilots who reported difficulties in reading the altimeter. In fact, more pilots reported difficulty in reading the altimeter than any other instrument.

The following pilots' reports are

"It was an extremely dark night. My copilot was at the controls. I gave him instructions to take the plane, a B-25, into the traffic pattern and land. He began letting down from an altitude of 4,000 feet. At 1,000 feet above the ground, I expected him to level off. Instead, he kept right on letting down until I finally had to take over. His trouble was that he had misread the altimeter by 1,000 feet. This incident might seem extremely stupid, but it was not the first time that I have seen it happen. More than one pilot isn't around today because he read his altimeter wrong while letting down on a dark

"A pilot of my bomber group was making practice night landings in a



This is a reprint of an article that deals with a vital subject. The altimeter can be misread! Try the test on these pages and then compare your answers with those on following page.

B-29. The traffic pattern was to be 2500 feet. The field elevation was 1000 feet. The pilot misread the altimeter and was actually 1000 feet lower on his traffic pattern than he thought he was. He went through his landing procedure, had his wheels down, flaps 30 degrees and was on his final approach. Before he realized what had happened, he flew into the ground about one and one-half miles short of the runway. Luckily he hit in an open field, bounced and managed to maintain flying speed. The main gear withstood the impact but the nosewheel was ruined. By expert piloting, he made a safe landing and averted what could easily have been a disaster."

It will be noted that in both cases the pilot was exactly 1000 feet lower than he thought. In other words, he read the altimeter 1000 feet too high. In this study all the pilots lived to tell about their errors, but in how many similar cases were the pilots less fortunate? Flight plans call for 1000-foot clearance over the highest terrain en route (2000 feet over mountainous areas). Under the stress of rough air and instrument conditions the pilot may read the altimeter 1000 feet too high and reduce his terrain clearance to zero.

The 2000-foot clearance assumed on IFR flights over mountains could be lost by a combination of misreading the altimeter 1000 feet and by wrong altimeter settings or effect of orographic lifting on the density of the air.

If more of the facts were known, we would probably find that many of the mysterious collisions with mountain peaks, or landings short of the runway, were caused by altimeter reading errors. The Air Force has had no monopoly on this type of accident, and a number of airline crashes similarly cast suspicion on the altimeter.

Several years ago an airline DC-4 crashed into a mountain while letting down on an ATC approved altitude change. The flight had been cleared by Airway Traffic Control for descent from 7000 to 2500 feet, and was to report leaving each 1000-foot altitude level. Approximately three minutes after reporting leaving the 3000-foot level, with no report of having left the 2000-foot level, the aircraft struck the mountain ridge at 1425 feet. In all probability the pilot, who was thoroughly familiar with the route, had mistaken his altitude when he reported leaving the 3000-foot level.

Shortly after this, a commercial C-46 crashed on a western mountain, at an elevation of 1890 feet, while making an instrument approach to Lockheed Airport at Burbank. The CAA Instrument Approach procedure called for an altitude of almost exactly 1000 feet higher at this stage of the approach, and the pilot was well acquainted with the approach procedure. A 1000-foot error in reading the altimeter provides the most plausible explanation of why the pilot descended below the authorized altitude.

A follow-up study at the Aero Med Lab by the author cast further light on pilots' difficulties in reading the altimeter. Nine experimental instruments, suitable for presenting altitude, were tested. Included was the present three-pointer altimeter. Results for 97 USAF pilots on three of the more interesting instruments are shown in Fig 1. It will be noted that for the conventional threepointer altimeter 11.7 per cent of all readings were in error by 1000 feet or more.

A further analysis of the data showed that at certain settings, the three-pointer altimeter is particularly susceptible to reading 1000 feet too high. This is most likely to occur when the sensitive pointer is approaching zero on the scale, as shown in Fig 2. On the particular setting shown, 11 out of the 97 pilots erroneously read the setting as 14,960 feet.

Why are these 1000-foot errors made?

