MAY 1956

FLYING SAFETY

UNITED STATES AIR FORCE

. . . all the way? . . . page 4

FLYING SAFETY

VOL. TWELVE NO. FIVE

● There have been some changes made in GCA parlance. "All The Way?" on page 4 brings you up to date. (NOTE: "Circling" approaches will be clarified in a future issue.)

● Straight from the lads who performed the spin and roll tests on the F-100 . . . page 16.

● After reading "Riser Sharp" you should be able to work the canopy quick release with your eyes closed.

Can you identify this airplane? It will be featured in next month's issue.

Major General Howard G. Bunker
Deputy Inspector General
The Inspector General USAF
Department of the Air Force

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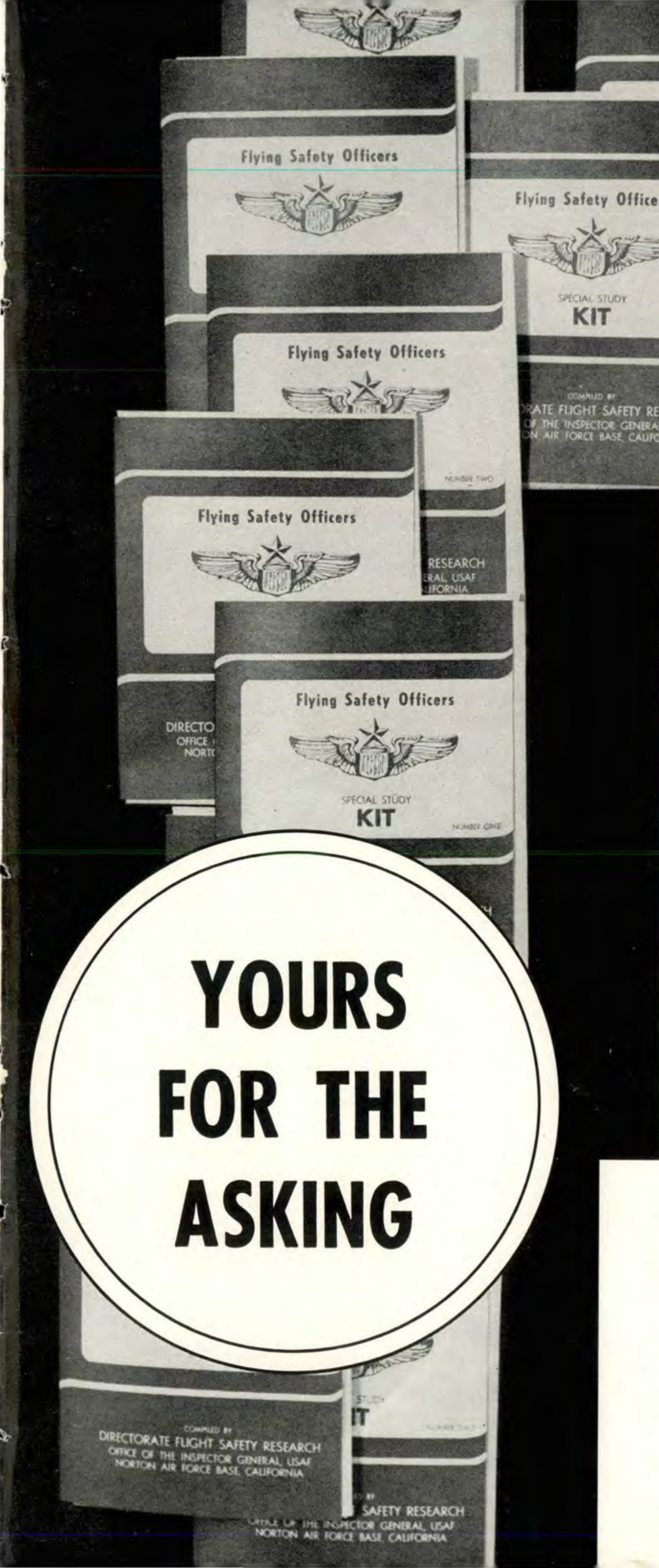
USAF PERIODICAL 62-1



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LETTERS TO THE EDITOR

Mighty Hard Paint

The suggestion by Captain Johnson from Wright-Patterson regarding concrete gear-down reminders sounds excellent but I have wondered if this might not lead to some of the same problems experienced at Midway Airport in Chicago where concrete runway marking numerals were at least a contributing cause to one accident.

Major Crispin M. Wood
483d TCGp Maint. Officer
APO 75

You've got a point. The moral of this story is to paint numerals with paint . . . not concrete.

★ ★ ★

Sounds Good

A short time ago I read a newspaper account of a harrowing experience a jet fighter pilot had on a night flight. He was in the process of consulting his Radio Facility Chart when he dropped his flashlight. In attempting to recover it, he lost control of his aircraft. He was flying at 30,000 feet at the time and recovered only a few thousand feet from the ground.

I wonder how many pilots and aircraft have crashed while flying at night for the same reason?

I have talked to another pilot who had a similar experience. His solution was to tie a string around his flashlight and hang it around his neck.

I have another solution to the problem. I would like to suggest the possibility of printing Radio Facility Charts and navigational charts for night operations with an ink that can be read under black or red light. This would eliminate the need for a pilot, particularly a fighter pilot, from having to control his aircraft, hold onto a flashlight and read a chart page all in the same operation. It would eliminate also the loss of night vision due to the use of a white light in the dark cockpit.

Lt Col Robert B. Ross, USAFR
3004 Parkway Terrace Drive
Suitland, Maryland

An interesting thought. Our printing editor is filling in the business reply card that comes in the Radio Facility Chart and forwarding it to the ACIC.

★ ★ ★

Bully for You

I've read with great interest the REX article on page 27 of the November 1955, FLYING SAFETY.

To go further into the matter of eliminating superfluous chatter during position reports I don't believe it is necessary to say "over Litchfield." Litchfield alone is sufficient if you are over it. If you are not over it, you are simply estimating your position and CAA, or ARTC, is just as apt to list you as "position unknown" under such a condition. If passing a station and you report in "abeam" or crossing a leg, they most definitely are interested if you give them "six miles abeam southeast," and so on, but mention "radar fix."

I also believe "at" can be eliminated in the phrase "at eight thousand," as well as the word "estimating." After all, when saying "Pullman one four one eight," you've given your estimate.

Now we come to one I feel is really needless. That is, saying the phrase "instrument flight plan." I personally fail to see where that is any more effective than saying "IFR." There can be little to confuse IFR with Vee FR. I should greatly appreciate your comments on this problem.

I thoroughly enjoy your publication and feel that you do a world of good. Yours for continued success.

Capt. Albert L. Catallo
SAC Arctic Research Indoc. Br.
Westover AFB, Mass.

Thanks for your thoughts about the magazine. Following the position reporting example in the FAC. Chart would eliminate much excess chatter.

★ ★ ★

Pinned Down

Reference is made to page 1 of the February issue, FLYING SAFETY, "Look Before You Leap." My experience on jets has been to leave landing gear down lock pins and tiptank safety pins installed until the pilot is strapped in and the engine is running.

I believe it is an oversight that you listed these two items as part of the pilot's walk-around inspection. The main reason to leave the gear down locks in on a T-Bird until the engine is running is for hydraulic pressure. It's possible I may be out-dated on this because I haven't been assigned to jets since June, 1955.

M/Sgt. Joseph M. Hurl
465th Fld Maint. Sq
APO 253 New York

You are right, pins should remain in until after start. Our lead question was, "would you leap in this bird?" Our T-33 expert had that in mind when he included pin removal.

★ ★ ★

Flow Gently

What about the fuel flow meter in the story "Hazards Can Be Hidden" in the October issue? It was very interesting to me, since I'm an ex-C-54 jockey of some forty odd hundred hours total and about 2000 IP hours in them. I did not find any reference to the fuel flow meter in your story. This instrument was always important to me (and used in SOP) because a leak will increase fuel flow. Was interesting too that the pilot had not been thoroughly taught, "What would you do if you saw a fuel pressure drop, fuel flow increase and engine continues to operate normally?" The answer we know. I was taught this in 1945 in transition school. If there be doubt of second guessing, refer to C-54, 42-2756 major accident, October 1953, at Keesler AFB (Pilot's Statement).

The picture in the magazine, as best as I can determine, has a "BULLY BEEF" Sixth Troop Carrier Squadron insignia. Interesting, because I was a member of that Squadron once. Is this the aircraft that was involved?

Capt. June M. Kennedy
Base Flt. Maint. Officer
3627th Fld Maint Sq
Tyndall AFB, Fla.

Sound advice on using the fuel flow meter. Guess everybody didn't go to the same school that you did. As to your question—negative!

★ ★ ★

Fly Right

An incident reported in the "Rex Says" section of FLYING SAFETY (December, 1955) has caused some concern to several academic instructors at this base. The write-up in question appears on page 24 and relates to the tale of a pilot who appears to have been mis-led or confused during a VFR flight "up a northeast numbered airway."

According to the report, said pilot was flying "correct quadrantal altitude" for off airways flight (northeasterly direction) and upon determination of this fact did change altitude by climbing.

From here, it appears that he was in the right to begin with, as proper quadrantal or airway altitudes (for condition specified) are the same—namely odd thousands. A possibility exists that the segment of airway involved may have fallen in the southeast quadrant; if this is true, then both aircraft were being flown at improper altitudes.

Considering those facts, it appears that our pilot was too quick to accept sole responsibility for the error. The action by the copilot in averting a collision was commendable. Some criticism of the pilot of the second aircraft appears to be justifiable, as he could not have been at an appropriate altitude.

We agree that too little is understood by too many when correct cruising altitudes are involved, and would like to point out that AFR 60-16, paragraph 32d, states that quadrantal altitudes (outside control zones and areas) are based on "Magnetic Course" instead of "Magnetic Heading" as quoted in your write-up.

Lt William E. Jacques, Jr.
Norman S. Orloff
Academic Instructors
Greenville AFB, Miss.

You've spotlighted a very pertinent point. You sum it up concisely when you say that too little is understood by too many, when referring to correct cruising altitudes. Better see page 3, Radio FAC Chart.

★ ★ ★

Where's the Bottle?

In your December 1955 issue of FLYING SAFETY you printed an article by Lt. Carter, entitled "The E in P. McCripe," recommending the proper routing of the long hose on the H-2 bailout cylinder. To a certain point I agree with Lt. Carter; however, I can not agree as to the location of the bottle itself.

I quote from T. O. 15X1-4-2-1, paragraphs 3 and 4: "An alternate method of carrying the cylinder assembly when used in conjunction with the back style parachute is to attach the carrying back to the right hand wing flap panel of the parachute pack assembly." To do this the inspection data pocket must be transferred to the left hand wing flap, then the straps on the carrying bag will be cut off and the bag sewed to the wing flap. This method has been in use in our organization for over two years.

Our organization also uses the F-1A automatic parachute release which is located on the left side of the parachute. If, in an emergency, the pilot had to use his oxygen bottle on bailout, upon reaching for the ball handle to activate the bottle, he might, in his haste, pull the automatic release if his equipment were fitted as Lt. Carter suggests. He would then be in real trouble.

I also noticed, in the picture Lt. Carter submitted, that the oxygen mask hose was twisted to the *left* so that the connector assembly can be connected to the combination bailout connector assembly. All oxygen masks that were ever used by our organization had the combination bailout connector assembly turned to the *right*. I doubt if, in an emergency, a pilot would have the time to twist his oxygen hose before going over the side.

I also believe that in a bailout at altitude the oxygen supply would be cut off by routing the bailout cylinder hose under the harness assembly, as Lt. Carter shows in his picture. We routed our hose assembly up the right side of the parachute, under the top of the opening band protector flap, over the shoulder, down the right side of the harness assembly, and under the keeper located below the canopy release fitting, thereby having nothing to obstruct the flow of oxygen to the mask.

If this letter will help in some small way to save a pilot's life, then I will consider my time well spent. Following the tech order is still the best answer to the problem.

T/Sgt Morgan H. Dunbar
457th Strat Ftr Sq
Tinker AFB, Oklahoma

Thanks for your time and your letter. You gotta go with that T. O.

★ ★ ★

Jolly Well

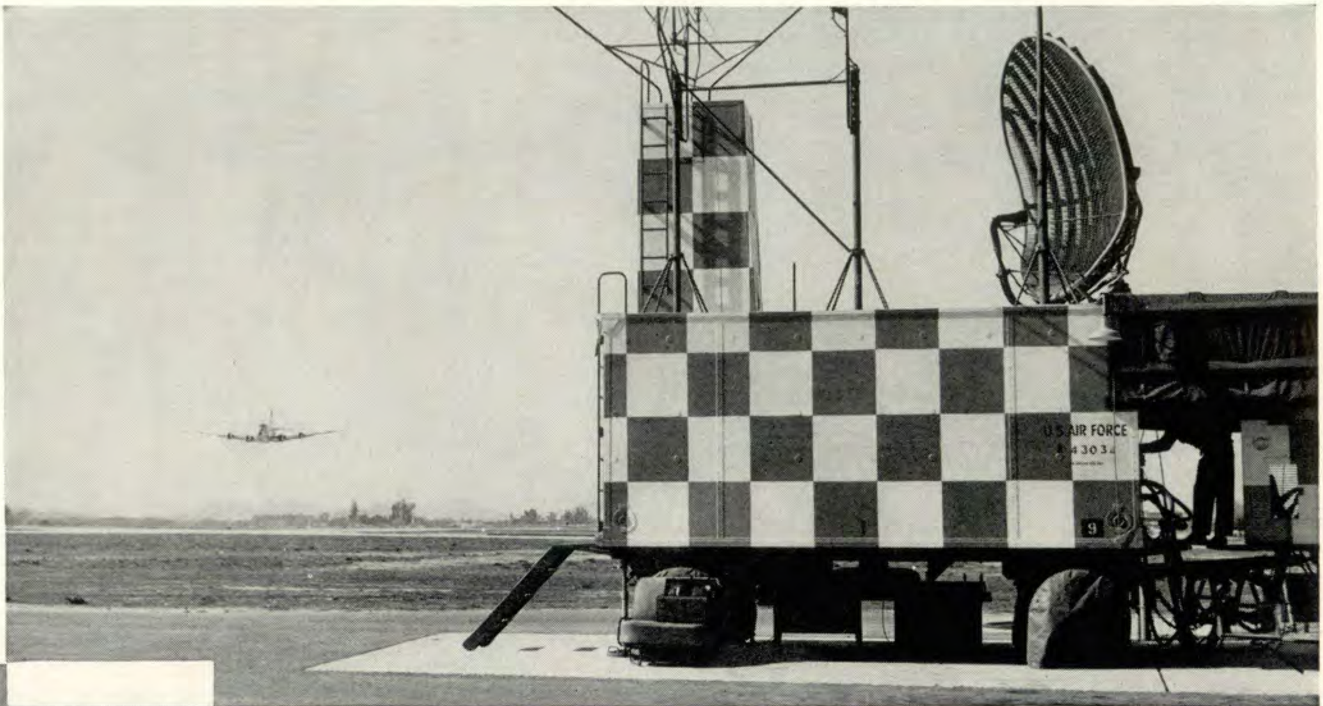
Reference is made to the article entitled "For Low and Slow," in the Crossfeed section of the February issue of FLYING SAFETY.

