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FLYING SAFETY

UNITED STATES AIR FORCE

From Oh to Zero...

PAGE 4

FLYING SAFETY

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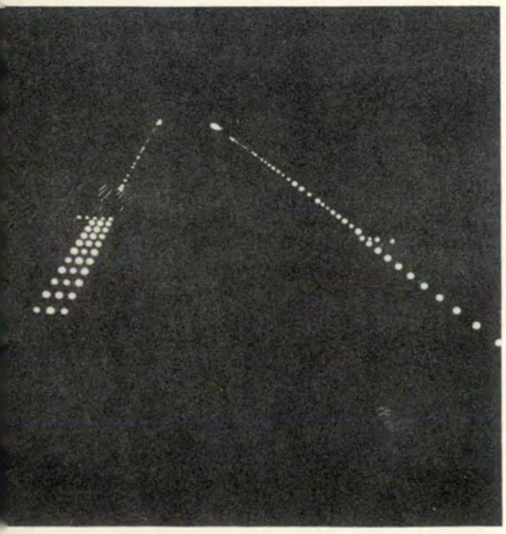
CONTENTS

Where are you? If you are not sure, see the article appearing in next month's FLYING SAFETY.



SUBSCRIPTIONS

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AT LAST!

AN AEROPLANE FOR EVERYBODY!

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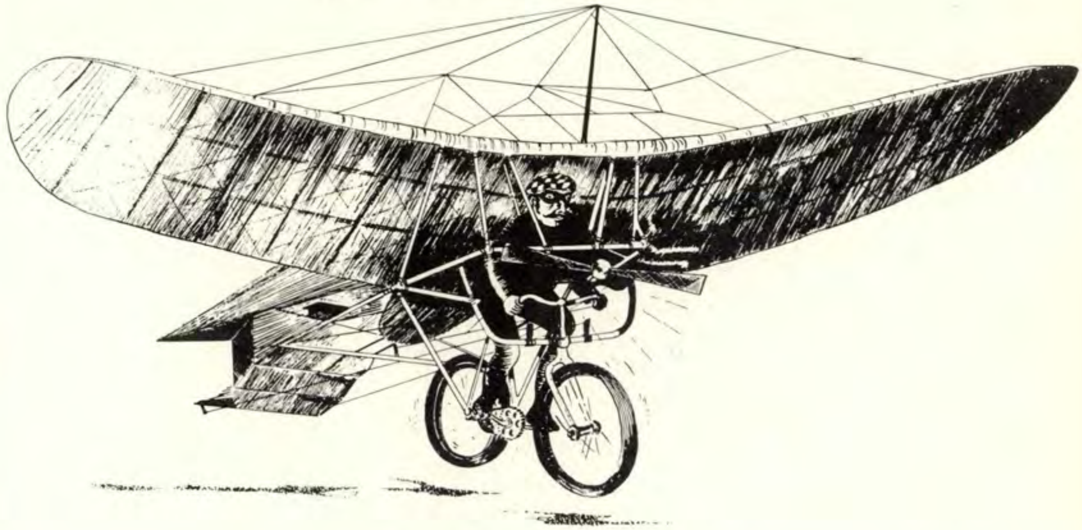
Think of flying with mere foot power. It pedals like an everyday, inexpensive bicycle. This is the only aeroplane that will do it. It is the smallest and most efficient of all aircraft. No longer is flying the sport of acrobats and millionaires. Every man and boy in the world can build one of these remarkable aeroplanes with ordinary tools in a few weeks and learn to fly at home with safety. No shop is needed. If you can use a hammer, saw and a pair of pliers, and have a shed, barn, a basement or a back yard you can build one of these remarkable fliers for a few dollars and in your spare time if necessary. Costs run less than 1/50 the cost of the average aeroplane and can be built for less than a fifth the cost of going to a flying school. It is the smallest, simplest, safest and most successful aeroplane in the world. The wonderful . . . . . .

BICYCLE-MONOPLANE



YOU CAN BUILD IT

Remember, this is not a toy or an experiment, but a thoroughly perfected man-carrying aeroplane with 18 foot spread and a speed of **several miles an hour.** Lifts 190-pound man with the greatest ease. Hundreds are already in use in the United States, Canada, Mexico, South America, England, Australia and the Philippine Islands. Hundreds of amateurs are building and flying these Bicycle-Monoplane aeroplanes, men and boys who knew absolutely nothing about aeroplanes and flying before. It is the simplest and safest flyer in the world.

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Yes, sir! Them was the days. Probably the fearless aeronaut didn't have to be an acrobat or millionaire to enjoy every mad moment of this contraption, but such a background might have been helpful. It's just a bit different today. The poor but honest aeronaut is flying a million-dollar machine and he's working for one of the biggest organizations in the world — The United States Air Force. His knowledge, training and responsibility represent a tremendous investment. And, unlike his predecessor, he cannot leap onto his bicycle-monoplane and pedal off into the blue, but rather lights the fuse and roars away at supersonic speeds. Efficiency of flight can only be achieved by constant study, assimilation and practice.

LETTERS TO THE EDITOR

Some of our readers want us to re-emphasize a point in the article titled "You-Safe Co-Op" that appeared in the April 1955 issue of FLYING SAFETY. You may remember that we were discussing the overall flying safety program that has been implemented within USAFE. At one point we stressed the value of standardized techniques and procedures and noted that the supervisory people over there have taken approved standards and lumped them together into usable packages.

Every pilot knows it sometimes takes a lot of digging to find all of the answers on any airplane. This is especially true of emergency procedures and the neat, packaged deals that USAFE produced are hard to beat for handiness.

Everything that they have lumped into the small, compact instructional books, is taken from applicable technical orders. They've eliminated the maze of "we-dare-you-to-find-it," so common to certain TO's and put basic know-how at the pilot's fingertips.

★ ★ ★

C-1 Survival Vest

Maybe I'm just hard to please, but after some first-hand experience with the C-1 survival vest during this last eastern fracas, I decided that it could be improved upon. I put in the usual gripes and got the usual action. Nothing. Repeat, nothing.