Fig. 2. Eleven of 97 pilots read this wrong.





true settings. 11.7% of the 1164

> readings were 1000 ft. or more off from true settings.

Average interpretation time was 7.1 seconds per reading.

true settings.

0.7% of the 1164 readings were 1000 ft. or more off from the true settings.

Average interpretation time was 1.7 seconds per reading.

0.6% of the 1164 readings by 97 pilots

0.6% of the 1164 readings were 100 ft. or more off from the true settings.

0.4% of the 1164 readings were 1000 ft. or more off from the true settings.

Average interpretation time was a fraction of a second.

At 20,000 feet, with a 5200 fpm rate of descent at 350 mph, a pilot will lose 600 feet of altitude and cover over a half mile laterally while reading his altimeter in 7.1 seconds.

Fig. 1. The results of 97 USAF pilots making 12 readings on each instrument are shown above.

In the first place, the sensitive 100 foot pointer makes one revolution for every 1000-foot change in altitude. Therefore, if only the 1000-foot pointer is read carefully, the reading is likely to be off by some multiple of 1000 feet.

The second source of error is illustrated in Fig 2. The 1000-foot pointer is pointing to the 4 on the scale, but to read the setting correctly, it must be read as 3 or 3000 feet. The error comes from reading the 1000-foot pointer to the nearest number, when it should be read to the next lower number.

This apparently is the most hazardous type of error that pilots make in flight, particularly while letting down under instrument conditions. Some of our unexplained collisions with mountain tops could easily have happened in this way.

From still other studies by Fitts, Jones and Milton, of the pilots eye movements during instrument flying, it is known that pilots spend an average of about four-tenths of a second each time they check their altimeter. Compare this with the time it took for actual quantitative reading of this instrument as shown in Fig 1. When pilots are on instruments, the hasty four-tenths-of-a-second look at the altimeter is not long enough to read this complicated instrument.

As a result of these studies of errors in reading altitude, the Air Force has a new altimeter under development. It will use the indicating principle of the center instrument in Fig 1, namely a combination of a sensitive pointer and a counter. The counter gives altitude in thousands of feet. The pointer, as on the present instrument, adds the hundreds. Instead of the counter window being at the top, as in Fig 1, it will be at the left side. To provide this new type of presentation, a new instrument mechanism must be developed and thoroughly proved.

Until an improved altimeter is developed in quantity, a matter of several years at best, pilots should be on guard against the hazard of misreading the present three-pointer instrument. The greatest danger is in reading the altimeter too high by either 1000 or 10,000 ft. When letting down on dark nights and under instrument conditions...read it right.

QUIZ ANSWERS

116,080	625,420
213,960	728,020
313,330	81100
410,700	911,000
534.640	1011,100



-SPARE THE SPACEMAN

-

NE thing about scientists—they're always thinking. And all this high-I.Q. mulling results in some very handy devices. Things like immersion suits, radar and APC tablets keep rolling out of the laboratories.

Recently science, in the person of Dr. Fritz Haber, has been considering a new problem—escape and survival at high altitude. No handy devices have been invented to cope with high altitude bailout, but apparently a lot of thinking has been done.

The thinking started with a fascinating fictitious situation. You are flying one of tomorrow's supersonic rocket planes, tooling along at 60 miles above the ground. An explosion shatters the eerie silence inside the cabin. The aircraft is rocking crazily, out of control. What do you do next?

Well, in a World War II propellerdriven crate, maybe 10,000 feet up, you'd have climbed over the side and hit the silk. In a circa 1954 jet, say at 40,000 feet, you'd have squeezed a trigger that tossed you out of the cockpit, then waited serenely until an automatic gadget opened your chute for you at a safe altitude. But this won't do at 300,000 feet when you're traveling 10 times the speed of sound.

Not that you'd have any trouble getting out of the aircraft. Dynamic pressure of the air itself decreases as you go up. The very factor that permits a rocket to attain such speed at great heights will allow you to leap over the side. But then how do you get down to earth?