The British have an excellent system for both day and night airfield identification. The station call letters are painted in a prominent spot, usually near the "Wind Tee" for day identification, and a rotating red beacon flashing the letters in code at night. For example: Wright-Patterson: "FFO," Bolling: "BOF."

Our Radio Facility Chart makes it easy enough to correlate them, but of course this system is still only good for VFR flights.

Captain John C. Funk
Wright-Patterson AFB

Solve the IFR angle and you win a free subscription.



Make sure of your clearance. Full stop, left, or for a low approach, above.

Whether you fly jets or reciprocal type aircraft, it is important that you understand correctly all GCA phraseology. Are you sure that you have been cleared . . .

. . . all

I SLAMMED the steel door shut and waited for my eyes to adjust to the darkness of the interior of the GCA trailer.

"Do not acknowledge any further instructions. Distance from touchdown is 5½ miles. Your heading is zero four zero. Check wheels down and locked. Maintain 1200 feet."

I walked toward the sound of the voice which was at the far end of the narrow aisle. I sidestepped around an airman who glanced up at me as I entered the trailer.

I asked, "How's business?"

"Everything from 33s to 124s. Sgt. Kline, the final controller, has been busy since eight o'clock this morning," he answered, swiveling in his chair to keep me in sight as I felt my way along the steel sides of the room.

"Three quarters of a mile from touchdown. You are on glide path. Half a mile from touchdown, slightly high on glide path. Down a little. You are now passing through GCA minimums. You are over the end of the runway. Take over visually for your landing. Final controller. Out."

I looked at the scope. The moving blip merged with the solid background reflection. Sergeant Kline acknowledged the comments of the pilot and took off his headset. Briskly, he rubbed his ears.

"Man, what a morning! They must be stacked clear up to 15,000. Anything I can help you with?" he questioned, still rubbing his ears.

"Yes, but it looks as if I picked the wrong morning to talk with you," I answered. "I'll just look and listen awhile. There are some questions about GCA approaches and equipment I would like to ask when you have the time."

A curt voice over the loudspeaker interrupted. ". . . final controller, this is Air Force 55890, how do you read?" I remained silent.

T-33 Low Approach

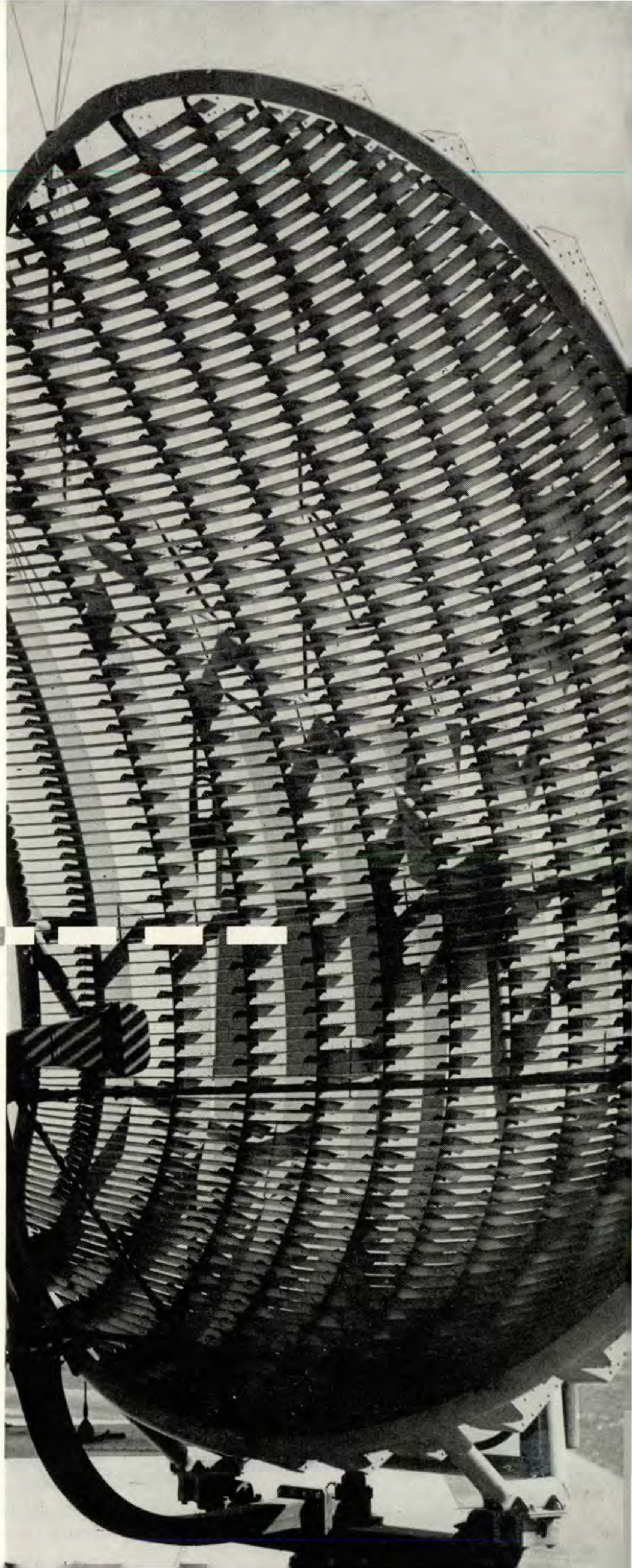
He turned back to his scope, donned his headset again and answered.

I watched him make the run and he did it without a hitch. During the break, I managed to firm up a meeting with him.

We met the following day, along

Any inbounds? Controller checks schedule.

the way?



with Captain Powers, operations officer of AACS.

Sergeant Kline started out. "I wish that you had been looking over my shoulder recently when a T-33 pilot made a low approach run. You know our console set-up? There are two positions to work, surveillance and final. I was working the final approach position.

"The ceiling was ragged at 1000 feet with light intermittent rain showers. Visibility was three miles. Our scopes were lined up for runway 12. However, the wind was out of the northwest. The active runway was 30, and we don't have an approved radar approach to that one.

"The T-33 pilot was at 3000 feet on a heading of 080 degrees when he contacted us on channel 17. The search operator had him turn to a heading of 300 degrees and to descend to 2000 feet. On his downwind leg, he was told that he had been cleared for a low approach only.

"He was asked what his airspeed would be on final. After his answer, he was directed to switch to channel 18; then, I took him over. He had been given the weather information and had acknowledged it.

"On the final approach in addition to his heading and altitude corrections, I stated, 'You have been cleared for this low approach.' As he passed through GCA minimums, I informed him of such and asked, 'Do you have the field in sight?'

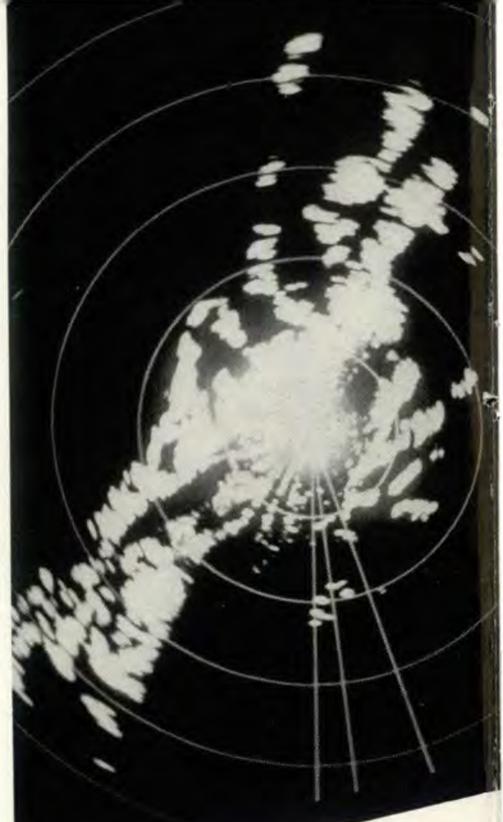
"He answered, 'Roger.' I told him then that he was cleared to the tower frequency for instructions.

"I continued to follow him on the scope. Instead of contacting the tower, the pilot landed downwind. He must have assumed that he had permission to land. Fortunately, the wind wasn't blowing too strong and he stopped before going into the barrier."

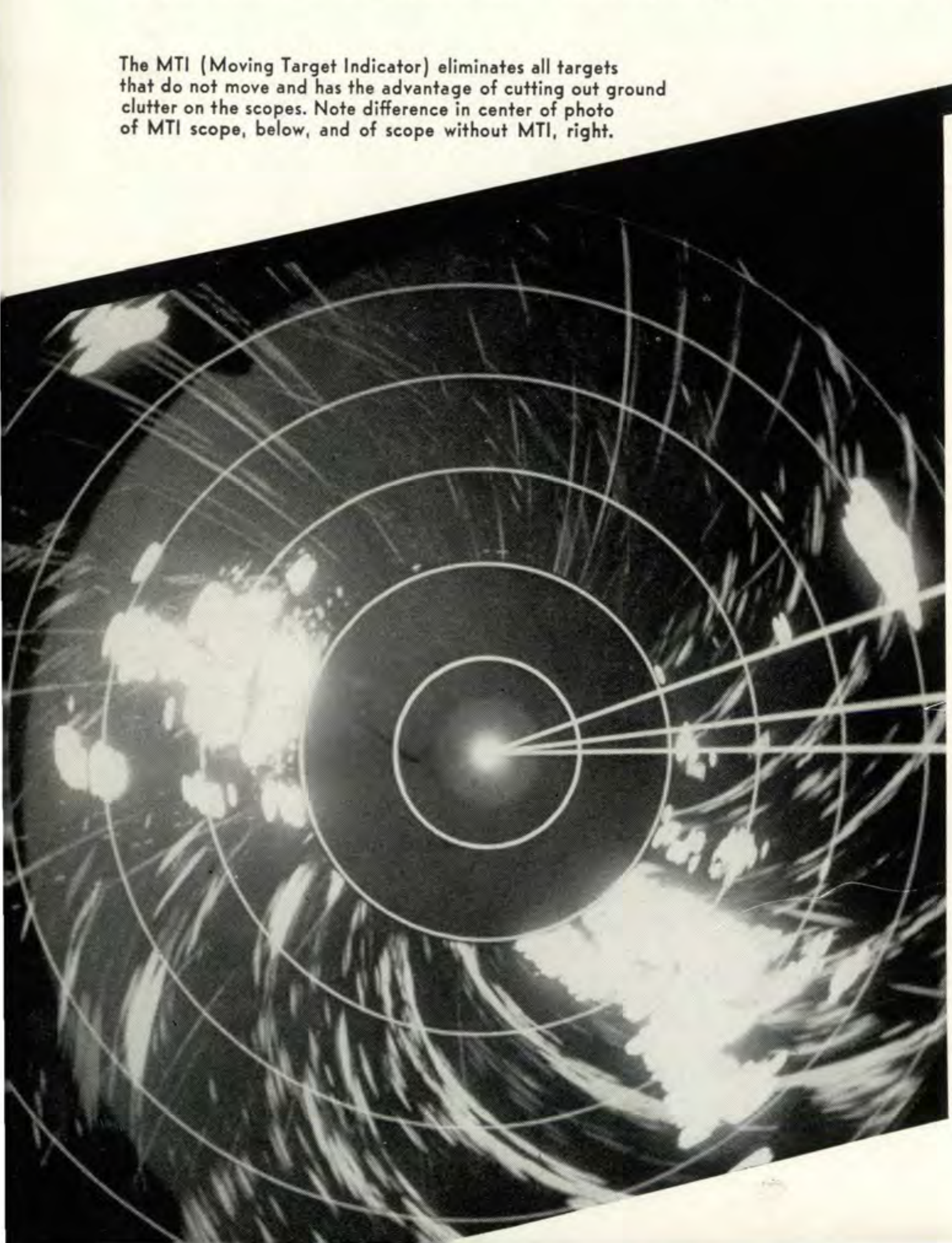
I wondered about Sergeant Kline's story. Why didn't this pilot switch to tower frequency? Did he misunderstand what the term "low approach" meant? I was curious.

I asked Captain Powers to elaborate on the types of approaches a pilot might receive from a GCA facility.

He commenced, "The types of radar runs for a pilot to know about are air surveillance approach and precision approach radar." *(Editor's note: Hqs AACS has directed their Air Traffic Controllers to use only the phraseology, precision approach or surveillance approach, when communicating with pilots regarding the type radar approach being conducted. Terms such as PPI, ASR, PAR, SAR and Search Approach will no longer be used.)* "A pilot can make a low approach using either airport surveillance radar equipment or the precision approach radar equipment.



The MTI (Moving Target Indicator) eliminates all targets that do not move and has the advantage of cutting out ground clutter on the scopes. Note difference in center of photo of MTI scope, below, and of scope without MTI, right.



"During all radar approaches, tower instructions will be strictly enforced. Tower controllers will be advised by the surveillance radar controller operator when an aircraft on a radar approach reaches a point 10 miles from touchdown. That means either the plane is on a base leg or on a straight-in approach.

"When the aircraft has reached a point five miles from touchdown, final clearance for the approach will be requested by GCA from the tower.

"In no case will the radar controller continue an approach without receiving final landing clearance. If he doesn't receive this final okay, then he will break off the approach immediately and advise the aircraft to go around or follow the missed approach procedure."