I don't go too much for this griping unless the gripe is accompanied by a better solution or at least a constructive suggestion, so-o-o I thought my next move had best be to come up with the same.

Working with the local parachute shop to take care of the necessary stitching, my recommended replacement for the C-1 is a small carrying bag which will hold everything that the C-1 holds, plus room for extra socks and muffler too. It measures 11 x 7 x 3 inches and through the attaching strap arrangement, it can be converted to a small knapsack for easy carrying in case you are in for a walk in your survival attempt.

Of course, it can be fitted with less than the full complement of survival equipment for stateside use. I don't believe that aircrews flying over the more populated areas in the Z. I. need as much survival gear as when flying over remote areas of the world. The kit has been submitted to AMC for their consideration.

Capt. Ken Wilkinson
Flight Test Branch
Griffiss AFB, New York

In our books Captain Wilkinson is entitled to his own pet aversions, especially if he includes a "fix." There isn't anything that can't be improved upon, so good luck to you, Ken.

★ ★ ★

Foggy Facts

After reading your article, "Foggy Facts", appearing in the May issue, I get the impression that special VFR operations in control zones are only authorized when aircraft are visible to the control tower operator or each aircraft is visible to the pilots of other aircraft concerned and the pilots can maintain their own separation.

These circumstances permit the controller to use reduced separation standards (IFR) when in his opinion adequate separation can be provided by this means. The procedures are not predicated on either the aircraft being visible to the tower or to the pilots involved. (Reference Par. 3.800, ANC Procedures for Control of Air Traffic.) These factors determine whether or not standard IFR separation will be used.

We in the air traffic control business appreciate your efforts to acquaint pilots with traffic control procedures. This media should prove beneficial to all concerned.

Maj. Noel E. Turner
Director of Flight Facilities
1801st AACS Gp. Hamilton AFB.

"Foggy Facts" cited an example whereby aircraft may depart or arrive at a base during below minimum weather conditions without standard IFR separation.

If the story didn't arouse your curiosity, maybe Major Turner's letter will. Check paragraphs 3.80 and 3.800 of the ANC Procedures for the control of Air Traffic.

★ ★ ★

Extra Omni Angles

With all due respect to the integrity of Major Mercer who wrote the article titled "Extra Omni Angles" in the May issue of FLYING SAFETY, there are a couple of points I believe need further explanation or correction. He never once mentioned whether or not the No. 2 needle was inoperative along with the RMI. The solution of the problems discussed in his article would greatly change, dependent on this factor. Also, this fact not being mentioned might create a little confusion.

The main points I'd like to discuss are as follows:

- The No. 2 needle always indicates the magnetic bearing *to* the station whether or not the RMI is working.
- The heading pointer is inoperative when the RMI is inoperative.

Due to the fact that the No. 2 needle works off the same signal as the vertical cross pointer needle (VCPN), it is very unlikely that the No. 2 needle would be inoperative while the VCPN is operating (although it is possible). During orientation, the fact that the No. 2

needle always indicates the magnetic bearing to the station eliminates usage of excessive time because the pilot can turn immediately to the proper heading to the station. After rolling out on this inbound heading, or while he is in the turn, he can crank in the inbound bearing in the course selector window as read off the No. 2 needle. If the course selector window is inoperative, the course selector knob can be turned until the VCPN is centered. When the VCPN is centered, the aircraft is then inbound on the radial that is indicated by the No. 2 needle and course selector window. This procedure works the same with the RMI inoperative.

As far as the relationship between the RMI and heading pointer is concerned it just about boils down to the fact that if the RMI is inoperative the heading pointer is inoperative because they are geared together. The RMI can be inoperative in one of two ways. It either turns as the aircraft turns, even though it doesn't indicate the proper heading, or it becomes stuck on one particular heading indication and does not turn as the aircraft turns. If the RMI is stuck on one heading, the heading pointer is completely inoperative. If the RMI turns as the aircraft turns and does not indicate the proper heading, a pilot can figure the difference between the RMI heading and the aircraft heading and still use the heading pointer for orientations in most cases. The difference between headings would always have to be applied when reading the heading pointer which would make it a little difficult to figure drift corrections going into the station. For all practical purposes, though, the heading pointer also is inoperative in the latter case.

We, in the Instrument Section at Goodfellow, think that the No. 2 needle is the most important part of the omni equipment because it *always* tells you the magnetic bearing *to* the station no matter what your position is, and also is the least likely instrument to go out without all of the equipment being inoperative.

Capt. Fred W. Cronn
Goodfellow AFB, Tex.

Good stuff. Sounds like the good Captain knows what he is talking about. Thanks for the added info.

★ ★ ★

This operational hazard reporting system features A. Gremlin.

Gremlins

Your attention is invited to the attached photo showing operational "Gremlin" which is furnished for your information and retention.

This particular concept for the reporting of those "almost-but-not-quite" accidents was developed and placed in effect by this headquarters on 1 April 1955.

Our personnel have been indoctrinated on the use of the "Gremlin" form, and we are pleased with the results. To date over 20 reports have contributed immeasurably in reducing the potential aircraft accidents. With continuous emphasis and indoctrination, we are convinced that this sort of hazard reporting will prove to be an invaluable adjunct to our Aircraft Accident Prevention Program. As you probably surmised, we have adopted your suggestions regarding the "Operational Hazard Report" discussed at some length in your publication, "Aircraft Accident Prevention," Guide No. 2, dated 1 March 1955.

Photos with "Gremlin" format were furnished to Headquarters, Air Materiel Force, Europe, in sufficient copies for dissemination to safety officers throughout the command. If you so desire, a brief sketch of the "Gremlin" may be published in the Air Force *Flying Safety Magazine*.

Capt. David B. White
Asst Adj. 7485th Air Depot Wing
APO 207, New York

The old Gremlin is back in business again. One difference; this time he's on our side.

from Oh to ZERO

An all weather Air Force. That's what we are striving for. And it's working out. Pilot proficiency is being stressed and requirements met. Cockpit instrumentation and lighting are coming along in good shape, and navigational aids are of sufficient caliber and reliability whereby Air Force types can take off and land without ever seeing the ground.