First of all, you'll need some kind of suit or capsule to supply pressure and oxygen. You won't be able to breathe unassisted or stand the temperature of your own body until you reach the denser air far down below. (Remember that above 63,000 feet the air pressure is negligible, and your blood will boil at normal body temperature.) It therefore seems likely you will wish to reach denser air without further ado. How about free-falling in your capsule down to about 20,000 feet, where an automatic chute opens?

Unfortunately, this is not as good as it sounds. In a free fall from 60 miles straight up, without any appreciable air pressure to brake it, a body plummets faster and faster until, like the rocket it just left, it attains a velocity several times the speed of sound. Now the speed itself doesn't hurt you. But when you hit the earth's cushion of dense air at about 100,000 feet, you throttle back to around 120 mph. This deceleration in our hypothetical case would resemble the shock of belly-flopping into a swimming pool, except magnified many times. If you come charging into this heavier air from well out in space, the impact could run as high as 300 G. Quite a crash!

With that little capsule equipped to travel slowly down to 100,000 feet, dive gently into the denser air surrounding the earth and then float you to the ground, everything would be dandy. With a peanut butter sandwich and a good book in your pocket, it might even be a relaxing pause in the day's business.

But there's still another problem. When you bailed out of your rocket you were moving horizontally at a clip in the neighborhood of 6000 mph. Before you reach the ground from a height of 60 miles, you will have traveled about 250 miles beyond the spot where you bailed out. If you happened to be passing over Syracuse, heading for New York City, you'd come down 50 miles offshore in the Atlantic. This may make it a little rough for Air Rescue to fetch you home.

Well, as yet no one has invented a self-braking capsule for this kind of fall through space. Dr. Haber, who made some complicated calculations and came up with the conclusions mentioned here, has compiled his studies into a project report just published by the Air Force School of Aviation Medicine at Randolph Field. Title: Escape and Survival at High Altitude. Until recently a member of the School's department of Space Medicine, Dr. Haber is now a practicing engineer in Baltimore and accustomed to conjecturing on problems of this sort.

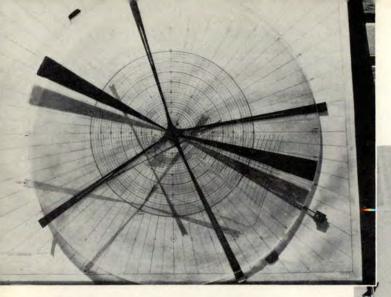
With one thing and another—although Dr. Haber doesn't say so—your best bet in this situation very likely would be to ride your wounded rocket down to 40,000 feet before you leave it. Provided there's something left of it to ride.

However, by the time you get around to filing a clearance to cruise at 60 miles altitude and 6000 mph, that cozy capsule or some other protective device no doubt will have come out of the laboratories. Something that will allow you to bail out up there, and survive.



ATMOSPHERE PROCEED WITH CAUTION

EARTH 19 MILES



Left, The Universal Radio Aids Navigation Board can be used to brief and teach pilots Omnirange procedures, to set up beam bearings for ILAS, GCA or radio compass. Below, the authors use a Hi-Speed table and board during an Omnirange Link exercise.



The instructor's standard C-8 Link direction indicator modified to become an Omni Resolver Simulator, This is used to help simulate Omni range approaches and cross countries.

Link cockpit with dual-dial A/S indicator.



OLD LINK...) NEW LOOK

By M/Sgt Paul H. Woods and T/Sgt Merritt Hickman Instrument Training Branch Edwards AFB, Calif.

With the Civil Aeronautics Administration placing development emphasis on Omnirange, and the cessation of low frequency four-leg ranges wherever possible throughout the INSAC system, familiarity, training and transition on Omnirange navigation and letdown procedures become increasingly important to USAF pilots.

The USAF is converting steadily to Omnirange in many aircraft, notably in the new B-25 modification program, and although Omni is simple to operate, and simpler to understand, it must be seen in action to be appreciated. A good place to initiate pilots on proper use of Omnirange is in the flight simulator.