Tower Permission

I stopped him. "Let me get this straight. The tower gives the GCA controller permission to tell a pilot that he is cleared for a landing, whether it be a touch-and-go or a full stop landing?"

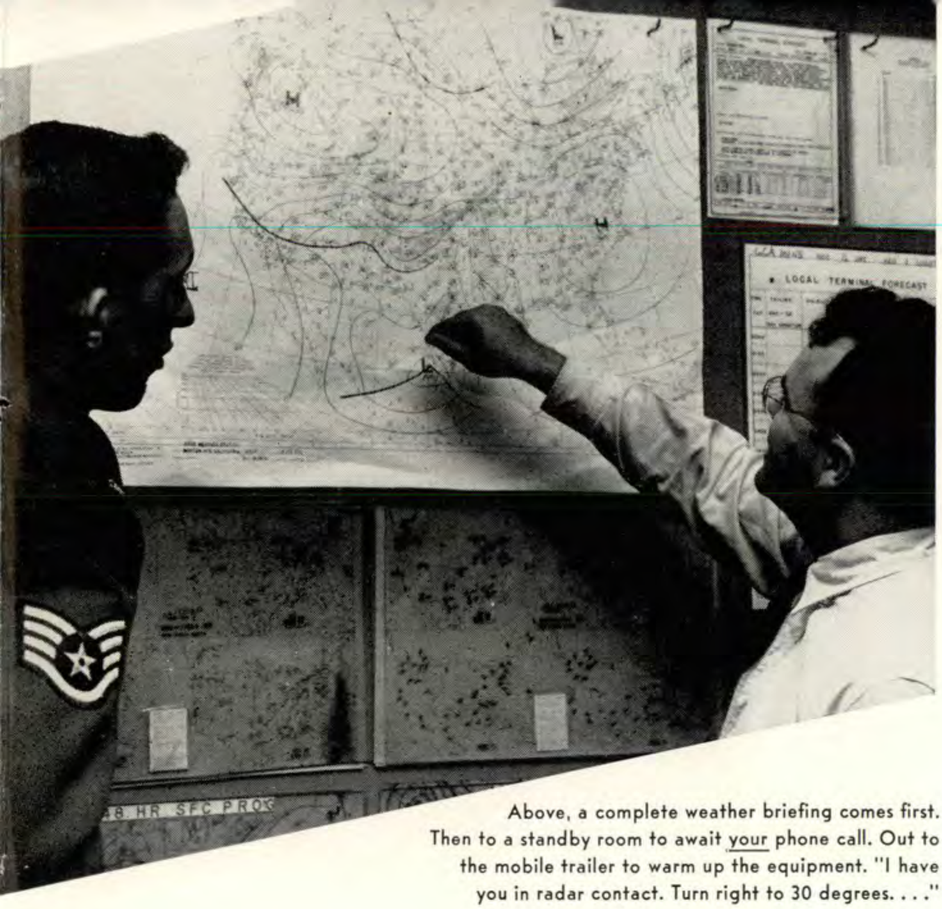
"Right," Captain Powers replied. "The pilot must realize that just because he has been cleared for a low

NOW. Roll out—NOW. Is this understood?" I nodded agreement.

Next, he explained how radar controllers handle an aircraft whose transmitter is inoperative. The radar controller states that he has not received any acknowledgment to his transmissions. He then says, "If you follow my instructions we will complete this approach. I will repeat all instructions twice." The radar controller then follows the movement of the blip to confirm that his instructions are being followed.

What are some of the improper flying practices that pilots follow which might get them in trouble?

Captain Powers answered, "First, this business of preliminary landing information: In addition to traffic data and field conditions, the radar controller will furnish the pilot with the active runway, field weather, altimeter setting, missed approach procedure, any special information and



Above, a complete weather briefing comes first. Then to a standby room to await your phone call. Out to the mobile trailer to warm up the equipment. "I have you in radar contact. Turn right to 30 degrees. . . ."

approach, that doesn't mean that he is cleared to land. He should realize that after a GCA low approach it will be necessary to switch to tower frequency for landing instructions. The tower, not GCA, controls all takeoffs and landings."

"What is the difference between a surveillance approach and a precision approach?" I queried.

"A surveillance approach was previously referred to as a PPI approach. In this type of approach the radar controller provides the pilot with heading information only. Pilots will be given range information and prescribed altitudes. For example: The pilot will be advised when to start his rate of descent. As he reaches each mile marker on final the controller will advise that he should be at a certain altitude.

"By checking his altimeter, the pilot is able to adjust his rate of descent accordingly. The minimums for this type of approach are higher than the precision approach."

I turned to Sergeant Kline. "What about precision approach radar?"

"On a precision approach the final controller issues control instructions based upon positive radar data, heading and altitude, so that the aircraft can be kept exactly on the glide path until the approach or landing has been completed. At any time the aircraft target varies from the established glide path in excess of certain prescribed minimums, the controller will direct the pilot to execute the missed approach procedure."

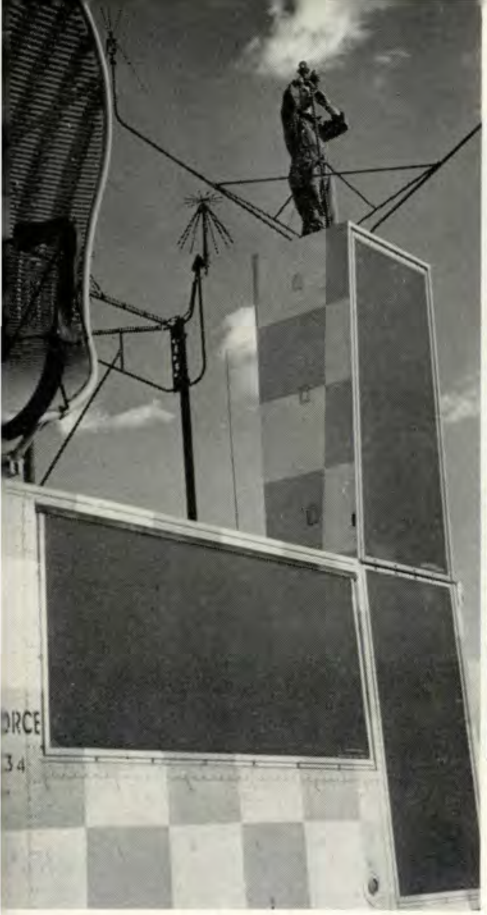
I winced. I remembered the time I was tooling down the glide path when the radar controller told me to execute the missed approach procedure. Startled I took a quick glance at the copilot and yelled, "What's my missed approach heading and altitude?" That taught me a lesson. When the GCA operator issues the missed approach procedure I copy it down. Why? Because the missed approach procedure he gives to you is not always the missed approach procedure that is published in the letdown charts.

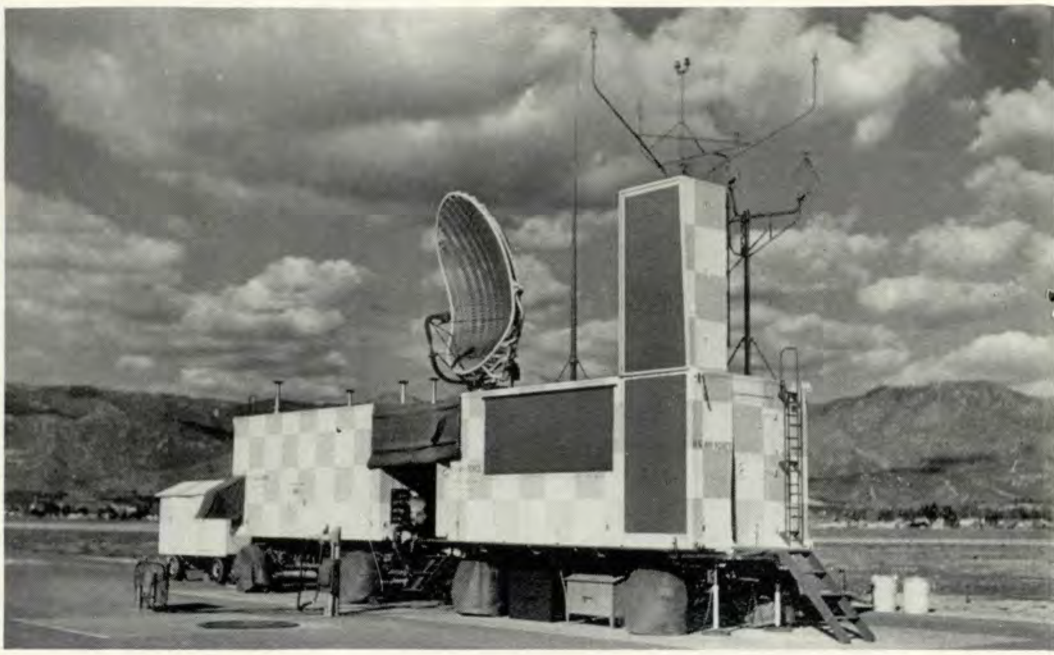
Gyro Out Approach

"Anything else on approaches before we get into improper pilot flying practices?" I asked.

Captain Powers continued, "We have what we call an inoperative gyro letdown. If a pilot tells us that his directional gyro is out, here's how we handle him:

"Make all turns standard rate. I will start and stop all turns. The command of execution will be the word NOW. I will say 'Turn right—





Located near the runways, mobile trailers are symbolic of GCA. New RAPCON facilities are housed in buildings.

minimum altitude for the approach. Normally, this will be given prior to the time the aircraft reaches the final approach gate."

Sergeant Kline interceded. "Believe it or not, but I have given this same information to pilots and have had them come back with 'Roger, gear down and locked.' I think that pilots have heard the same phraseology so often that they sort of blank out when we give this preliminary data to them."

Captain Powers nodded agreement and continued. "Because of this weakness, the Air Force and Civil Aeronautics Administration are changing the procedures to require the controller to give the pilot his missed approach instructions at the time he needs them—Climb to (altitude). Turn right/left to heading."

"However, it is not necessary or desirable for the pilot to read back the weather or missed approach procedures. All that is required is to repeat all headings and altitudes and the altimeter setting. Just acknowledge receipt of the other information.

"Another phase that pilots can sharpen up on is the turn to final approach. Some pilots start their turn too late, overshoot and then wonder why they don't hit the center line. Other pilots will stand the aircraft up on a wing and of course they undershoot the final.

"Same thing applies to glide path corrections. They are supposed to be slow and easy, not resembling dives or climbs."

An interesting point came up when radar approach minimums were discussed. Seemingly, when a pilot hears this phrase, the blip begins invariably to move from side to side, indicating that the pilot is off instruments and visually searching for the runway. In multiplace airplanes a little cockpit coordination would straighten this out. If the copilot cannot see the runway you may as well stay on the gages and execute the missed approach. Transitioning from instruments to outside and back is bad business.

Controller Training

I was interested in the training that a radar controller receives and any new equipment that he might be using.

"A radar controller first has eight weeks of basic air traffic control school. Then, nine weeks of special radar schooling and several months of OJT follow before he is permitted to control aircraft in IFR weather. He must pass the Air Force written and practical tests for his rating.

"Most radar controllers average about 60 hours of duty per week. Why that much? Well, it is a very critical career field and experience is at a premium. Many of the senior controllers in ATC radar facilities are rated Reserve officers and know quite a bit about aircraft and their problems.

"In the past, most of our equipment has been the old MPN-1.

"Bases now are being equipped with newer equipment, the CPN-4, which includes the Moving Target Indicator (MTI). It eliminates all targets that do not move and has the advantage of cutting out ground clutter on the scopes. Incidentally, glide path corrections will be given as 'high' or 'low,' 'slightly high' or 'slightly low' instead of 'by feet.'"

Also, the precision scopes are combined into one azimuth-elevation scope. This way one controller can work final instead of the two required by MPN-1. The CPN-4 has better altitude coverage, better communications and jet aircraft are easier to pick up.

RAPCON centers incorporate the latest improvements with GCA facilities. (See FLYING SAFETY, January 1956.) They are located away from the runways and are housed in buildings. They have three surveillance scopes and two precision scopes.

I looked at Captain Powers and Sergeant Kline. "That's about it," they chorused. "Tell pilots to visit us when they have an hour to spare." ●

....who dat man?

YOU'VE HEARD THE story about the little man who wasn't there, haven't you? He's there, all right. If you're flying in, through or adjacent to an ADIZ and either by your own negligence or circumstances beyond your control, you cause the bells to ring and the lights to flash and the jets to roar at an ADC base, you best start looking around. Why? Because that little man is going to be there, but quick.

You're right. That little man is an ADC interceptor fighter pilot. Just like ham and eggs, ADIZ violations and interceptions go together. Here's the why, who, how and what you should know about ADC intercepts.

Why is a pilot intercepted? Intercepts are made in an ADIZ when it is not possible to correlate the observed radar track with flight plan information available at the radar site. Outside an ADIZ, intercepts or rather identification checks are made when the track, because of observed actions, may create suspicion. These actions may be a combination of speed, altitude, maneuvers and proximity to or turning toward a critical target.

Besides a track that is suspicious, you may be intercepted because of a communications lag or mishandling of your flight plan. Radar site controllers coordinate closely with ARTC centers on flight plans to confirm correlation. However, no track is taken for granted. If you don't fly as filed or if you are not within the prescribed tolerances, that little man is going to pay you a visit.

Who starts this intercept and what are the tolerances? The radar site controller responsible for identification in the particular sub-sector, orders the intercept. An observed aircraft for which a flight plan is not on file or one which is outside the tolerances in time and distance is declared an "unknown." These tolerances are:

- Time—plus or minus five minutes from an estimate over a reporting point or point of penetration.
- Distance—ten nautical miles from centerline of proposed route, if entering or operating within domestic ADIZ or entering the United States across International Boundary ADIZ. Twenty nautical miles from centerline of proposed route if the aircraft is entering or operating within a coastal ADIZ.

The radar controller is allowed two minutes to establish a track and one minute to classify it as "friendly" or "unknown." If it is an "unknown," an intercept is initiated. After the scramble is ordered, and if the aircraft is identified as friendly, the fighter pilot is instructed to return to his base.