Just when things start to look rosy, up pops another problem. Like all plans of mice and men, things sometimes go awry. In one case the dilemma was "How can an all weather fighter interceptor pilot perform all the functions required of him and complete his mission?" True, if he had enough eyes, ears, arms and legs he could watch the gages, check the letdown charts, acknowledge transmission, perform the various tactical operations required and fly the aircraft. But most jockeys are handicapped by possessing only two each of the above mentioned anatomical items.

So what happens? Does the Air Force decide to discontinue all weather operations? Negative! It has reached deep into the bag and come up with some real fine techniques and procedures designed to help the pilots.

What we discuss here is use of the ILAS, utilizing Zero Reader or Omni equipment, whichever is installed. Now don't you advocates of the GCI letdown with a GCA handoff go walking away shaking your heads. It could well be that knowing about the Instrument Low Approach System could someday get you out of a rather hairy situation. The first part of this article covers Zero Reader-equipped aircraft; the second covers those equipped with Omni, an automatic pilot and the automatic coupler.

Before people got a little shook and brought it all to a screaming halt, the boys down at Tyndall AFB were shooting touch-and-goes with this equipment when you couldn't see the length of a .50 caliber slug. They did it as a matter of course and never came close to losing an aircraft during the process.

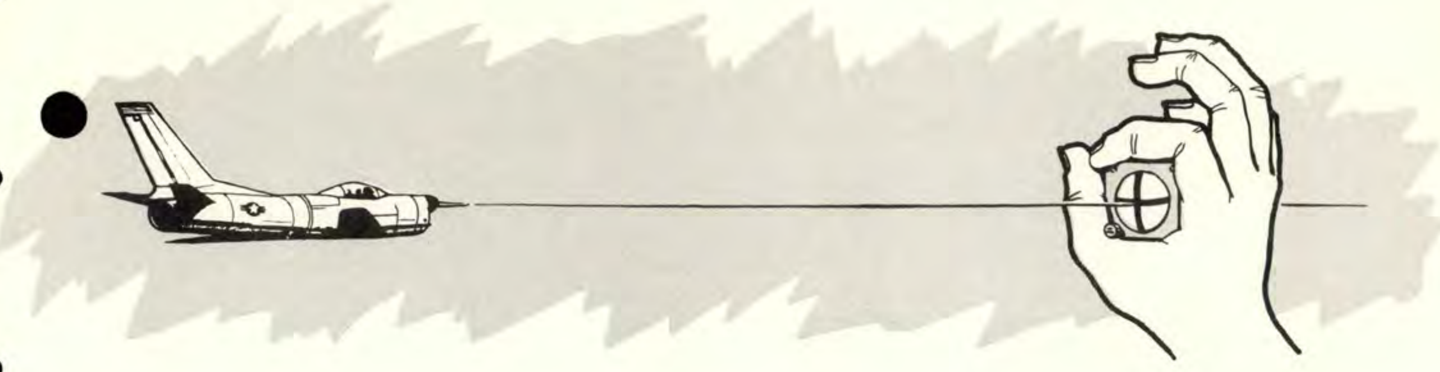
the Zero Reader

IN THIS ARTICLE we are going to delve into the inner workings of the USAF Flight Director, more commonly known as the Zero Reader, manufactured by the Sperry Gyroscope Co. Now before you fly types flip your lid, eject through the canopy and groan something to the effect that you don't even want to hear about another instrument in the cockpit, best you regroup and see what it says in the fine print at the end of the contract. Could be that after you read what it is, what it can do and how to use it, you might even get enthusiastic about it. Most people who are familiar with it, like it — in spades.

Okay, you say, so it's different, but I still have to add it to my cross-check in the cockpit. True. But that's okay if it eliminates several other instruments, isn't it? And that is this little dude's big gimmick. It simplifies, makes things easier, helps the pilot without adding to his workload.

Specifically, the Flight Director (hereinafter referred to as the Zero Reader) is a gyroscopic flight instrument. It takes a variety of information from such sources as the gyro horizon, directional gyro, magnetic compass, sensitive altimeter and the ILAS and VOR indicators and presents it to a pilot on a simple two-element indicator. The instrument gathers this combined information, precomputes it and tells a pilot when, in what direction and how much to move the controls of his aircraft.

As stated before, at first sight the whole deal may seem like just another instrument in the cockpit. But a few minutes perusal makes it obvious that it introduces a new and basic instrument concept. The Zero Reader



anticipates or looks ahead of the existing facts; predicts the future consequences of present attitude and heading of the aircraft at a given moment.

All pilots are familiar with and have used those instruments which are generally considered primary; the gyro horizon, directional gyro, sensitive altimeter, magnetic compass and the ILAS deviation indicator. They might be termed attitude and displacement or "how goes it" instruments. They visually indicate degree of bank, present heading, altitude above sea level or how far you are from the center of a radio beam. This is information concerning your present condition, at a given moment.

The Zero Reader is a single instrument which, using two indicator bars or needles moving at right angles to each other, converts this "how goes it" information into control commands that a pilot follows. It merely states, "Go up, go down, go to the left or go to the right" as the case may be; and needs only one instrument to transmit these commands to a pilot. (That doesn't mean that a pilot never refers to his "how goes it" instruments, but he only has to monitor them occasionally.) Considerable mental computing, necessary under manual flight, is now done by the Zero Reader through an automatic computer instead of by a pilot. He flies it by keeping the two indicator needles centered, which makes for an easy-to-follow visual reference. And remember, the Zero Reader is much more sensitive and precise than basic flight instruments.

In other words, in this single-instrument indication, the attitude and displacement "now answers", individually shown by the basic instruments, are combined algebraically into a single prediction demand as seen by the relationship of the two indicator needles. Heading and roll signals are combined on the vertical needle, and a radio beam coupling can be added to the computation by switching them in at the pilot's discretion. Pitch attitude, altitude or glide path and go-around signals are combined on the horizontal needle. You are flying correctly when the two needles are zeroed in, hence the term, Zero Reader.