M/Sgt Woods and T/Sgt Hickman have succeeded in modifying the C-8 and the ANT-18 Link Trainers to simulate Omnirange navigation. They believe their modifications and innovations can save the USAF both defense dollars and training time. These modifications require no special training for the operator, and because the main feature of the C-8 Omnirange system is its simplicity, hundreds of hours of training time have been logged without a single malfunction.

Their Omnirange board is an excellent visual training aid for use with any type instrument trainer. It can be used in classrooms or for individual briefing of pilots before and after flying an exercise. It demonstrates clearly the different flight paths in respect to selected bearings and terrain features as well as showing the sensitivity and directional qualities of the course indicator.

FLYING SAFETY



The Hi-Speed table top covered with standard USAF sectional charts under plexiglas. These charts cover the entire West Coast and can be used for any given cross-country problem.

WE designed our Universal Radio Aids Board and Omnirange addition for the C-8 and ANT-18 Link Trainers to bridge a definite gap in our training facilities. We asked pilots what they thought was needed and designed the equipment to meet requirements and requests suggested by men experienced in instrument flying and radio navigation.

The board combines low frequency range, ILS, GCA, radio compass and Omnirange patterns. With it there is a limited cross-country chart that can be drawn to scale for certain congested areas providing maximum instrument and navigation procedures. The board dimensions are 48 inches x 36 inches x 3/16 inches. It is made of Masonite with a standard radio compass QDM chart mounted on it. Pieces of circular plexiglas with a three-foot diameter are mounted on a shaft or pivot in the center of the board. By drilling only half way through the top sheet it is possible to have a smooth surface over the radio station. Four low frequency beams, interposed between the two plexiglas sheets are connected to the center shaft and are free to be rotated to any course. The beams have a center slit for accurate alignment on the compass rose; the station-to-field bearing and fan markers can be plotted on the glass with a grease pencil.

On the bottom piece of the circular plexiglas we etched the standard visual beam of the VAR and VOR. This two-course beam is approximately 20 degrees wide from the edge of the blue to the edge of the yellow markings on the ID-48 indicator in the C-8 trainer. This is also the approximate width of the Omnirange bearing sensitivity for the same ID-48. We used it further as the standard ILAS localizer beam by scaling it down for the two and one-half degrees color indication from the center position of the localizer needle. A calibrated glidepath is marked off on the beam so that in conjunction with the altimeter, mounted on top of the recorder, the standard ILAS glidepath or GCA glidepath can be transmitted either visually or aurally to the pilot.

This circular disc is rotated to any approach bearing selected for ILAS, GCA, VAR or Omnirange approaches. The top disc is locked stationary so that any movement of the bottom when selecting courses will not disturb the relative position or progress of the flight recorder. The top disc can be taken off easily so that low frequency range legs may be removed or replaced as desired.

During Omnirange problems, an automatic radio compass bearing transmitter is aligned on the transmitting station to simulate Omni bearings to the Radio Magnetic Indicator or a VHF compass and for low frequency radio compass work.

The basic requirement for the Omnirange addition was accomplished by the installation of the necessary functions on the instrument panel. This includes the TO-FROM indicator and the Omni Bearing Selector. The third component, the ID-48 indicator (the standard cross pointer ILAS indicator) is used as is; the basic principle of flying the Omnirange with this instrument is the same as with the USAF version of the new cross-pointer instrument, the ID-249 indicator. On the ID-48 instrument, the localizer needle is directional as long as the pilot makes sure that his magnetic heading is within 90 degrees of the Omni bearing selected.

The TO-FROM indicator is a small electro-magnet and mechanical arm which moves the indicator "To" or "From" when energized. In the deenergized position of the relay the "To" is in view as this is the position indicated longest on a flight to a station. The indicator is mounted directly above the Omni Bearing Selector in a window cut out of the plate that mounts the selector. This selector consists of the radio compass bearing transmitter, the compass rose knob being operated by the pilot and the selected bearing indicated on the receiver teletorque in view of the instructor.