How do you know you have been intercepted? This may come as a surprise, but usually you find out through a formal violation notification by Flight Service. Here is how it works:

Suppose you are tabbed as an "unknown." A scramble is ordered. The jet interceptor pilot is vectored within range of you. He flies only close enough to scribble down your aircraft serial number. He relays this and any other pertinent information to the GCI controller. Some ADC interceptors are equipped with cameras. If they are, a few feet of film is made of your aircraft. Then he breaks off. When he makes his break, you may get a glimpse of him, but in most cases you won't. He is not there to signal you to land, as is often believed, but to make positive identification. Neither he nor ADC is interested in where you will be landing. Don't dive away or turn on an Aldis lamp into an interceptor pilot's eyes.

Upon landing, the interceptor pilot is required to sign an affidavit concerning the actual interception. The violation is then sent to his Air Division headquarters and thence to Flight Service. You'll receive the violation notice in the mail after your commanding officer has read it.

During IFR conditions, different interception procedures and maneuvers are used. These special ADC techniques are of a classified nature.

The interceptor pilot has a job to do and he does it. You actuate him when you violate an ADIZ flying restriction. It's easy to keep him off your back. File your flight plan and fly it. ●

the New Trim Look

Alfred W. Reiter ACIC, USAF

I AM ASSIGNED to the Aeronautical Chart and Information Center and have frequent occasion to visit various Air Force bases to determine requirements for aeronautical charts. On a recent visit to a large base, I ran into an Air Force Major with whom I had had several past contacts. While leaving base operations, he invited me to have dinner with him at the officers club.

About the time we came to our cigarette course, he flipped his match toward the ash tray, leaned back and said, "You know, I've got a gripe, and since you are with the outfit that produces aeronautical charts, maybe you can explain something to me."

"I'll certainly try," I replied. "What's your problem?"

"Well," he continued, leaning forward, "why must we spend hours cutting margins off of charts, taping, trimming, folding and whatnot and wasting time that could be spent to better advantage for briefing, flight planning and aircraft checks? And why waste the money invested in the chart scraps that are all over the operations floor?"

I broke in to slacken the pace and to take time to collect some well scattered thoughts. I was dealing with a senior pilot with many hours of flying time. Apparently, many hours of chart stripping time, as well. I decided the questions needed a complete answer and began with, "Perhaps its does appear, on the surface, that we waste your time, and Air Force money, but actually there is more to this than meets the eye. Let's go over this thing and really look into the problem.

"...spend hours cutting margins off charts..."

"First, I'm sure you'll agree that many flights do not require strip coverage. Local flying or short range flights may involve only one or two charts. Other operations are area type, such as close air/ground support or interception. You don't know in advance what your course will be."

Not even slightly satisfied, the Major came back with, "This is true. But how about the many flights where we do know our course in advance? These flights include every type from administrative flying to SAC long-range missions."

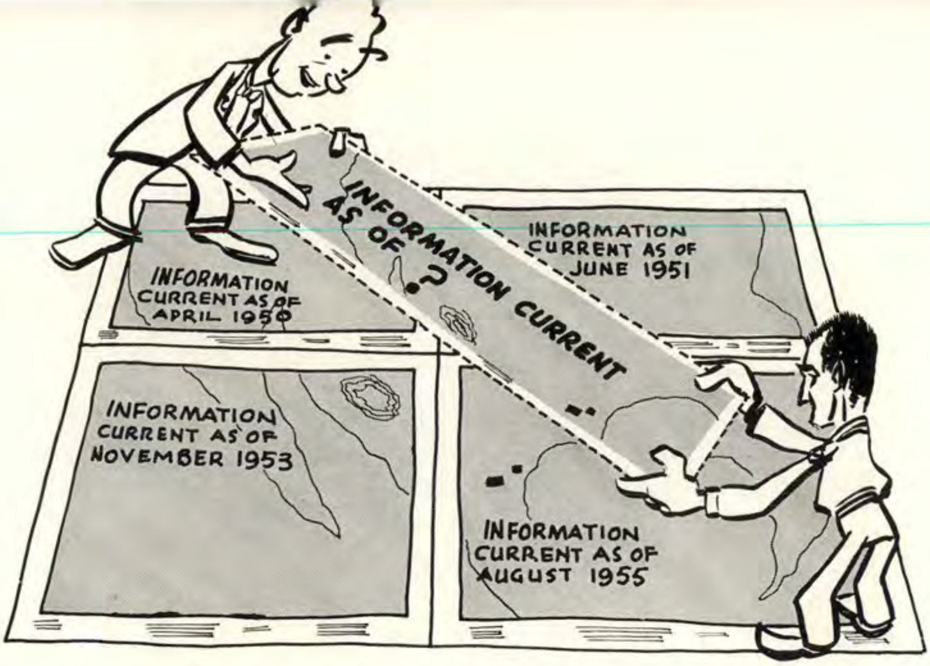
"That's one of the difficulties," I broke in again. "Commands like MATS and SAC have so many bases and so many destinations, we'd be faced with producing thousands of strip charts for each route. In addition, terminal points may change or new ones may develop. Besides, there's the matter of lead time to consider. By the time we make a chart for your route, changes may obsolete the chart."

He countered, "I see that all right, and I'm not asking for the moon. If you eliminate the more infrequent runs and combine the others, you can plan these strips to cover major airfields and cities and reduce the number quite a bit. Once you get the number of routes down to a reasonable amount, the rest is simple. The coverage is there; it's just a matter of printing the charts."

I took a deep breath for the next exchange. "There are other problems. Certainly, as you say, eliminate the less frequent runs and combine others. That's a must. But now what do we have? Let's say you want to go from Point *A* to Point *B*. Chances are, if we reduce the number of strips to a reasonable amount, these points will not be centered on the strip. Possibly one or both may not appear at all. But if we assume they are both off-center, you may very well run out of working space for radio or celestial navigation. Also, you may want to change course because of weather, to take advantage of favorable winds or to evade interception. You may get off course before your next fix shows a wind shift. Restricted strip chart coverage would be inadequate in these kinds of cases.

"As for production, it looks like a simple matter, but it isn't. For instance, we have four charts of a standard coordinated series. Let's say charts *A* and *B* are adjacent to one another in one latitude band, and *C* and *D* are directly below. However, *A* and *B* are constructed on a different set of standard parallels from *D* and *C*. This situation occurs at various latitude bands to distribute scale error inherent in the Lambert Conformal projection. The result is an imperfect fit of charts constructed on different sets of standard parallels. I won't go into the technical details; it's one of the things we run into by flattening a sphere. Something's got to give. To produce a strip chart running diagonally across all four charts, we are faced with adjusting the fit prior to printing.

"Suppose that we have now produced such a strip. New information becomes available which causes chart *A* to be recompiled and reprinted. What should we do about the strip? This new information was either of major importance or an accumulation of minor changes that are equally serious, otherwise we wouldn't have to revise the chart.



New and revised information flows in continually. Strip charts must be reprinted often.

"If we revise the strip, charts *B*, *C* or *D* may soon require revision. New and revised information flows in continually. This means that a strip chart must be reprinted as often as each component chart, or else be used despite its present incorrect condition. No easy choice, is it?

"There are storage and distribution problems, as well. There's extra storage at the production end, and it's at a premium now. There's extra shipping and record keeping. And you'd have storage problems at the operational end as well, where it's even more critical.

"Now for the other side of the picture. Only so much money, manpower and production facilities are available. When the choice boils down to programming for required charts and target materials, the logical course is crystal clear."

The Major, tapped his cigarette against the ash tray. "I didn't realize all of this. I know the problems we have in using charts. I'm amazed at what you are up against in making them. Looks like I'm shot down."

From the disappointed tone of his voice, I could tell that it just didn't seem right to him that nothing could be done. "We've been thinking about this problem for some time," I said. "It has been brought up many times before. More than that, we've already done something about it and may be able to do even more. Everything I said still goes, but we've taken a new approach to the problem and have asked ourselves this question: 'If we can't do it for them, what's the next best thing?' The answer we came up with was to make it as easy as possible for the chart user to do it himself.

"We've developed what we call a 'partial margin' format for our coordinated series of charts. Instead of having a margin all around the chart, in the usual manner, we've dropped the margin from the north and east edges; chart detail goes right out to these edges. We then relocated marginal data in the remaining two margins. You can now join charts much easier by simply placing one chart over the margin of the adjacent chart without folding or trimming the edges. This helps in particular on the north edge, which is a curved line on the Lambert Conformal projection. We've compiled overlap detail from the south edge of the adjacent chart into this 'bow-shaped' area, and as far as joining is concerned, eliminated the resultant curve.

"On the new Jet Navigation Chart Series (JN), Scale 1:2,000,000, which will have world coverage, this format has already been used. Practically all of the northern hemisphere is produced in this series, and we'll be printing southern hemisphere sheets before very long.

"Domestic charts are produced by the U. S. Coast and Geodetic Survey and do not have this feature now, but later editions will be converted. Our new and reprinted 1:1,000,000 scale

The problem. Charts A and B are constructed on a different set of parallels from C and D.

The north and east edges have been dropped.

World Aeronautical Charts (WAC), 1:500,000 scale Pilotage Charts (PC), and 1:250,000 scale Approach Charts (AC) are being printed with partial margins. Other series will also be converted if we determine that this feature is required.

"Another angle to solving this problem is to improve chart-matching characteristics. We have increased the spacing of standard parallels on the JN Series and, as a result, decreased the number of latitude bands where an imperfect fit will occur.

"The dimensions of the JN chart have been increased to about twice the size of a standard WAC, PC or AC. Printed copy is placed so that strips cut in any direction will retain necessary detail. Examples are the closer spacing of isogonic line values and the placement of graticule values along each full degree within the body of the chart. These features result in greater convenience to the pilot making strip charts.

"We're also working on the development of an adhesive that can be coated on the underside of the north and east edges so tape won't be necessary. This presents some problems. We don't want the charts to stick together in packages because of heat, pressure or humidity; we don't want the stuff to 'set' too fast for proper matching, and we don't want it to be uneconomical. But these are our problems and we hope to overcome them.

"All of this means that you can tailor strips for your particular course, no matter where Points *A* and *B* are. You don't run out of working space and you don't have gaps. Another thing, you know what good results we've had from pressure pattern and jet stream flying. Other techniques are also under development to reduce flight time by going the long way. Well, you need a wider strip if your track snakes through the sky, and this new approach gives you the flexibility that you've always needed."

All signs of disturbance seemed to have left the Major by now. "Well, I can see you have some good points in your favor—sounds like you're on the right track. Your approach reduces the workload for both of us and gives me exactly the strip coverage I need. Now, if I followed you correctly, we can take a JN Chart and simply fold or cut away the unwanted area and for many flights we only need one chart. It sounds real good! But one last question. How about all the scraps of paper on the floor? You've talked about saving money. Doesn't that waste money?"

The Major was certainly thorough. "It may seem that way," I replied, "but actually it's a net profit. Most of the cost of a chart is in the first one. Research, compilation, drafting, photography and plate making comprise the bulk of the total cost. In the quantities we normally have to print the unit cost per chart is quite low. When a chart such as the JN with the strip feature is printed, we run extra copies. The cost of these extra charts is based on press time and paper. We've estimated the cost to be about 15 cents per chart. A B-47 can burn that much worth of fuel in about one second of flight.

"However, there may be cases that justify strip chart production. We know that some routes are heavily traveled and quite stable. In these cases we can center terminals on a strip. If most of the coverage is over water, only terminal portions of the chart would be subject to revision. We have produced some of these charts and will look into situations where it appears logical to produce others. Possibly we have failed to discover all such conditions in the past, or our priority workload just won't let us get to the problem immediately. But we work closely with the operational people and try to keep pace with their problems."

We were both relaxed again. Reflecting on the discussion, I thought, "It's good to talk over these matters. It makes for better understanding."

"You know," said the Major, "I was just thinking. A lot of pilots gripe about preparing their own strip charts. I think they'd look at it differently if they'd heard what you have said tonight. If you could only reach more chart users!"

I laughed. But then I got to thinking about his statement. ●

WELL DONE

TRAINING ★ TEAMWORK

1ST LT. WILLIAM K. HARDY was on duty as senior mobile controller at Bryan Air Force Base, Texas. Heavy jet traffic was in progress.

2d Lt. Robert J. Morrow (then aviation cadet) entered traffic at the end of the flying period. On his pitch out for landing, a large bird struck the windscreen of the T-33. The impact shattered the windscreen and carried the bird and glass into the cockpit. Lt. Morrow was partially blinded.

Turning on downwind, Lt. Morrow lost approximately 1000 feet of altitude. He called "Mayday" and informed mobile control of his predicament. Lt. Hardy immediately ordered all other aircraft out of the pattern and cleared Lt. Morrow to land.

He approximated Lt. Morrow's altitude at 400 feet and asked him how well he could see. The pilot replied, "Just a little, but I can't see how high I am."

Lt. Hardy began giving Lt. Morrow continuous instructions, turning him on base and final. He lined him up with the runway, guided him through a normal approach and intentionally landed him a little long. After touchdown, Lt. Morrow's vision returned sufficiently for him to maintain directional control and bring the airplane to a safe stop.

An accident was averted because Lt. Hardy was quick to grasp the situation and able to give clear, positive landing instructions to Lt. Morrow, who calmly followed these instructions.

The performance of Lt. Hardy and Lt. Morrow is an example of the value of close cooperation between the mobile controller and the pilot. Well done!

1st LIEUTENANT

William K. Hardy

3531st PT Sq, Bryan AFB, Tex.

★

2nd LIEUTENANT

Robert J. Morrow

62d FIS, O'Hare Intl Arpt, Chicago, Ill.

Keep Current

NEWS AND VIEWS

Faster and more economical. One of these YC-97J Stratofreighters,powered by T-34 turboprop engines, flew the Atlantic in six hours.

New Flying Saucers?—Tiny meteorological research balloons launched from Air Force planes are scheduled for release during the coming months over different sections of Texas. Purpose of the test balloons is to study atmospheric turbulence and wind circulation over mountain and ocean areas. The balloons are approximately six feet in diameter and will appear in the sky as small luminous spots after they are launched.

The whole program is connected with hurricane research. When a balloon is released from an aircraft in flight, it drops as a package for a short distance, before automatic inflation. A small, plastic, gas-filled bottle inflates the balloon which then drops to earth by a small parachute, ten feet in diameter.

The balloons have no instrumented packages, but each carries a postcard, requesting the finder to fill in certain information as to where and when it was found and to mail it back to the launching scene.

Twenty-nine years apart. Replica of "Spirit of St. Louis" and C-124.