The Zero Reader is made up of two parts: The combined indicator and the selector switch. The combined indicator, as its name implies, combines two instruments, the flight director indicator and a heading selector, within a single housing. It has several functions: a. Provides on a two-element indicator a visual reference to the flight control movement required to do any maneuver. b. Permits a desired heading to be set into the flight director. c. Repeats the magnetic heading indication of the aircraft's compass system.

What, another instrument! Maybe, but this one is just like a crystal ball.

A selector switch enables a pilot to select the particular flight pattern desired or required at any time. Selection is made by rotating the control knob to any of four positions: FLIGHT INST, VOR-LOC BLUE RIGHT, VOR-LOC BLUE LEFT, APPROACH. Altitude control can be set in by switching another knob and a go-around is triggered by pushing in the altitude control knob.

- FLIGHT INST—The Zero Reader becomes a gyro-controlled flight instrument independent of radio signals in this position. Altitude control may be on or off.
- VOR-LOC BLUE RIGHT—Functions the same as above, plus the addition of a radio navigation signal. Signal source can be an ILAS beam, provided blue sector of the beam is on the right of the flight path. VOR is always used on BLUE RIGHT because it provides to-from indications without relating them to blue right or blue left indications.
- VOR-LOC BLUE LEFT—Is a reversal of the direction sensing of the radio signals for VOR-LOC BLUE RIGHT. In this case the blue sector is to the left of the flight path, as for VAR and ILAS.
- APPROACH — Same as VOR-LOC BLUE RIGHT plus glide path signal on horizontal needle.

Turns to Headings

Check Figure 1 to see just how simple this can be. Assume that a plane is on a heading of 200 degrees and the pilot wishes to turn to a heading of 290 degrees. The pilot sets in the new heading and banks the aircraft toward the vertical needle sufficiently to center it. If he rolls in too little or too much, the vertical needle remains off center but the moment the aircraft assumes the attitude (bank) which will lead it to the desired heading, the needle becomes centered, or zeroed if you prefer. The system is as simple as that. As the 290-degree heading is approached, the amount of bank required to cancel the heading signal is decreased. This is indicated by a displacement from center by the vertical needle; taking off bank to correct this displacement recenters the needle. After reaching the new heading of 290 degrees, keep the needle centered to maintain the heading.

All during this simplified version of how one phase of the equipment works, the instrument is electronically doing all of the mental computing and looking ahead for the pilot. For example, it is continuously measuring the angular displacement of the aircraft from the desired heading, and as the angle decreases, it automatically indicates to the pilot, when, in what direction and how much to adjust the controls to reflect this continuous change in displacement.

Actually, this is a good example of how the Zero Reader can be used to intercept the known heading of a radio beam. The interception is made evenly, without overshooting or bracketing.

Before getting into the many uses to which the Zero Reader can be put, let's restate one thing. The Zero Reader is not a primary instrument in the sense that an altimeter is, for example. The altimeter is the primary instrument for maintaining pitch attitude; the Zero Reader may not give exact information concerning the exact attitude or condition of the aircraft; for this it is necessary to cross-check the full instrument panel.

But in another sense the Zero Reader does become a primary instrument. It does tell a pilot that he is flying his aircraft in exactly the proper attitude to accomplish a desired maneuver, and frequently this is the only information he is looking for under certain conditions. This information becomes primary when he is faced with the task of achieving and accurately maintaining a new flight condition.

Okay, now let's take a look at some other uses of the Zero Reader. We have seen already how it can be used as a flight instrument to turn to and maintain a heading. We saw that the key to that was to get the needles centered and keep them there. Now let's take a look at what it will do for you on an instrument takeoff.

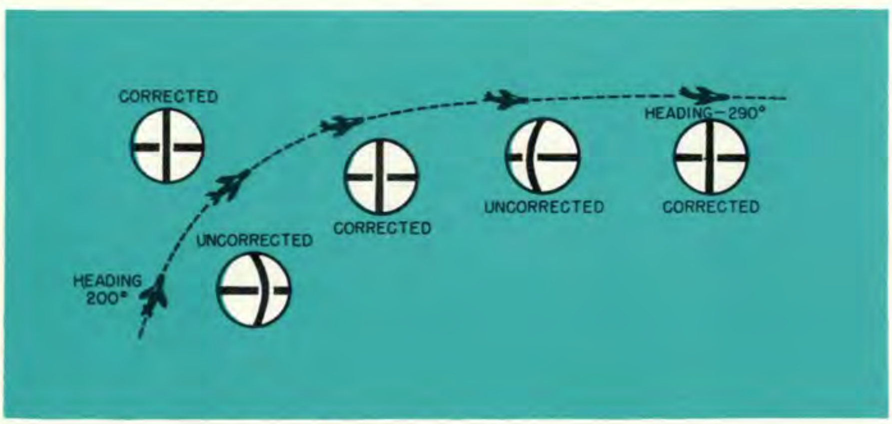


Figure 1. Keep the needles zeroed to stay on the flight path.

Combined Indicator of Zero Reader.

ITO, Climb and Level-Off

Set the pitch attitude control knob for takeoff attitude (you should experiment to find just where this belongs on your aircraft by trying it several times in good weather.) Get the aircraft aligned with the runway and be sure that the vertical needle is centered and that the horizontal needle indicates a "fly-up" deflection. (Be sure that the altitude control is OFF by checking to see that the green light on the selector switch is on.) At takeoff speed, pull the nose up to center the horizontal needle of the indicator. This needle, at this time is purely a pitch attitude indication of magnified reference. Keep the needles centered until ready to turn to a preselected climb heading that conforms to your takeoff instructions and to your best climb airspeed. After getting on heading and reaching climb speed, adjust the pitch attitude trim knob to center the horizontal needle, which serves as a sensitive pitch indicator.