The Omni Resolver is an instrument designed to tell the link instructor exactly which BLUE-YELLOW or TO-FROM signals to give the pilot at all times. No matter how complex the changing situation may become, the output is clear and readable to the instructor. This instrument combines the receiver indications from the pilot's Omni Bearing Selector and the instructor's input of magnetic bearing to the station, which are referred to a set of wing-tips representing both the BLUE-YELLOW and the TO-FROM situations.

C-8 Modification for Hi-Speed Problems

We made several modifications to the C-8 link trainer to simulate high speed navigational flights. No attempt was made to simulate jet engine operation but the actual planning necessary for jet navigational flights is present in the modified trainer.

We replaced the trainer desk with a large table top measuring eight feet by six feet, which stands 31½ inches high. The table top is covered with standard USAF sectional charts under plexiglas. These charts cover the entire west coast of the United States. Actually all types or sizes of training charts can be used as there is plenty of room for two or more charts which



RADIO AIDS TERRAIN MAP

Sgts. Woods and Hickman believe that sometimes the longer way around may prove to be the shortest distance between two points, at least when it provides a wider margin of flying safety. To prove their point they have designed and built a projection terrain map of the local and surrounding Southern California area. They have found that this map is an effective training aid to present a panorama of this locale to new or TDY pilots assigned to Edwards Air Force Base.

They state, "This map takes the place of many words and much imagining. Terrain flying, in this area, requires continuous flight planning and caution, and combined with weather, the problem is doubled. The terminal area in the Los Angeles-Riverside vicinity is a triple threat in instrument weather during the winter months when violent Pacific storms move inland. The rest of the year has ideal VFR conditions except for some coastal fog and a pilot might tend to get careless. Then, when a heavy storm moves into the area, all heaven breaks loose.

"The venturi effect of winds in the Cajon and Beaumont passes sometimes reaches planes flying as high as 18,000 feet. Combined with possible altimeter errors this severe turbulence plus icing could mean bad trouble for

any pilot.

"Our map, designed to allow a pilot to learn the area the easy way, is scaled approximately four inches to the mile and has a vertical scale of terrain on a six to one ratio. A pilot may reconnoiter this high terrain from any angle, as the map is mounted on a special stand with casters for easy moving and rests 25 inches above the floor at the front, with an additional 18° elevation at the rear. All airports and emergency landing fields are designated and VOR, L/F ranges and airways are located to scale, using colored tape. The overall result gives a lasting impression of 48,000 square miles of Southern California terrain, complete with high peaks, deep valleys and flat desert. Pilot comment has been highly favorable for the map and we feel it can be used to advantage in any locality where terrain is a factor in safe flying."

may be desired for a given crosscountry problem, or for GCA or ILAS work.

The automatic recorder can reach any area on the table top without extension, while the radio console is mounted on a stand with casters so that it can be rolled around the table by utilizing a 10-foot extension cord.

The recorder cable conduit support is utilized to mount the remote instrument box on a 10-inch flange so that it can be pivoted left or right through 90° for easy instrument reading conditions. We taped the recorder cable to the outside of the cable support part way, then passed it through an extension arm 15 inches above and beyond the remote instrument box.

The altimeter is mounted on the recorder to facilitate altimeter readings and close observations during GCA and ILAS approaches. The altitude reset switch and the rough air control switch also are located on the radio console.

Standard C-8 airspeed dials were replaced with dual scale dials calibrated in knots. This dual scale is calibrated on each airspeed dial on the link trainer panel and the remote instrument box. Outer scale numerals are painted silver for the conventional airspeed readings while the inner scale numerals are painted a bright yellow. The airspeed pointer was shortened a quarter of an inch so that all numerals can be read easily. The outer scale has the same speed relation as the original miles per hour calibrations except for the conversion to knots. As an example, if normal cruising was 150 mph, then the outer scale now reads 130 knots.