Automatic Traffic Control—An electronic computer for use at the Air Route Traffic Control Center at Indianapolis is one of the first steps toward an automatic air traffic control. The equipment will be ready for installation in September, 1956, and is to be operated by the Civil Aeronautics Administration.

The IBM equipment relieves the operator of the clerical detail involved in separating traffic in the air, and does the job far more quickly. The principal element of the computer is a memory drum which can store information on all airway routes and bring it up instantly on demand from the controller.

The controller types out the flight plan in punch card form and feeds the card into the computer. The computer searches the drum and comes up with a series of printed strips giving the controller a continuous "program" of the proposed flight. This gives the controller more time to make decisions, uncluttered by the task of remembering a mass of details and of calculating and writing flight progress strips.

★ ★ ★

H-mmm-Hmm-Hmm—a new automatic warning device dramatically reminds pilots to lower their wheels when landing.

The device puts a bothersome 250-cycle interrupted tone into the pilot's headset when he prepares to land. The signal functions when the throttle setting, airspeed or altitude of the airplane indicates a landing is coming. It may be stopped manually or will stop automatically when the wheels are down and locked.

The F-104 is the only jet fighter using a downward ejection seat.

The T-shaped horizontal stabilizer has no elevator and moves as a unit.

Intake ducts are masked in this photo. Top speed remains secret.

Sharp-edged wings are thinner than those on rocket research planes.

Although the device is built into the pilot's radio headset, it operates independently. The warning signal will function even if the radio is disabled. It normally operates from a 28-volt (DC) system, but it can operate on as low as 14 volts if the airplane's electrical system is damaged and only the battery is functioning.

It uses three noise levels. It is hermetically sealed, weighs only 13 ounces and has a total volume of 13 cubic inches.

Newest Fighter—Shown above is the latest in air superiority fighters, the Lockheed F-104. Dubbed the "Starfighter" it has the greatest combination of speed and flying performance ever built into a combat aircraft. It is powered by the new General Electric J-79 turbojet, constructed especially for the 104.

Producing more thrust per engine weight than any other aircraft, the 104 is acclaimed as the "world's fastest fighter." Its top speed remains a secret.

The unusual wings are less than 22 feet long overall, and are thinner than those on rocket research planes. The leading and trailing edges are so sharp that sheaths are fitted on them to protect ground crewmen.

The wing down-droop is an aerodynamic design engineered to enhance precision control of the high tail. The T-shaped horizontal stabilizer has no elevator and moves as a whole unit.

In addition to its outstanding speed and performance, the 104 is described as a real "pilot's airplane." Tony LaVier, veteran engineering test pilot, says, "The F-104 is completely honest and a pilot's dream to fly." ●

Here is the second installment on flying the F-100. North American Aviation test pilots discuss how to spin and how to roll this airplane. FLYING SAFETY will continue to keep you informed on flying techniques and operational procedures of all the Century series aircraft.

Parade of the

YOU'VE PROBABLY HEARD many wild tales regarding the spin characteristics of the F-100. On all new airplanes, rumors concerning spins seem to spread like wildfire. Most of these are either completely erroneous or so greatly cloaked in fiction as to be worthless. The purpose of this article is to give you the straight, ungarbled word.

The F-100s have been flying now for more than 2½ years and have been in tactical use in Air Force fighter groups for 1½ years, yet I know of only two cases of pilots inadvertently spinning the airplane. One of these spins resulted when a pilot tried to do a loop from above 30,000 feet at 300 KIAS in military power (no afterburner). He didn't get over the top, and in trying to recover from a nose-high, on-his-back attitude while fresh out of airspeed, caused the airplane to yaw around (probably by unjudicious use of ailerons) through three quarters of a turn inverted where it came over right side up in a normal rotational spin.

The only other inadvertent spin of which I know occurred from a high-altitude accelerated stall, and I shall go into details on that later in this article. The points I'm trying to get over here are that (1) there is little chance of your inadvertently spinning the airplane, particularly if you read and heed this article, and (2) if you do spin the airplane and follow the correct recovery procedure, you are going to recover from the spin.

Spin Recovery

Here is the one and only spin recovery for the F-100A and F-100C. *Hold ailerons full with the spin, stick full back and rudder against the spin until rotation stops.* The airplane will then be in a stalled attitude. Recovery from this stall can then be made with normal stall recovery procedures—if the nose is extremely high, *pop* stick forward with rudder and ailerons as needed to hold wings level, or if the nose is low, *ease* stick forward with rudder and aileron deflection as needed to hold wings level.

With this procedure, recovery is effected from most spins in one-quarter to one-half turn in the F-100A, and in one to 2½ turns in the F-100C. Aggravated or violent spins may require up to four or five turns of constant recovery controls to bring about recovery. It is believed that even a completely flat spin would recover in eight turns or less with this recommended recovery method.

Experience has shown that it is of

F-100 Centuries

Spin Tests

J. O. Roberts, Engineering Test Pilot

no value to return to pro-spin controls and then go back to recovery controls. Once you recognize that you are in a spin and know which direction you are spinning, *apply full aft stick, full opposite rudder, and full aileron in the direction you are spinning* and hold these control deflections continuously until rotation stops or until you are 10,000 feet above the terrain, where you should eject.

If, because of some airplane malfunction or damage, recovery is not affected as described in this article, continue holding recovery controls and try pulling the drag chute handle. If the drag chute will come out (air loads are such that in a completely flat spin it probably will not come out), it may aid recovery. However, be prepared to jettison it once recovery is accomplished.

Spin Characteristics

We performed successfully more than 115 spins in F-100 type airplanes. They included spins in the clean airplane with landing gear down, with speed brake down, and with drop tanks and bomb pylons installed. Spin tests were conducted at medium and high altitude.

Because of adverse yaw, the F-100 will not enter a spin in the direction that the ailerons are deflected. Any time I tried to spin the airplane with the ailerons deflected in the direction of the intended spin, it started off in the opposite direction. However, on one occasion when a particularly violent spin was obtained in an F-100C, it was determined that with full forward stick, moving the ailerons over in the direction of the spin would not cause the spin to stop or even slow down. It was this spin, by the way, which finally proved that full aft stick was better for recovery than full forward stick.

With the ailerons held exactly at neutral, the airplane will not enter a true spin. With stick full back and full rudder in the intended spin direction, *but with neutral ailerons*, the nose pitches up and over slightly and then drops through to a 60 to 70 degree, nose-down position with very slow rotation rate. The airplane maintains this attitude while yawing slowly in the direction of the deflected rudder. Any time back pressure on the stick is released, the airplane flies right out.

If moderate amounts of opposite ailerons are added, the airplane yaws up to an attitude of approximately 20 to 30 degrees nose low and half-heartedly spins with the nose oscillating between this attitude and the 60 degree nose-down attitude. Any time neutral aileron is resumed, the nose falls back to 60 to 70 degrees below the horizon.

The only F-100 spins that I would call truly well-developed spins are those where full aileron or almost full aileron is held against the spin. The characteristics of this spin vary slightly from airplane to airplane and depend upon whether the spin is left or right. However, in general, these are the spin characteristics.

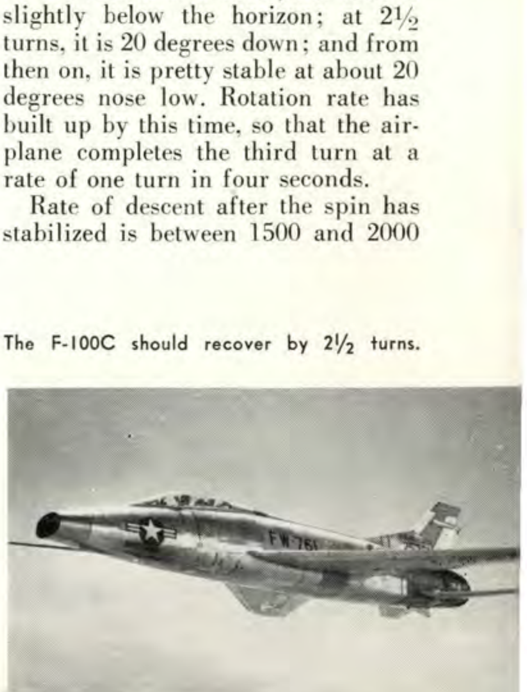
Yaw Builds up Rapidly

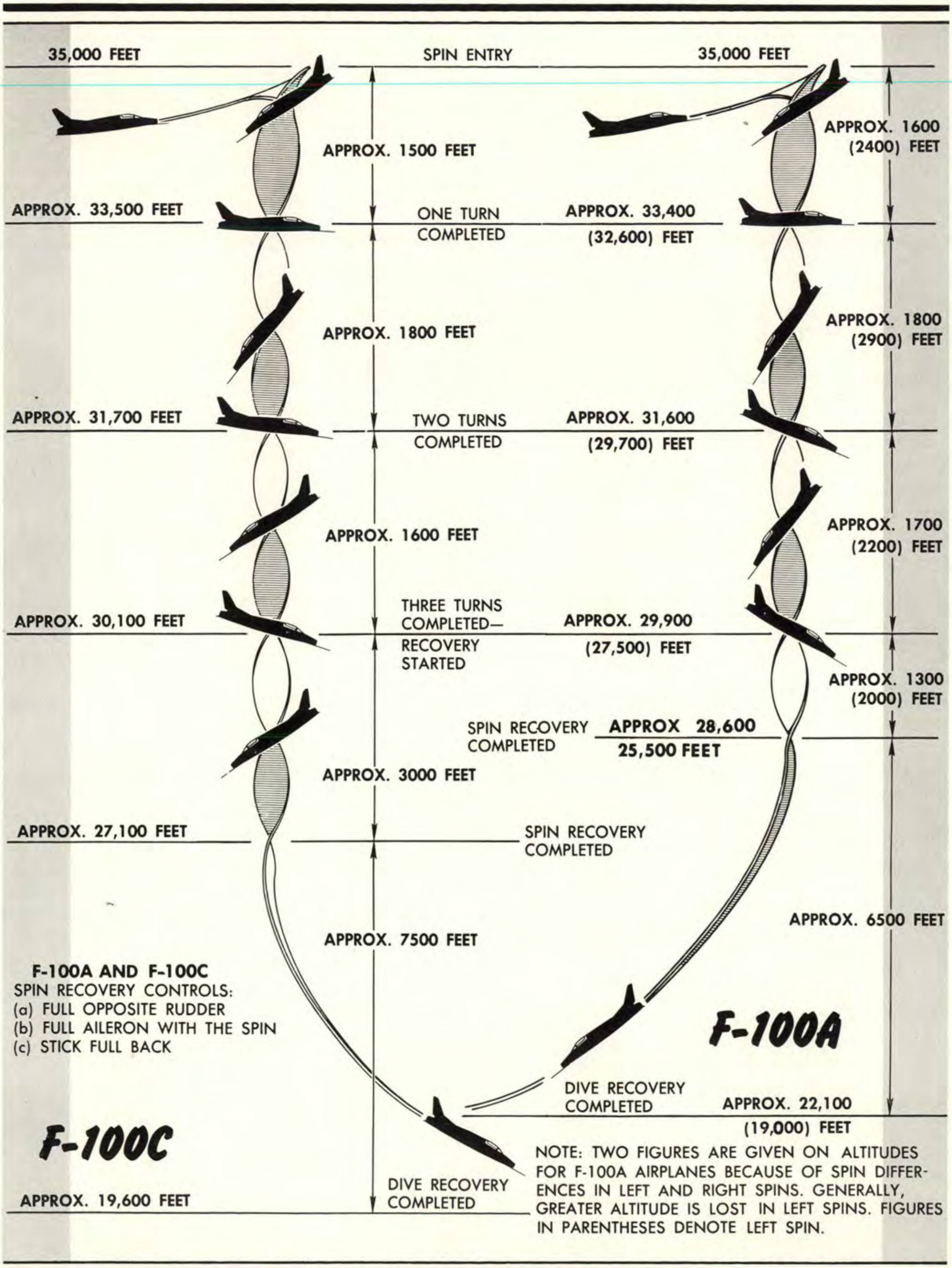
The nose pitches up and over in the direction of the intended spin and then drops to 50 or 60 degrees below the horizon at the end of one half turn. Yaw then builds up rapidly as does rotation rate, and the nose swings back up until it is at least level with the horizon at the end of one turn. On the higher altitude spins, the nose definitely is 10 to 20 degrees above the horizon at this point, and the pilot has the impression that the spin may be going flat.

In the F-100C, the nose then swings back down to an attitude of approximately 30 to 40 degrees below the horizon at the end of 1½ turns and again starts to swing back up again. At the end of two turns, the nose is slightly below the horizon; at 2½ turns, it is 20 degrees down; and from then on, it is pretty stable at about 20 degrees nose low. Rotation rate has built up by this time, so that the airplane completes the third turn at a rate of one turn in four seconds.

Rate of descent after the spin has stabilized is between 1500 and 2000

The F-100C should recover by 2½ turns.




35,000 FEET
SPIN ENTRY
35,000 FEET
APPROX. 1500 FEET
APPROX. 1600
(2400) FEET
APPROX. 33,500 FEET
ONE TURN
COMPLETED
APPROX. 33,400
(32,600) FEET
APPROX. 1800 FEET
APPROX. 1800
(2900) FEET
APPROX. 31,700 FEET
TWO TURNS
COMPLETED
APPROX. 31,600
(29,700) FEET
APPROX. 1600 FEET
APPROX. 1700
(2200) FEET
APPROX. 30,100 FEET
THREE TURNS
COMPLETED—
RECOVERY
STARTED
APPROX. 29,900
(27,500) FEET
APPROX. 1300
(2000) FEET
SPIN RECOVERY
COMPLETED
APPROX 28,600
25,500 FEET
APPROX. 3000 FEET
APPROX. 27,100 FEET
SPIN RECOVERY
COMPLETED
APPROX. 6500 FEET
APPROX. 7500 FEET
F-100A AND F-100C
SPIN RECOVERY CONTROLS:
(a) FULL OPPOSITE RUDDER
(b) FULL AILERON WITH THE SPIN
(c) STICK FULL BACK
F-100A
DIVE RECOVERY
COMPLETED
APPROX. 22,100
(19,000) FEET
F-100C
NOTE: TWO FIGURES ARE GIVEN ON ALTITUDES FOR F-100A AIRPLANES BECAUSE OF SPIN DIFFERENCES IN LEFT AND RIGHT SPINS. GENERALLY, GREATER ALTITUDE IS LOST IN LEFT SPINS. FIGURES IN PARENTHESES DENOTE LEFT SPIN.
DIVE RECOVERY
COMPLETED
APPROX. 19,600 FEET

feet per turn in the F-100C, between 1600 and 3000 feet per turn in the F-100A. The F-100A and C airplanes lose about the same altitude in the first turn, since the spin is not well developed until the latter part of this turn. Once the airplanes are spinning good, the F-100A loses more altitude in each successive turn because it spins more nose down than the F-100C.