At the desired altitude, level off and turn the altitude control knob on the selector switch to ON. This automatically establishes this altitude as a reference. Keep the horizontal needle zeroed and you will maintain altitude; a gain or loss in altitude will displace the needle and call for corrective control movement. After reaching the desired altitude be sure and reset the pitch attitude knob to level flight. This control is especially useful in controlling altitude during turns and will be satisfactory up to 60 degrees of bank.

Turning the altitude control to ON, automatically makes any pitch attitude trim setting inoperative but, presetting a contemplated attitude change into the system enables a pilot to climb or descend immediately if the altitude control is turned off.

High Speed Turns

If heading changes are small, that is less than 20 degrees, the bank limits of 45 degrees built into the Zero

Reader will establish a reasonable rate of turn. However, if large changes in heading are desired this rate of turn may be too slow. To decrease the time of turn necessitates an increase in the angle of bank. This is done by overriding the Zero Reader and carrying the vertical needle deflection on the opposite side to the direction of turn.

For example, with the heading selector set well off of the aircraft's heading (more than 30 degrees), the angle of bank can be increased to 65 degrees by deflecting the vertical needle slightly over the one-half scale opposite the direction of turn. (See Figure 2). Center the vertical needle when approaching about 20 degrees from the selected heading. Holding it centered will cause the aircraft to roll out on the selected heading. In a steep turn with the altitude control on, remember to center the horizontal needle slowly whenever the indicator shows a "fly up" condition to avoid any possibility of a high speed stall. Turn error is eliminated with this instrument, and if a pilot follows the visual indications he will roll out with his wings level.

The four-position Selector Switch.

Descent and Level-Off

For descent and level-off at a lower altitude, the Zero Reader is used in the same way as to climb out to a desired altitude. The horizontal needle is used to hold the pitch required to maintain the desired letdown speed.

A pilot can use the instrument in two ways. He can leave the pitch attitude control in the zero pitch mark and hold the needle in a deflected position to maintain his rate of descent. Or he can set in the desired letdown attitude on the pitch attitude trim mark and keep the horizontal needle centered. (For an extremely high rate of descent it may be necessary to hold a slight "fly up" deflection on the horizontal needle.) If the first method is used, level-off can be accomplished by centering the needle and, if desired, turning the altitude control to ON as soon as the vertical speed is on zero.

Uses in Radio Navigation

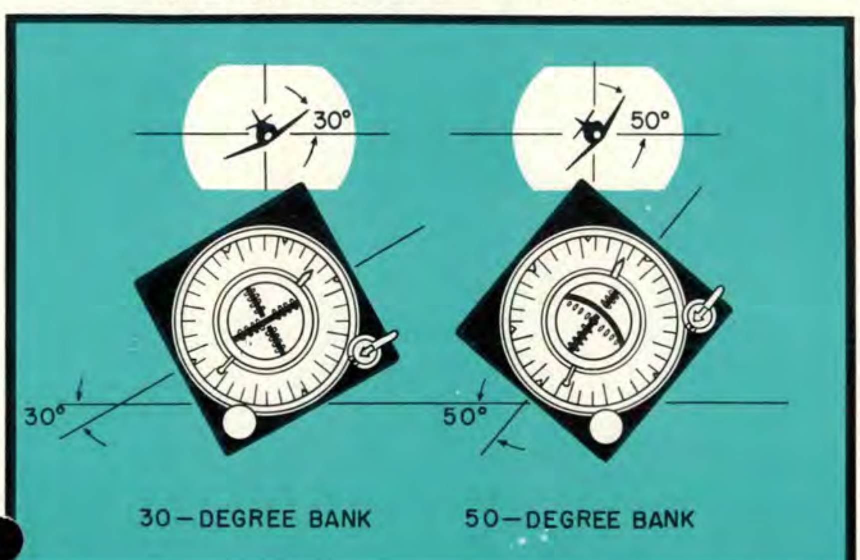
When using the Zero Reader to fly VOR and VAR range beams some functions, such as the altitude control and the manual pitch attitude trim, are used in the same way as when on FLIGHT INST position. This means that using the Zero Reader for radio navigation is an extension of its use as a flight instrument.

To intercept a VOR or VAR beam, tune the navigational receiver to the desired channel and check the ILAS deviation indicator for proper operation. (The ILAS deviation indicator is not part of the Zero Reader but is the regular cockpit instrument used in flying VOR-ILAS.) Then turn the selector switch to FLIGHT INST and the altitude knob to ON. Next, set-in an intercept heading on the heading selector which will provide a beam intercept angle of 90 degrees or less. Bank the aircraft to zero the vertical needle and the Zero Reader will take you into the beam on the set-in intercept heading.

Upon entering the beam, the vertical needle of the ILAS deviation indicator will begin to move toward center. Check the appropriate charts for the correct heading to the facility; set it on the selector. Immediately set the selector switch to either VOR-LOC BLUE RIGHT or to VOR-LOC BLUE LEFT, as required. (This will depend on whether the blue sector is to the left or right on VAR or ILAS.)

Fly the aircraft to zero the needles and you will arrive close to the beam center, contingent, however, on any crosswind being present. (Crosswind procedures will be covered later.)

Figure 2. Opposite needle deflection indicates steeper banks.



VOR Approaches

In general, when using the Zero Reader for approaches, the techniques described for radio navigation are applicable. After intercepting the beam, center the needles and follow the beam on-course signal. As an example, assume the inbound heading to be 270 degrees, so that after passing the station on an outbound heading of 90 degrees, a procedure turn and letdown are necessary. (On VOR, use VOR-LOC BLUE RIGHT.)

Before initiating procedure turn switch to FLIGHT INST position and set in first increment of heading change (45 degrees). Zero the vertical needle and you will maintain this heading until ready to turn back to the intercept heading. After flying away from the beam the desired length of time, set-in the reciprocal heading (225 degrees) and fly to re-zero the needle. As the beam is ap-

The Zero Reader also can be utilized as a radio navigation instrument.

proached, set-in the inbound heading, switch to BLUE RIGHT, zero the needle again and you will be on the correct heading.