On the inner scale which is converted for high speed navigation on sectional charts, the reading is 312 knots when the indicator is in the same needle position as the 130 knot indication on the outer scale. The high speed inner scale is calibrated from the cruising position based on the scale of a USAF sectional chart. For example, on a high speed flight using the inner scale, indicated cruising speed at 15,000 feet is 312 knots. By setting the free air temperature to conform with the standard day temperature at 15,000 feet (approximately -15°C.), the true airspeed will be 395 knots or 455 mph. A minor adjustment on the lapse rate linkage makes it possible to draw full power of 36" manifold pressure for the desired indicated airspeed. Then the stall assembly and control loading are adjusted to fit the desired flight characteristics. Wind drift is figured in on a proportionate basis, also.

All voice procedure on these simulated cross-country flights is recorded. General procedures for air route traffic clearances, tower instructions, position report, weather and approach control sequences are played back for pilot and trainer operator self critique. The importance of quick, concise and accurate voice procedure is brought home to the pilot after he hears his transmissions and remembers how important they are on an

IFR flight.



WELL DONE

2ND LT. WILLIAM G. FRISBIE 479th Fighter Bomber Group George AFB, California

While flying solo at night from George AFB to Kirtland AFB in a T-33, Lt. Frisbie experienced complete electrical failure over Winslow, Arizona. Realizing he could not use his wing and leading edge tanks, Frisbie climbed to 44,000 feet to conserve fuel. He turned off all electrical equipment and used his flashlight to check his instruments.

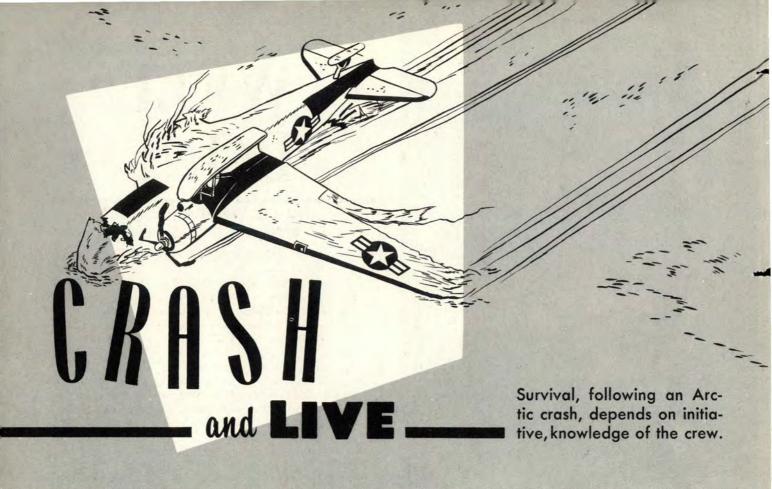
At 44,000 feet his canopy frosted over completely and he had to scrape holes with his fingernails to see. Without radio and with near zero visibility, Frisbie did a fine job of dead reckoning navigation and com-

puting fuel consumption.

At Kirtland he dragged the field, rocking his wings to signify no radio, but the tower operator failed to see him. Frisbie observed an aircraft taking off and set up a pattern for the proper runway, with no flaps or speed brakes. His canopy was still frosted over and he decided against checking his airspeed for fear of getting vertigo.

Lt. Frisbie straightened up his aircraft just prior to touch-down by using the small clear spot on the left side of his canopy to see the left hand row of runway boundary lights. He made a successful, no flaps, no speed brakes landing and taxied in with approximately 50 gallons of available fuel. Well done, Lt. Frisbie!

Frisbie had to scrape holes in his frosted canopy to land.





ARCTIC operations in ski-equipped aircraft present hazards not encountered in ordinary flight in more temperate climates. One of the primary hazards involves survival and protection of personnel in the cockpit after emergency or crash landings on ice and snow.

This accident story began with the unreliability of instruments in the Greenland area, coupled with the lack of means to obtain a proper altimeter setting over the desolate icecap.