In the F-100A, the spin remains the same in succeeding turns as in the first turn. The F-100A never tends to stabilize, but continues to oscillate with the nose 60 degrees down at least a part of each turn.

From entry altitude to recovery in straight and level flight after a three-turn aileron-against spin usually requires between 14,000 and 16,000 feet. One-turn spins require approximately 10,000 feet. This is why we say that you should eject if a spin is entered below 10,000 feet above the terrain or if recovery is not imminent at 10,000 feet from a spin entered at a higher altitude.

Spins out of 2G turns, spins with landing gear down, spins with speed brake extended, and spins with two 275-gallon external tanks installed demonstrated, with very minor variations, the same characteristics as those described. Spins entered at higher altitudes (45,000 feet and above) appear flatter with the nose coming higher at the end of the first turn. Spins in the F-100C with six bomb pylons showed approximately the same characteristics at 35,000 feet as clean airplane spins at 45,000 feet and above.

It is possible to get the F-100 into a violent spin by either (1) holding full, or almost full, ailerons against spin for several turns and then popping stick forward while still holding ailerons against spin (this may sound like something you would never do, but the forces in the cockpit on the pilot's body are such that unless you specifically think about avoiding it, you will unconsciously hold some ailerons against spin) or (2) stalling the airplane in a high-altitude, high-speed turn which may result in the airplane yawing violently and rolling up over the top. If the pilot opposes this airplane motion, the airplane will spin because of the aft-stick, aileron-against-spin control position.

Flat Spin Entry

Only one flat spin has been encountered in an F-100A airplane. This spin was entered in a manner peculiar to flight testing.

In the past, airplanes have had only enough elevator control available to produce the stall at low speed (a 1G stall). This was the determining factor for the size and throw of the elevator. Since the F-100 is a supersonic, as well as subsonic, airplane, it was necessary to provide a large movable horizontal stabilizer with a large throw in order to be able to reach accelerated stalls or limit load factor (7.33G) at supersonic speeds. (Because of a great increase in airplane stability in the supersonic speed range, greater movement of the stabilizer is required to obtain stall or limit G.)

Thus, on previous airplanes, it was the accepted test procedure for spin entry to decrease the speed at the rate of one knot per second until the stick was full back. This was done in an F-100A by an NAA test pilot, and in this manner, a speed well below normal stall speed was reached.

With external tanks installed, pilots should use the normal spin recovery procedures.

Usually, it is difficult for the pilot to hold wings level down to this speed, which was 108 knots. At this speed, the F-100A sinks like a rock. But with wings level and stick full back, the pilot simultaneously applied full left aileron and full right rudder. The airplane went into a flat spin in the first one-half turn, and from that point on, nothing the pilot tried altered the attitude of the airplane, which was nose on the horizon.

At the time of this spin, the accepted spin recovery procedure was to reverse rudder with neutral aileron, pop the stick forward, and hold for two turns. This control combination, as well as others, was tried without any success.

I definitely do not believe there is any way of getting the airplane into a flat spin other than the method herein described. Therefore, it is quite simple to stay out of a flat spin —don't do this. I also believe that holding the now accepted normal recovery procedure for seven or eight turns is the best possible way to recover from a flat spin.

Avoiding Spins

There are a couple of basic flying rules that I'd like to pass on to you on the subject of avoiding spins in the F-100:

• First, should you find yourself at the top of some acrobatic maneuver, plumb out of airspeed, and fresh out of ideas, don't *ever* try to force the airplane, through random control motions or cross controlling, back to a right-side-up straight-and-level attitude. Make no violent or large control movements; just hold more or less what you have and let her fall through a little sky (you shouldn't embarrass yourself by getting into these positions

★

J. O. Roberts flew P-40s in the Aleutians in 1943, and during his nine years with the Air Force has flown P-47s, P-51s, P-80s and F-86s. While flying the F-86 in Korea he was credited with downing one MIG-15 and credited with damaging another.

He attended Yale for two years, and graduated from the Air Force Test Pilot's School at Edwards AFB, Calif. He has been an engineering test pilot for North American since March 1952. He flew in the test programs of the T-28B, F-86D, H; F-100A and C.

at low altitude) until it is flying again. *Then* fly it back to where you want it.

• Second, and this is closely related to the first, remember that whenever an airplane stalls, its control surfaces don't have normal effectiveness. Therefore, as they taught you in primary, make a stall recovery first; then fly it with the controls. Here I am referring particularly to high-speed, high-altitude accelerated stalls. The F-100 will yaw and roll up over the top, but it is stalled, whether you think you did it or not, so don't oppose these airplane motions with the controls. Use normal stall recovery of going with the maneuver, going forward on the stick. Only after you have it flying again should you resume what you were doing.

In this manner, you should be able to avoid spinning so that you don't have to use that accepted recovery procedure of:

- Full aft stick
- Full opposite rudder
- Full aileron with the spin. ●

Rolling the "100"

Herbert "Zeke" Hopkins, Engineering Test Pilot

AS MOST OF you probably know, the Air Force has a specification for the flying qualities of the airplanes it purchases. This specification covers everything from soup to nuts, and that's a lot with airplanes like the F-100. The F-100 was built to comply with military specification 1815B, published in 1948 when certain of the characteristics encountered in the F-100 weren't even gleams in the designer's eye.

This article is intended to cover the roll characteristics of the F-100 where differences from past airplanes have been encountered.

There are a number of ways to cause an airplane to roll. You can lean, use engine torque, ailerons, spoilers, flaperons, rudder or various combinations. In high-speed flight, the conventional outboard-mounted aileron, when deflected, causes the wing to twist to such an extent that in extreme conditions the airplane will actually roll in the opposite direction. To try and eliminate this problem, our designers chose conventional ailerons set at mid-span for the F-100. The control surface is in two parts so that wing twist will not apply excessive twisting forces to the aileron. With the ailerons placed at mid-span, no aileron reversal is present up to maximum dive speed.

Adverse Yaw

Now, what characteristics result from this two-piece aileron that require watching and understanding? The first is not new—adverse yaw. When the ailerons are deflected on most airplanes, the "down" aileron (upgoing wing) has more drag on it than the "up" aileron, causing the airplane to yaw in the direction opposite to the roll; hence "adverse" yaw. In the F-100, with ailerons powerful enough to give a satisfactory rolling rate at maximum dive speed, it stands to reason that at lower speeds roll rate will be quite high, and at certain speeds this means a high value of adverse yaw. Without going into too much technical detail, the adverse yaw tendency is greatest subsonically at high altitude. Incidentally, adverse yaw will not show on the turn-and-slip indicator because the ball is above the airplane roll axis, and inertia will move the ball in the direction opposite the way you move the stick, erroneously showing favorable yaw.

At speeds above approximately .9 Mach, because of changing aerodynamic effects, the yaw due to aileron deflection actually reverses and becomes "favorable" yaw, reaching a maximum at approximately 1.2 Mach number. At this Mach number, if you jam the stick hard over and hold it, the rate of roll will continue to increase, as will the yaw angle. Eventually, you could exceed the structural limits of the airplane. It takes more than one full 360-degree roll for this to happen, how much more depends on other factors, so the F-100 is limited to full aileron of sufficient duration to produce one complete revolution. This may mean returning the aileron to neutral as early as 270 degrees of roll. As a matter of interest, rate of roll is higher in right rolls than in left rolls because of engine torque effects.

High Roll Rate

This brings us to the second characteristic—high roll rate. If you slap the stick over to one side at .8 Mach number, it won't take you more than a few hundredths of a second to know that you've really got a tiger by the tail. In another fraction of a second, you're rolling so fast you begin to lose orientation. Because of yaw and pitch rates, you're getting some uncomfortable knocking about in the seat, and if you're human, you'll slack off on the stick. A good criteria is: Do not roll any faster than is comfortable and you'll never get into any trouble. The airplane needs all of that deflection at extreme speeds—the pilot can use a lot less than full deflection very nicely at most normal speeds. The maximum roll rate of 220 degrees per second is quite a bit higher than most pilots can comfortably tolerate.

Probably the most serious problem connected with rolling is a characteristic called inertial coupling. If you'll excuse a little technical poop, the coupling terms in the equations of airplane motion have heretofore been small numbers which, when multiplied together, had such a negligible effect on the result, they were neglected. Normally, they're referred to as second-order terms. They were neglected once too often and some pretty violent snap rolls occurred, so now nobody neglects them no mo'! Physically, it's a little difficult to draw an analogy. If you're flying along level at a certain angle of attack and instantaneously roll 90 degrees, then angle of attack becomes an angle of yaw. Throw in more yaw, due to aileron deflection, and a little from other sources, and the airplane has not only a roll rate but also a yaw rate.

Make another instantaneous 90-degree roll to inverted, and this deflection from the flight path turns into a negative angle of attack, so now we have a pitch rate. There's an awful lot of weight concentrated along the fuselage of all modern fighter airplanes. This means high inertia. Once all of these rates start building up, the airplane begins to gyrate about all three axes, and the inertia about each airplane axis begins to affect motion about the other two, hence you have inertial coupling.

One analogy that might help is that of the dumb-bell. If you suspend a normal weight-lifter's dumb-bell from its center of gravity and spin it so that the axis of spin is right down the long axis, through the center of the handle and through the middle of the balls on each end, it will spin properly. But just touch one end, to start a slight motion in another direction and the inertia of the spinning balls will affect this motion. In very short order, the dumb-bell will be gyrating wildly about all three axes, posterior over teakettle. Of course, the airplane isn't nearly this bad, because it has vertical and horizontal stabilizers, but if roll rate is too high, the inertia forces can overcome the stabilizing forces of the tail surfaces. It was for this reason that a bigger vertical tail was put on the airplane. Inertial coupling contributes to the yaw due to roll, so that even when you roll supersonically, where yaw is "favorable" (in the direction of roll), the yaw angles get quite high. Understand now, if you operate according to the Dash One, you're not going to have any trouble. If you exceed the limits, you're on your own.

Know Your Aircraft

Of course, the reason for this article is to familiarize you with these quirks in the character of the F-100. This is always the best way to get the most out of your aircraft—know all there is to know about it.

With the high performance we deal in today, it's getting to be a bigger and longer job to nail down all the various flying qualities in engineering flight test. Hence, it takes longer for this information to get to you. It's more important than ever that you operate within the published limits because everything within that range has been checked out. Outside the published limits, there may be large areas where information is incomplete. You certainly don't want to panic if you inadvertently wander into some forbidden area. But—you're flying an expensive hunk of machinery, so why not be smart and stay within limits? Large engineering staffs of aircraft companies and the U. S. Air Force's own engineers are in the business of figuring out what you can and can not do. Don't think you can second-guess them.

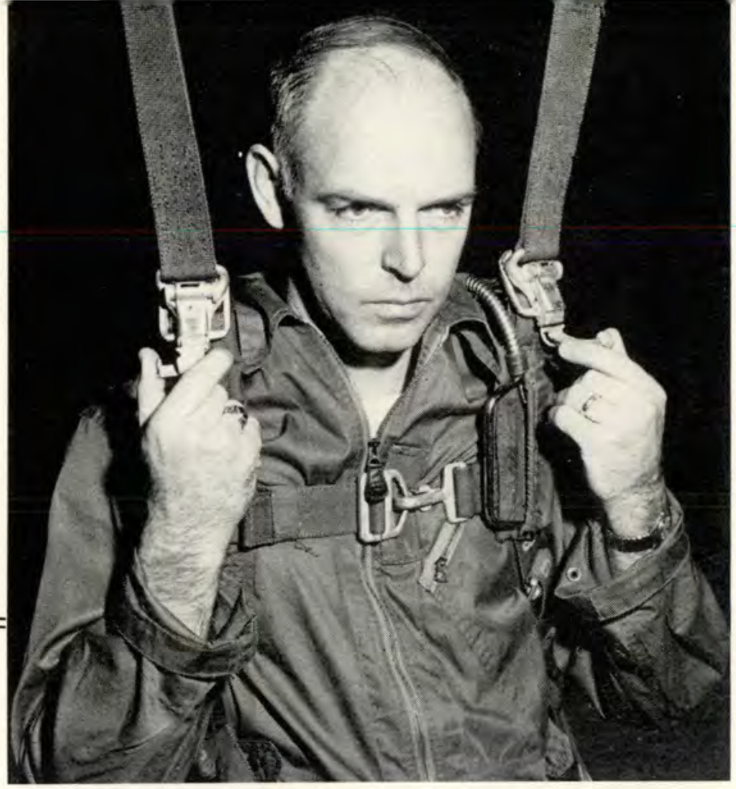
Back to rolls. Our test pilots feel that a maximum rolling rate in the neighborhood of 180 degrees per second is all you'll ever need, provided that you can get this rate in a hurry. However, indications are that the inertial coupling problem is going to get more serious as we progress to higher model numbers, so some sort of roll limiter looks like a future black box. This gadget would operate to slack off on the ailerons for you, and would enable you to get the most out of any maneuver at any speed with safety. These gismos have been known to fail, however, so we're back to "know your airplane" as the surest way to effectiveness in the air. ●

Herbert "Zeke" Hopkins is an engineering test pilot currently engaged in the F-100 flight test program. He is a graduate of the U. S. Military Academy and holds a Master's Degree in Aernonautical Engineering from Princeton. Prior to joining North American in 1955, he was flight test engineer at Wright Field for a year and a half and Air Force test pilot at Edwards Air Force Base for four years.

★

RISER SHARP

Captain Joseph P. Davies, Jr.
Aero Medical Safety Div., D/FSR



Step One. Pilot suspended in harness uses right and left hands to pull out and down on the canopy guard release. Do this when approaching ground or water.