During the procedure turn, an approximate rate of descent can be set into the Zero Reader while flying a constant altitude signal. After setting the pitch attitude trim knob to the estimated position, the descent is initiated by turning the altitude control knob to the OFF position. Reference to the rate of climb indicator may dictate a slight reset of the trim knob after the descent has started.

To eliminate the erratic indications that appear when passing over the radio station it is necessary to turn the selector switch temporarily to FLIGHT INST and follow the existing set-in heading. (Accomplish this approximately one minute from the station.)

For ADF and low frequency range approaches, the selector switch is left on the FLIGHT INST position. Headings are selected as required to bracket the beam and fly radio bearings. Control of elevation and rate of descent is accomplished using the altitude control and with the horizontal needle used as an indicator.

Zero Reader and GCA

Using any of the above approaches in connection with GCA is simplicity itself. After the letdown, the GCA controller will establish the aircraft on the downwind leg. At this time set in the heading given by the controller and establish the desired airspeed, keeping the needles centered.

Set-in the base leg heading when given by the GCA controller and put the aircraft into final approach configuration. Changes in heading on the final approach are set-in immediately when called off by the controller. Two-degree heading changes on the final may seem insignificant, but flying the Zero Reader and making coordinated turns will make for better results than using standard instruments which often require skidding and slipping to maintain heading.

Descent on the final approach is made using the horizontal needle of the Zero Reader as an attitude instrument in the same way that an artificial horizon is used. A pilot can select a fixed pitch reference (horizontal needle deflected) similar to that of the artificial horizon, or he can adjust the pitch attitude trim so that the horizontal needle will be centered on final approach. However, the recommended method is to use the horizontal needle as a sensitive pitch indicator by leaving the pitch attitude trim on zero and holding the needle off center.

ILAS Approaches

One of the most important functions of the Zero Reader is its use in making ILAS approaches. As shown in Figure 3, assume that your aircraft is at position 1; altitude is 20,000 feet. You are homing on the middle marker using ADF and cleared for an approach. Set the heading selector on 315 degrees, switch to FLIGHT INST and keep the altitude control ON.

Two procedures are possible where an aircraft arrives over the middle marker before bracketing the localizer. (Obviously, if the beam is bracketed inbound and and then the procedure turn initiated outbound, the same general letdown procedure would be used.) The procedure in Figure 3 requires bracketing the outbound localizer immediately after obtaining the on-course indication over the middle marker. If flown at high speed without using the Zero Reader, several overshoots will occur before the aircraft is settled on course because of the narrowness of the beam at this location. Using the Zero Reader, a single overshoot will occur and the aircraft will settle on-course approximately 18 miles from the transmitter.

After zeroing the needles and flying the beam outbound with altitude control in OFF position, the selector switch in VOR-LOC BLUE LEFT and the heading selector on 270 degrees you are ready to start your procedure turn. At this point you can reduce power, extend speed brakes and start the descent. (We are assuming in this example that you are flying a jet. However, in general, procedures hold true for any aircraft.)

Center the needles to intercept and stay on the ILAS localizer beam.

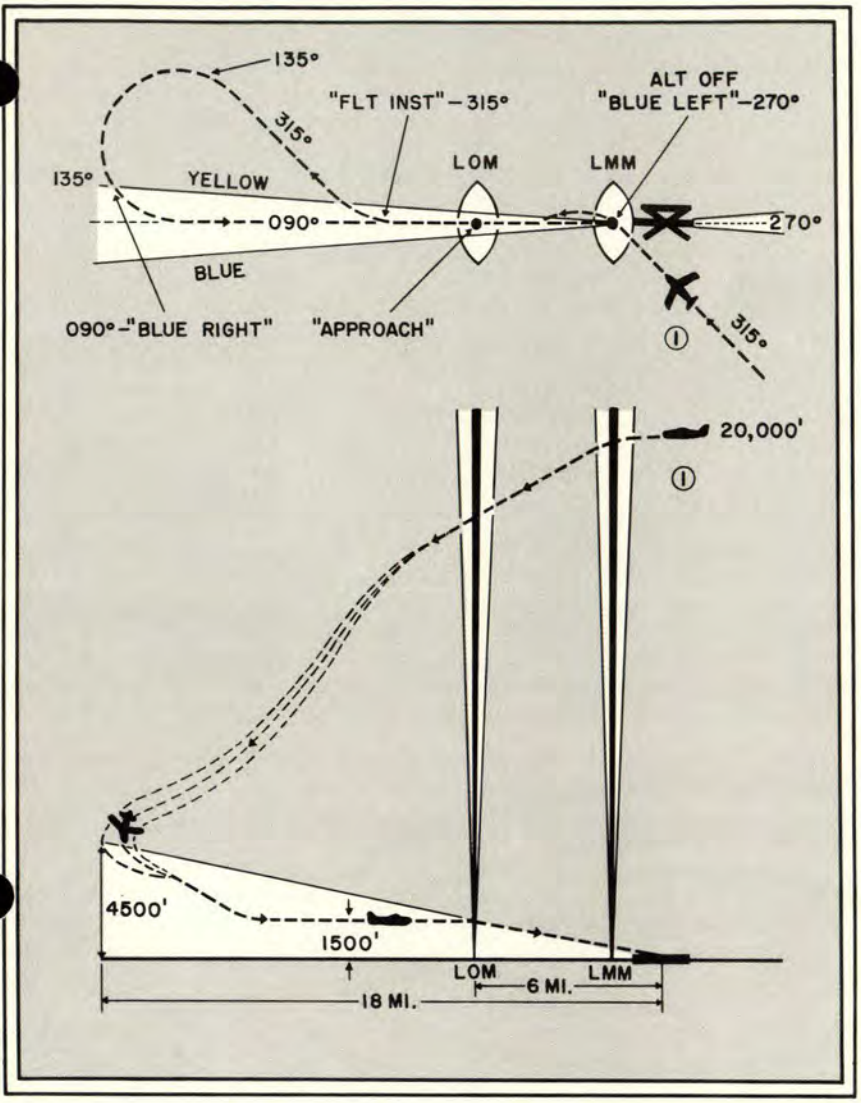


Figure 3. Two selector positions, FLT INST and APPROACH, are utilized in performing a jet penetration and an instrument low approach.