An instructor pilot was on a check ride with a recently-arrived pilot who had no experience in Arctic flying. Weather was VFR and they were looking for a point where they were to make a landing. There was a slight difference between the readings of the two altimeters in the airplane, but since they were VFR the pilots had not been paying much attention to the instruments.

The weather over the icecap is famous for its quick changes, however. The pilots suddenly found themselves in IFR conditions with a white-

"Knowing survival procedures and utilizing whatever is at hand...are vital to survival."

Snow houses, while hard to make, provide dry, warm shelter for airmen downed in Arctic.

out. They flew over but could not find the point at which they planned to perform the landing operation.

Instead of one of the pilots immediately focusing on instruments, both began to look out the sides of the cockpit in an attempt to locate the

landing area.

The IP suddenly saw the point and told the pilot, who leaned forward and tried to look out the right window. Believing that he had sufficient altitude, the pilot began a turn to the right. When the plane rolled into the turn, the right wingtip touched and dragged the surface of the icecap.

The pilot tried to lift the wing and the left prop struck the ice. The right wing and prop then dug in and the entire wing and nacelle were sheared from the fuselage. The aircraft flipped over on its back, lost the left-prop, and then skidded upside down for about 150 yards before coming to rest. The cockpit was demolished and the instrument panels were torn loose.

Just as the right wing struck for the first time, the IP lost consciousness and recalls awakening and realizing that all was quiet and that he had pressure on his legs and abdomen. He did not realize that he was inverted, and released his safety belt which allowed him to drop and strike his head, causing unconsciousness from a second blow. The pilot remained conscious until the plane turned over — when he also sustained a severe head blow.

The flight engineer was sitting at the navigator's table and was knocked out on initial impact. Just a few seconds before impact, the radio operator had been called forward. He was momentarily dazed when the plane flipped over, but by the time the plane had stopped he was awake and active. His only injury was a small laceration on the forehead. He escaped through the hole made in the fuselage by the shearing of the right wing.

The problem of survival now became most important and rested with the radio operator alone. The weather was overcast, snow was blowing and the temperature was about 18°F.

All radio equipment was completely demolished and most of the air-



craft was wreckage. The position of the site was not definitely known and the base could not be notified at the time of the accident.

If the radio operator had violated the first rule of survival and become panicky, all four men would have become casualties. He remained calm, however, surveyed his predicament and then systematically set to work.

His first job was to remove the three unconscious men. This in itself required almost superhuman effort because the pilots are six-footers and weigh about 200 pounds each, and were cramped in the cockpit under instrument panels. (The airman is 5' 6" and weighs 140 pounds.)

He managed to remove them safely and carry them about 100 yards from the plane. His next step was to provide comfort and protection from snow and cold. He partially undressed the injured men and made bandages for their head wounds from bits of his clothing because there was so much debris in the plane he could not find the first aid kits at once.

The plane had been carrying a cargo of food stuffs, including boxes of boneless beef, canned vegetables and dry foods. The cargo compartment had been crushed and was littered with so much debris that he wasn't able to reach the survival packs and personnel clothing bags at once. He had to unload many crates first.

He carried these crates over to the men and arranged them into a protective shelter. After dozens of trips he was able to find some clothing, and then managed to get the injured men into sleeping bags and covered with sufficient blankets. Now he realized that he needed to insulate the sleeping bags from the snow and ice. In the cargo section he found large boxes of soda crackers. He emptied the crackers on the snow and arranged them into adequate pallets.

The airman was unable to fly the kite of the Gibson Girl, and after assuring himself that the now conscious personnel were in relatively good condition, he set off on foot to reach assistance. After about two hours of walking, he was still unable to locate help so he retraced his steps to the scene of the crash. He attempted to make the others more comfortable and opened cans of vegetables and allowed them to drink the juices.

After 10 hours, rescue was effected and personnel were brought into the hospital. Their condition was excellent despite their prolonged exposure and the shock of serious injury.