"THE BAILOUT AND descent were uneventful except for greater swinging and oscillation than I expected, but I was dragged for about 200 yards before I could pull the bottom risers in and collapse the canopy." . . . "The ejection and parachute opening were 'no sweat' but I slid across four miles of ice before I could collapse the parachute canopy."

For some time now, the Air Force has been equipped with a Class III parachute harness. This harness is used on all types of chutes—seat, chest and back. It can be adjusted quickly to different sized personnel and a particular advantage is that by operating one or both of the canopy releases, the canopy can be deflated quickly or released completely, after landing. Thus, it is designed to prevent personnel from being dragged through water or across land.

Canopy release just below collarbone. Chest strap approximately 12 inches below chin. Note right hand tightening right back strap.

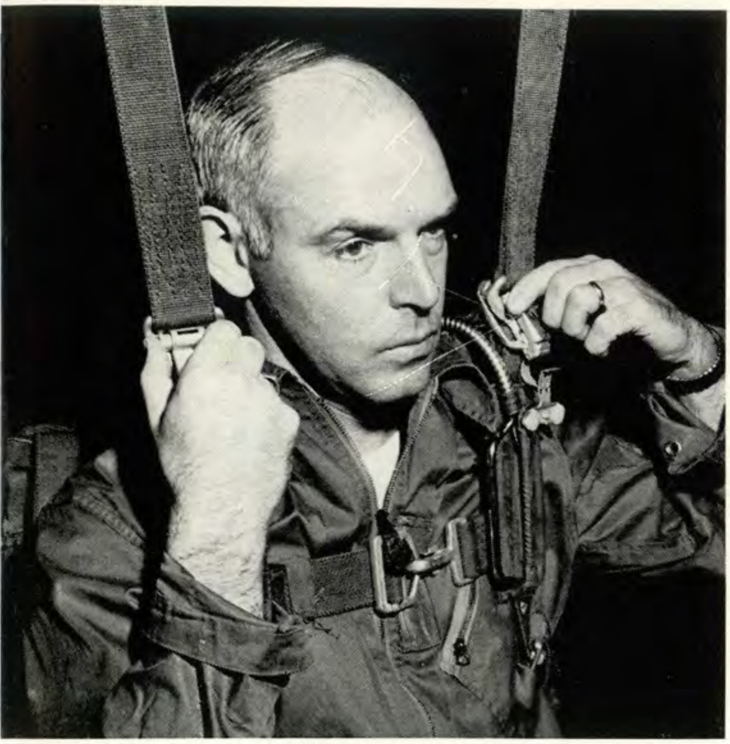
Unfortunately, accident and bailout records show that very few crewmembers know exactly how to use the canopy quick release mechanism. Also, many do not adjust the Class III harness correctly so that the canopy release mechanism can be used easily if necessary.

The canopy release mechanism should be located just below the collar bone. You find it by placing your predetermined Index Number on the vertical harness straps.

Even when wearing bulky clothing, the Index Number will ordinarily remain the same. Many crewmembers have been loosening the vertical chest harness straps to accommodate increase in bulk. This adjustment should be made by loosening the diagonal back straps. Otherwise, the canopy quick release mechanism moves up toward the top of the shoulder. Unless a man is a real Goliath an Index Number below five should not be used.

Now as to operation of the canopy release mechanisms. A recent operational survey by personnel of the Directorate of Flight Safety Research,

Step Two. When contact with the ground or water is made, the buttons should be squeezed and clip rotated out and down.



Step Three. The right hand riser is free. Canopy will collapse. Try these three steps. Convince yourself that you know how.

proved that a great percentage of crewmembers who were suspended in a Class III harness did not know exactly how to unfasten the canopy release. Further, they were afraid to remove the release guard while suspended in air.

The time consumed by most of these crewmembers in getting this guard unfastened and then actuating the release, would result in being dragged a considerable distance under high wind conditions. Many who experienced difficulty thought that after removing the release guard, the canopy risers would be released merely by squeezing the two buttons on the release. This is not true. Actually, one or both release guards should be removed by pulling out and rotating the guard down as the ground or water is approached. Then with the right hand on the right release and/or the left hand on the left release, as soon as contact with ground or water is made, the buttons should be squeezed and the mechanism rotated out and downward. Releasing one side of the canopy is sufficient to spill all the air.

Survival equipment is attached to the Class III harness. Consequently the harness should be retained during water parachute landings.

Properly used, the canopy quick release mechanism offers real advantages. Certainly, there is no excuse for crewmembers being dragged any appreciable distance by their parachutes, if they are physically able to actuate the quick release.

Your organization can profit by emphasizing a proper fit and adjustment of the Class III harness, and by suspending a Class III harness and having each crewmember sit in the harness and operate the canopy quick release mechanism while his full weight is being applied on the harness. Try this at your next flying safety meeting. "Take the wind out of those sails." ●

the Professional Approach

Lt. Col. Robert S. Walker, Jr., Commander, 84th AR Sq.

TO FACE EACH flight with the confident knowledge that we will not unnecessarily jeopardize our lives or our equipment should be the goal of all of us who fly. Yet, accidents do happen and it has been established that relatively few of them are the result of Divine Providence. Somewhere along the path from the hangar to the scene of the accident, human frailty manifests itself. Indifferent inspection, hasty planning, faulty knowledge, inadequate supervision, unsound judgment and poor technique are but a few of the many terms used to describe human shortcomings sifted out by accident investigating boards.

It is the pilot in command of the aircraft who is entrusted with the bulk of the responsibility for safe flight, for he is there, on the scene, throughout the flight. Yet, he is limited by the framework within which he must operate—his own inadequacies, those of his crew, his supervisors, the quality of maintenance and the many support functions. So we are all involved, and we must ask ourselves how we can help to close this gap of human deficiency, how we can reduce the toll of unnecessary accidents. It is the theme of this article to suggest that a truly professional approach to flying safety may help every pilot to achieve this goal.

First of all, what is meant by a professional approach? We are all familiar with the term "the profession of arms." We can name other professions such as medicine, law, theology and teaching.

What special characteristics render a profession different from other forms of employment? Essentially, a profession is more than just a means of satisfying our material needs. Its focal point is public service. It signifies a body of people dedicated to the intrinsic value of their works as a contribution to the general welfare. It is characterized by a rigid, well-defined and morally elevated code of conduct. Its members are expected to subordinate their desire for personal gain and self-gratification. They are encouraged to study, to acquire knowledge, to explore ideas, to conduct research, to seek and accept responsibility, to become effective leaders within their community and society and above all, to give their very best to the work now at hand.

A professional approach to an objective then would mean the adoption and application of the attitudes and values suggested above. Moreover, the non-career officer or airman will recognize that these attitudes and values are pertinent and worthwhile in other walks of everyday life as well as to the military profession.

How would a professional approach to our duties stimulate flying safety? Perhaps some specific illustrations would prove the point. The truly professional man regards study and the acquisition of knowledge as a never-ending process, never really fulfilled to his satisfaction. He cannot be content with an eight-hour workday without also losing ground in this respect. Therefore he accepts as the normal course of his responsibility the obligation of study, research and investigation in his field.

Most of us would admit readily that

"... encouraged to study, to acquire knowledge, to explore ideas and give their very best."

Do you know the background and capabilities of fellow pilots? Will they follow you without hesitation? These are part of the code of ethics which govern our profession of flying.

there is a tremendous body of information that we lack concerning our equipment, the medium through which we fly, the procedures that control our flights, the background and capabilities of fellow crewmembers and the psychology of leadership, to list only a few broad categories. When one considers the already heavy workload for the eight-hour workday, it is dishonest to think that we can make real gains in these areas without consistently applying extra effort "on our own time."

Accident records frequently credit the absence of some vital knowledge concerning equipment or procedures as the principal cause of an accident. Moreover a critical determinant of sound judgment is the adequacy of the information establishing and reinforcing our decisions.

As another illustration, let's examine the code of ethics which governs our profession and apply it to flying safety. Loyalty, dependability and integrity constitute some of the important components of this code. Is the pilot being loyal to his office of public trust and to the men who must fly with him when he jeopardizes both by wilfully violating flying regulations? Is the navigator demonstrating his dependability by showing up late for a briefing with a hastily prepared flight plan? How much integrity does the aircraft commander display when he openly initials the PIF without bothering to read its contents? Such acts are not only contrary to our professional code, but they also prejudice discipline and undermine the confidence of superiors and subordinates alike.

There have been many aircraft accidents which trace their origin to the causes suggested above. Is it possible to relate the professional approach toward personal gain and self-gratification to flying safety? The answer is an emphatic yes.

Consider some of the components of a personality oriented toward these goals rather than away from them. He is likely to be selfish, to seek glory or prestige at the expense of others and to possess an abundance of false pride. Perhaps he even considers himself infallible in his desire to erect a defense against every real or imagined challenge to the wisdom of his final decisions or plans.

Such a man is not likely to be interested in expanding the training or capabilities of his crew. He may take great risks for his own personal convenience without considering those who must fly with him. He might be inclined to discourage advice or suggestions from subordinates, thereby increasing the margin for error and an accident. The professional approach toward flying safety can not accommodate this individual.

In the preceding paragraphs we have tried to present the significance of a truly professional approach toward our responsibilities in the interest of flying safety. It is a human trait that all of us like to believe in the worthwhileness of the activities that dominate an important part of our lives. As members of an honorable and exacting profession we can not help but derive a special satisfaction that accrues to each of us as a result of such membership.

Regardless of how we choose to label ourselves, truly professional status is accorded only those who deserve it and it is not deserved unless we continually apply the attitude and values of the professional approach to the responsibilities of our office. In so doing, we can not help but close the gap in human error that is so costly to ourselves and our people. ●

REX SAYS

A FRIEND OF mine who's an FSO at a training base sent me a copy of his flying safety bulletin recently and asked for my comments. I told him that I was forwarding it to Rex for study.

"Many times an aircraft will call over the radio as follows: '33245, Number One.' Number One, where? Accidents have been attributed to confused traffic instruction such as this. *Clarify your position.* The greatest amount of confusion lies between Number One on taxiway and Number One on runway.

There is need for some type of phraseology to distinguish between these two positions.

Until something is standardized and to avoid confusion, use:

Number One on *taxiway*.
Number One on *runway*.
Number One on *final*.
Number One on *downwind*."

***REX SAYS** — Until some other phrases are approved, I'll go along with the above.*

★ ★ ★

CONTINUALLY SWITCHING from Channel One to Guard Channel UHF while getting DF steers can be a dangerous practice.

The T-33 pilot had received an advisory of his plotted position and had been given a heading to fly to the nearest Air Force base. Every time the tower tried to contact him, he had switched channels. Twelve minutes later after subsequent steers had been given, a second advisory pin-pointed him in the same respective area.

Finally, he settled down on Channel One and was brought precisely over the airfield.

***REX SAYS**—This lad was working real hard to get the DF boys shook. Must have been frustrating to chase him through all 20 channels.*

★ ★ ★

HERE IS THE case of the dangling D-ring.

The pilot had tried unsuccessfully to airstart the F-86. He tidied up the cockpit, released the canopy and squeezed the ejection trigger. Up and back he went. At the top of the arc, the seat separated from him and he began to tumble. He grabbed for the D-ring, but no D-ring. His clutching fingers found the cable and followed it down until the ring was located. He yanked hard and the chute promptly opened.

His comments are pertinent.

If the D-ring is not held securely in the pocket, get it fixed. Take your parachute to the personal equipment officer or the parachute department and make them secure the D-ring.

***REX SAYS**—This is the third account that I know about where the D-ring has come out of its retaining pocket. If this should happen to you, remember that it will travel only about five inches. Seek and ye eventually shall find.*

★ ★ ★

LOCAL EXPERIMENTS conducted at an Air Force base last summer had some very interesting results. With a ramp temperature of 90°F, the uncovered cockpit of a newly parked jet got up to 170°F in 40 minutes. Covering the cockpit with an aluminized canvas cover kept the temperature down to 120°F. Oxygen masks left in the uncovered cockpits became sticky and were damaged. Those masks left in covered cockpits were not so affected. MORAL — Get covers for cockpits and don't leave oxygen masks in uncovered ones when the temperatures are high.

***REX SAYS** — Nothing like a hot seat for a steaming stone.*

★ ★ ★

I'VE BEEN A crew chief on C-124s ever since our group received them. I've got as much rope and ladder time in them as some of our young copilots have flying time. I witnessed an incident recently that reaffirmed my belief that using the old rope and ladder routine is the best way to get up into and down from the lofty pilot compartment of a 124.

We were on the last leg of this flight. It was IFR with moderate turbulence. I was dead-heading this leg and was sitting in the cargo hold shooting the bull with a few of the passengers that we had picked up at our last stop.

The Big Brute was bouncing considerably. I glanced up and saw the copilot start down the ladder. Instead of facing forward and grasping the ladder or guide rope to help him descend as recommended, he faced aft and stepped down to the first rung. You probably know what happened. About half way down the ladder, a sudden gust caused the 124 to pitch real viciously.

He lost his balance and caught his arm in the flight deck door. By the time two of us reached him, he was dangling helplessly and yelling for assistance. Luckily, his arm was only badly bruised.

REX SAYS*—Climbing down a ladder to success is just as important as climbing up the same ladder.*

★ ★ ★

I'M NOT SO HOT at this writing stuff so if old Rex will overlook my editorial ignorance, I'd like to pass on something of interest.

Not long ago a friend of mine, civilian type pilot, showed me a very interesting bit of reading. The literature was a Special Safety Alert bulletin, and the subject was an accident in which a pilot lost control of his aircraft in instrument weather shortly after takeoff. After a number of uncontrolled dives and climbs into the low clouds, his aircraft lost a wing and dived right into a nearby apartment building. The accident resulted in extensive damage and loss of life. The pilot was fatally injured.

During the course of investigation by the Civil Aeronautics Board, some important facts about the location on the aircraft of the Grimes anti-collision rotating beacon were brought out. I understand that the Air Force has the Grimes light on a few of our B-36, C-45, T-29 and C-131 types, so the findings of the CAB may be of interest to us.

Accident investigators became interested in the Grimes light when witnesses reported seeing two rotating beacons flashing brightly on the aircraft prior to the crash. Investigation led to the discovery that mechanics had warned the pilot of the fact that he had the two red rotating beacons installed too far forward on his aircraft. They had advised him that the reflected light from the beacons might prove serious, if not dangerous.