Various methods of procedure turns can be used:

- It can be made during descent.
- The descent can be stopped at an arbitrary figure, the turn completed and the descent continued.
- The descent can be continued to a low altitude and the turn initiated at this point.

Let's assume in this case, that the procedure turn is started immediately after settling on the outbound heading and during the letdown. Upon completing the turn, the heading is held until the ILAS deviation indicator shows that the aircraft is entering the localizer beam. At this point, set the heading selector to the runway heading of 90 degrees, switch to BLUE RIGHT and center the needle.

A shorter procedure is to continue on a course of 315 degrees for about one to two minutes after arriving over the marker, starting a left turn to 135 degrees on the Zero Reader and then bracketing the localizer inbound. In either case, airspeed requirements at high speeds require that a pilot responds immediately to the movement of the Zero Reader throughout the initial approach. Delays will result in high intercept angles and overshoots which will take the aircraft past the outer marker before the inbound localizer is bracketed. (This is applicable to jets only.)

At a distance of 18 miles from the runway, the glide path will generally be approximately 4500 feet above runway elevation. Most approach diagrams call for flying under the glide path and leveling out before entering it but, if you wish, you can save time by planning your descent so that the aircraft arrives at the glide path altitude during the procedure turn onto the localizer beam.

As you reach glide path altitude during the descent, the horizontal needle of the ILAS deviation indicator will begin to rise from the bottom of that instrument. As it starts, reduce the rate of descent and switch the selector to APPROACH. Your Zero Reader is now coupled to both the localizer and the glide path. All that is required is to keep the needles centered to remain on the center line and on the glide path. Reduce airspeed to that needed for lowering the gear and flaps before reaching the outer marker. As you pass over the outer marker extend gear and flaps and reduce power to establish final approach airspeed.

Drift Correction

The presence of a crosswind is automatically shown on the Zero Reader by a steady indication of drift angle on the heading selector. (The ILAS deviation indicator also will show a steady error with respect to a radio beam.) The drift angle is the angular difference between the compass heading and the set-in heading. The term steady is intended to apply to length of time; that is, a momentary or transitory indication would not be an indication of drift, whereas an indication of several minutes would signify drift angle.

In this case, align the aircraft heading pointer to the index marker (or align the two pointers). Fly the aircraft to zero the needles, this will correct for the wind and return the plane to the radio on-course signal indicated by the ILAS deviation indicator. It will remain there until the wind changes.

Don't keep fiddling with the knob when on final approach. You can make a correction after stabilizing on the localizer beam when nearing the outer marker and one more, if necessary, when at the middle marker. Another technique is to make your correction on the basis of reported ground winds and fly all the way down with that correction. If the Zero Reader installation includes an automatic crosswind compensator, such compensation will take place automatically on final when the selector switch is on APPROACH.

Go-Around Procedures

Last but far from least, the Zero Reader can be used for a go-around if you fouled up on the low approach. In the event of a go-around, depress the altitude knob on the selector switch (it's marked FOR GO-AROUND PUSH.) A yellow go-around flag appears immediately on the right side of the Zero Reader indicator. Now the indicator needles are no longer influenced by radio or altitude control signals.

Control your aircraft to zero the "fly-up" deflection which will appear on the horizontal needle. The resulting attitude has been selected to stop the descent quickly and to provide a pitch reference for the initial climb-out. Be sure to crosscheck the airspeed as the aircraft's configuration is changed and, if necessary, hold the horizontal needle off zero slightly to maintain the desired speed. After a safe altitude has been reached, disarm the go-around switch by turning the selector to FLIGHT INST. Adjust the pitch attitude trim knob so that when the indicator needles are zeroed the desired climbing speed is maintained.

If you don't desire to use the go-around feature, or if it is not installed, a missed approach can still be made using the FLIGHT INST position of the Zero Reader. Prior to reaching the outer marker when inbound on a final approach, set the pitch attitude trim knob to a predetermined climb reference. (Experiment with your Zero Reader to find a setting that will definitely stop your descent.) Then if you must make a go-around, you have only to switch to FLIGHT INST and control the aircraft to zero the horizontal needle. Check your airspeed and, if necessary, readjust the trim knob to maintain the desired indicated airspeed during the climb. It goes without saying that, using either method, it is incumbent upon the pilot to apply proper go-around power.

Naturally, there are many more details that could be gone into when discussing the Zero Reader. For example, when discussing how it should be flown in turbulence. The manufacturer recommends that it be flown loosely. That is, don't attempt to follow every small signal. Rather, attempt to average them out and select steady signals. We can't go into all the fine details in this article, so for detailed explanations of certain techniques best you take a good look at your instrument flying manual, ATRC 51-4. As a matter of fact, we'll bet a bob or two that you'll find a lot of things in the book that you might well brush up on. Why not give it a go, and see? ●

Omni for Fighters

IN CASE you haven't noticed, that piece of equipment commonly referred to as Omni is here to stay. True, there are many pilots who haven't had the opportunity to fly it, but it won't be long now. Stations are springing up like the weeds in your front lawn and more and more aircraft are being Omni equipped.

If Omni's only contribution was to provide a reliable means of getting from here to there regardless of the electrical disturbances induced by thunderstorms and other weather phenomena, it would be enough. But this amazing chunk of wires, tubes and fuses has proved its versatility almost beyond belief. Omni equipment, tied in with an Instrument Low Approach System, tied in with an auto-pilot, hooked up to an automatic coupler, strapped into an aircraft . . . (deep breath) . . . will bring you down to the runway by the "Look, no hands" method. But we're getting ahead of our story.

The versatility of Omni is particularly appreciated by the all-weather interceptor pilot. Normally speaking, the standard IFR approach for the jet driver is the GCI letdown with a GCA hand-off. It's a good system. It is reliable and has proved itself to be the easiest all-around method of getting out of the soup on to the gritty. But look at it this way. Any professional pilot is obligated to be familiar with the equipment provided him. The Air Force has provided alternate letdown methods involving a variety of equipment and you may sometime be called upon to put them into practice. When you arrive over an installation that has no GCI or GCA to assist you, but has an ILAS, you should know how to use it.