From the standpoint of flying safety, knowing survival procedures and utilizing whatever is at hand to minimize exposure to the cold, as this airman did, are vital to survival. Proper Arctic gear and know how are musts on even routine local flights.



CROSSEE



Ramp Rubbish

The 190th Fighter-Interceptor Squadron, Idaho ANG, is being equipped with F-86A aircraft. At present our strength is ten F-86A's, one T-33A and three T-6's.

The parking space is adequate, but the construction of our new hangar has presented a problem of keeping the ramp area clear of loose debris.

Recently we borrowed a rotary sweeper from the Boise City Street Department and swept the whole area. Then the 116th Ordnance Company, Idaho NG, let us use its magnetic sweeper mounted on a Diamond T 6x6 which was used to follow up the sweeping operation, gathering the metallic debris not picked up by the sweeper. Here is a picture of the collection of the metallic objects, each piece capable of ruining the J-47 engine. Safety wire remnants were most prevalent but also in the collection were 50 cal. machine gun links, nuts, bolts and washers.

Capt. Chauncey B. Reese FSQ, 190th Ftr-Int Sq Idaho ANG



The All Jet Issue

The special all jet issue of Flying Safety for December is a wealth of dope that every jet pilot should read and remember. I intend to keep a copy personally for ready reference.

To criticize any part of a fine publication such as this seems a bit superfluous. However, a couple of things were mentioned which are pet

peeves of mine.

On page 6 at the end of the section titled "Flight En Route," it states: "The best power setting to produce the greatest range for the wind condition and altitude is shown in the Flight Operating Instructions Chart, as is the CAS and groundspeed to be expected from the power setting."

At the beginning of the next section, "Fuel Weight," it states to the effect that CAS will be lower when the airplane is heavier at the same

power setting, etc.

Although the latter statement is true, the whole procedure will not give you the longest range for the least amount of fuel, and it is a com-

mon misconception.

It should be realized that for any given gross weight and altitude, an aircraft will have a definite pitch attitude which provides optimum efficiency. A direct indication of the pitch attitude is the CAS which, in the F-84 at normal cruise speeds, is practically the same as IAS. Therefore, the IAS as shown in the cruise charts should be religiously adhered to, while the power settings shown are only approximations. Now, it should be realized that the heavier the gross weight of any given aircraft, the higher the cruise IAS should be to maintain the optimum altitude. Therefore, after level-off at cruise altitude, the throttle should be gradually retarded and the IAS reduced (as shown in the cruise tables) as the airplane becomes lighter. Using alternate method, "Cruise Climbing," the original cruise rpm is maintained and the aircraft allowed to climb gradually rather than allowing the IAS to increase. This is the very best method since it takes into account engine compressor efficiency which is best at higher rpm.

The old concept of flying power settings may be good for piston types, but the power output of jet engines vary too much for the practical use of this ancient cruise control method in jet powered aircraft.

> Capt. William L. Skliar 523d Strategic Ft-Sqdn 27th S-F Wg, Bergstrom AFB

The information given in Captain Skliar's letter is correct. Adherence to CAS given in the charts will give maximum cruise regardless of power setting required. Cruise climb is the

* * *

The all-jet issue, December 1953, is being reprinted as a special study. Copies will be furnished the field as soon as they are off the press.

* * * FC-10 Compound

I was especially interested in "Clear The Way!" on page 23 of your November 1953 issue. While this article does not say so, I'm sure that someone in the Air Force is familiar with the fact that FC-10 was developed by the Canadians and has been in use up there for quite some time on all types of military and civil aircraft. Also, quite a number of civilian pilots in the United States have been using this compound over the years. So far as we can determine at the moment, it's the best thing of its kind that has yet been developed.

I note that you've asked for firsthand reports of field experience with FC-10. Obviously, the Canadians have quite a few of them. And there are quite a lot of civil users in the United States who also could give you such

first-hand reports.

Max Karant, Gen't Mgr. Aircraft Owners & Pilots Assn. Washington, D. C.

FLYING SAFETY