In order to determine the significance of these lights in relation to the accident, the CAB had two such beacons installed in the same location on an aircraft identical to the one involved in the accident. The aircraft manufacturers' own pilots conducted the flight tests, accompanied by a CAB safety investigator.

A test was made under IFR conditions. Both rotating lights were turned on when the aircraft approached scud at the bottom of the overcast. Upon entering each successive cloud tuft in the scud the upper rotating light produced bright red, intermittent, blotchy glares of far greater intensity than could possibly have been anticipated. The sweeping action from left to right introduced a degree of vertigo requiring the fullest concentration possible on the flight instruments to maintain control of the aircraft. The upper light was turned off and the lower light produced a similar result, though to a far lesser degree.

The aircraft was then pulled up into the solid overcast and both rotating lights were again turned on. The intensity of the glare from the solid cloud increased substantially over what it had been in the scud. The sweep of the upper light from left to right produced an intense bright red revolving glare within the cabin through a continuous arc of about 280 degrees. Simultaneously the lower light produced a contra-rotating glare through a broken forward arc of about 200 degrees. The combined result produced extreme vertigo in a very short time. No individual experiment could be continued safely beyond an interval of 30 to 40 seconds duration. A number of tests were conducted and in no case was the positive control of the aircraft possible beyond the approximate period of its inherent stability.

REX SAYS*—If your outfit is slated to install the Grimes light, make sure that the following recommendations are observed. They are the result of the flight tests that CAA officials and company pilots discovered in solving this accident.*

- *The beacons should be mounted as far back on the fuselage of the airplane as possible, strictly in accordance with the T.O.*
- *Professional pilots turn off the beacons when actually flying in clouds, on instruments. The beacons are not intended for such use, but are only for VFR conditions or in restricted visibility.*
- *The installation should be checked for reflections. If adverse reflections are discovered, parts of the beacon can be masked to eliminate the dangerous reflection from the aircraft structure. UR where appropriate.*

★ ★ ★

GROUND CREWMAN congregate in our maintenance office quite frequently which accounts for the issues of FLYING SAFETY in our file becoming so dog-eared soon after they are received.

The other day a couple of crew chiefs were grousing about some pilots who do not dim or turn off their landing or taxi lights while their aircraft is being parked on the ramp.

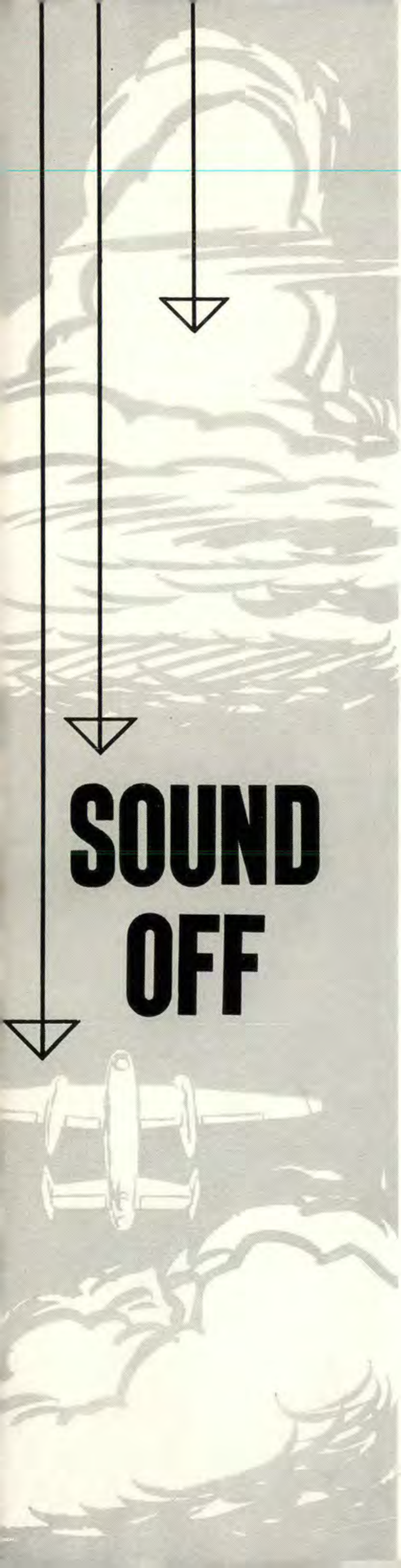
Since ***REX SAYS*** is a sounding board for the odds and ends of flying, we wondered if he would "air" this problem facing ground crewmen.

With the full candle power hitting them smack in the eyes, it is a difficult job for them to park some types of aircraft. AFR 62-10 covers hand signals that ground crewmen will use but there isn't any hand or arm waving that covers dousing the lamps.

All they ask is that pilots slow down their taxi speed and when they turn into that final slot for the last few feet and see the fluorescent wands or flashlights beckoning to them, just reach up and flip that light switch off. It's easier on the eyes that way.

REX SAYS*—Lights out. Well, not quite, but this maintenance officer has a valid idea. An aye for an eye.*

SOUND OFF



LETTERED IN RED ink at the bottom of a checklist in a base weather station is a message that exemplifies pilot reports (PIREPS). It reads, "Inflight and postflight weather reports help us to help you."

Many of you probably have seen such a sign, yet, how many of you have used or contributed to this service? There is one very good reason why you should know about PIREPS and use them, and that is the current, existing weather, used with a forecast, will give you the best idea of what to expect. And there is nothing so current as an accurate, promptly transmitted PIREP.

It's a foregone conclusion that once you understand how a thing works, you are more likely to accept it. So, for your understanding and acceptance here is an explanation of PIREPS. Use them to help yourself and at the same time, help others.

In addition to you, the primary users of pilot reports are the weather people. They use these reports in a variety of ways.

General Information

They use them on maps and in briefings and in making forecasts; they display these reports for the general information of aircrews, and they are used in special analysis of unforecasted weather phenomena.

What sort of weather conditions must exist to warrant a PIREP? Well, AFR 60-16 says you should report "any unusual weather conditions encountered that were not forecast." Assuming that you do run into some weather, not as forecast, it is important to get the word out immediately. So, all you have to do is contact the nearest radio facility and give them the information. Don't wait until you land to tell all.

There is a guide on the back page of the Radio Facility Chart that you should follow in giving a PIREP. It states, "Report weather encountered in the following sequence, APPENDED TO POSITION REPORT. Hazardous weather should be reported as soon as practicable.

- Any unusual weather.
- Turbulence.
- Icing, altitude encountered.
- Precipitation, type and intensity.
- Clouds, amount, type and height.
- Temperature.

Now, how does a PIREP get from you to a fellow pilot?

Suppose you are over the Austin, Texas radio range station, northbound, at 21,000 feet. The weather officer at Laughlin AFB, Texas, had forecast the possibility of isolated thunderstorms in the Austin area and sure enough there they are. Only one thing is wrong, however. They are not isolated; they have developed into a solid line of real bumpers. Being the conscientious type, what can you do to let the next guy who comes along, know about the new situation.

Simply get on the horn and give Austin radio the information.

Teletype Circuit

Austin radio, in turn, contacts San Antonio ARTC who puts the PIREP out on the normal teletype circuit. Lots of people can make use of your contribution. (In base weather stations, there are clipboards with the hourly sequence reports on them from civilian reporting stations. Your PIREP will show up there for the benefit of any pilot flying around the Austin area.)

In addition, the Austin radio broadcasts this information in the open immediately and includes it on the 15-minutes and 45-minutes past-the-hour weather reports.

Another example of the use of a PIREP is the report you give your local forecaster after takeoff.

The tower operator relays your report to the forecaster. After proper coding, it is reflected on the next hourly sequence with the letter A in front of it, which designates it as a pilot observation (aircraft).

How do weather people feel about PIREPS? When the weather is the lousiest, they are the busiest, but they are never too busy to have you bend their ear with a postflight report.

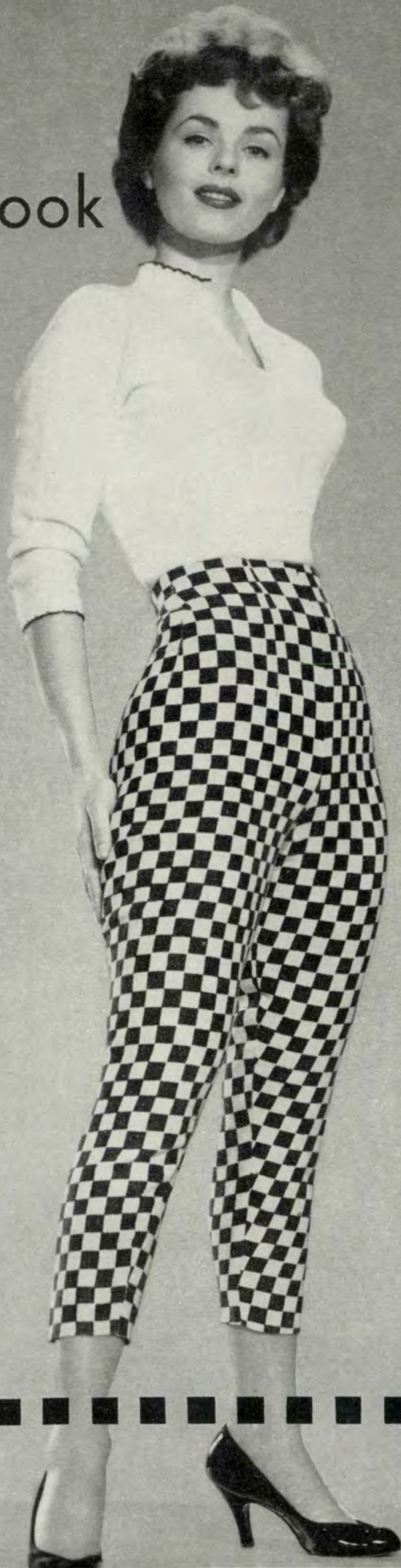
What do you do if a forecaster is deluged with anxious pilots waiting to leap off and you try to get to him with your inflight report? Very simple. Just latch onto one of his assistants. They'll log what you have to say on a pilot report form.

Write It Down

If you can't find a body to give this information to, don't give up in disgust. Put the facts down on paper or better yet, list them in the remarks section of your Form 175 and hand it to the Airdrome Officer. Let him know about it and he'll get the word to the weather officer.

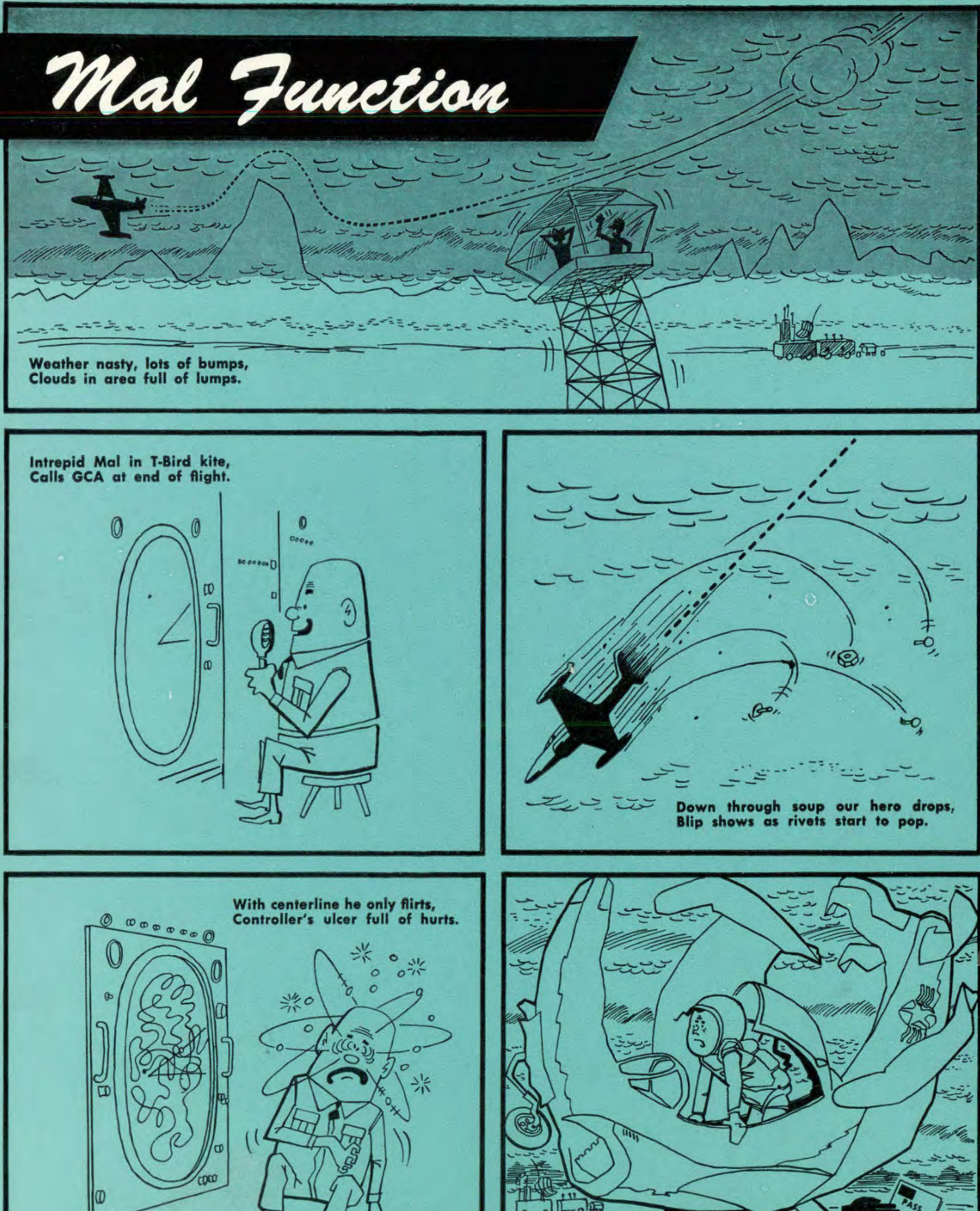
So there you are. All checked out on PIREPS. Avail yourself of the service and as the saying goes, "He who helps others, helps himself." So, help yourself with a PIREP. ●

the New Trim Look



Take a good second look—at the 'trim look' article on page 10—for some changes coming up on navigational charts. Like this little gal, you'll find them very neat and trim around the edges.

As for her ensemble, anybody for checkers? Your move.



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