Perhaps the aircraft you fly is not Omni equipped, but it soon will be. In the very near future, all of you will have the necessary equipment to utilize the Instrument Low Approach System using the course indicator instrument of the Omni equipment. With this type of installation the Omni instruments are the only ones required to make a penetration and low approach, right down to the runway.

The AN/ARN-14 omnidirectional receiver is a VHF navigation receiver

When the weather is on the deck, the Omni equipment is a real life saver to the all-weather interceptor pilot.

with associated indicators that provide reception of all Omni ranges, localizers and voice facilities on 108 to 135.9 megacycle channels. It has a control box and two instruments, the course indicator and the radio magnetic indicator (RMI). With this installation the pilot can home on any Omni facility using the standard Omni procedures. In addition, the glidepath and on-course of any ILAS can be tuned in and indications will be received on the course indicator. In a nutshell, you tune in an Omni station and make your letdown; then after turning inbound to the field, you switch a single selector knob to the ILAS frequency and fly the course indicator, using the vertical needle for directional control and the horizontal needle for the glidepath. It's just as simple as that.

Let's take a hypothetical case and follow an F-86D pilot through his entire letdown process.

Our hero is tooling along at 35,000 feet with an F-86D strapped securely in place. He notes that his destination has an Omni facility and has an ILAS installation First he tunes in the correct frequency on the Omni range. The control is located on the right console and is labeled VHF-NAV. After identifying the station, he checks the closest magnetic bearing inbound, as indicated under the double barred pointer on the RMI. He turns toward the pointer until it is at the top of the instrument. He rotates the selector knob until the desired bearing appears in the bearing window of the course indicator and he flies the vertical needle to the station. It's as easy as shooting fish in a barrel. Following station passage, he is ready to execute the letdown into the ILAS pattern.

ILAS Approaches

An ILAS approach requires considerable planning prior to execution and that's where the Pilot's Handbook—ILS Chart comes in. It shows the physical set-up and cross-section of the localizer and glidepath beams, location of the markers and altitudes to be flown. The transition point from the last radio navigational aid to the ILAS procedure is shown in detail. Normally the localizer beam is tuned in and intercepted after passing the Omni range station. However, if utilizing an ADF or low frequency range for penetration purposes, as discussed later, the ILAS frequency can be tuned in before starting the letdown.

When cleared by the controlling agency for a penetration and low approach, our boy executes a standard penetration for that station and departs the range on a heading that intercepts the localizer beam of the ILAS. By this time he has turned the frequency selector on the VHF NAV control panel from the Omni station frequency to the published ILAS localizer frequency. Now the location of the on-course line is represented by the vertical needle of the course indicator and the glidepath is reflected in the horizontal needle. He takes care to note that there is no alarm flag indications on the course indicator instrument indicating some malfunction.

There are several combinations that he could use to make an initial penetration and get down into the ILAS pattern. He could make an ADF letdown using a homer or the outer or middle marker of the ILAS. In such cases he would have the ILAS frequency already tuned in, and warmed up. He would use the ADF feature of the radio compass for his letdown and, upon leaving the homer, merely bring the course indicator into his crosscheck to intercept the ILAS localizer beam.

Regardless of whether he executes the penetration using an Omni station, a homer or a low frequency range, the procedure is to leave that facility on a heading that will intercept the ILAS localizer (center line) and have the ILAS frequency tuned in, identified and ready to operate.

Beam Following

Upon intercepting the on-course our F-86D pilot maintains a constant inbound heading with the vertical needle centered. Movement off the beam is caused by wind (assuming the magnetic heading is maintained accurately). The rate of deflection is, of course, indicative of the wind direction and velocity. It's a good idea to get and remember the surface wind velocity and direction as given by the control tower. That prepares you for a drift factor, to right or left, so you can better establish an on-track heading. It is important to crosscheck the needle rapidly and the first off-course indication should be immediately counteracted. Corrective turns must be coordinated, and degree of bank shouldn't exceed the number of degrees to be turned.

As he flies the localizer, his altitude is at the designated approach altitude and the airspeed is reduced to the final approach speed. He lowers the gear and completes the final flap adjustment. The correct altitude is maintained during the reduction in airspeed and is held until the glidepath is intercepted.

Precise beam following is of prime importance during the entire run. The approach altitude is normally 1000 feet above the field elevation, and at this altitude the glidepath is intercepted over the outer marker. As

Disconnect the coupler before passing the station. The plane will follow the needle.

soon as the horizontal bar of the course indicator starts to move down he prepares to make the power reduction to establish the correct descent. When the glidepath crosspointer (horizontal needle) arrives at the center line of the instrument, he reduces power to the correct setting and establishes a descent at the desired rate.

Any corrections required to get back on either the glide path or the center line should be crosschecked using the attitude gyro. Likewise, the airspeed indicator should be closely observed. Normally the power is kept constant during final approach, however, if the airspeed exceeds plus or minus 5 mph from the desired, a change in power is made.

As the aircraft flies inbound, the altimeter should be crosschecked over the middle marker to determine the accuracy of the glidepath beam. The correct altitude is listed in the Pilot's Handbook—ILS Chart. In the event you are on the glidepath but the altimeter indicates that you are 50 feet or more from the published middle marker altitude, go-around. It is obvious that if the beam or the instrument causes this much of an error, continuing a low IFR approach would be hazardous.

A little gimmick that many drivers use is to have the GCA controller monitor the ILAS final approach. In such cases the controller merely advises once in a while that "You look good on our scopes, on center line, on glidepath" or perhaps "You appear to be to the right or left of the center line." Remember, the comments from the GCA controller are advisory only, and you are flying the aircraft using the ILAS as your primary low approach instrument.

Look, No Hands

Now that wasn't too hard to take, was it? Of course you are probably wondering what that yakking about auto-pilot and "look, no hands" was all about. Well, we saved that 'til the last because it's the best.

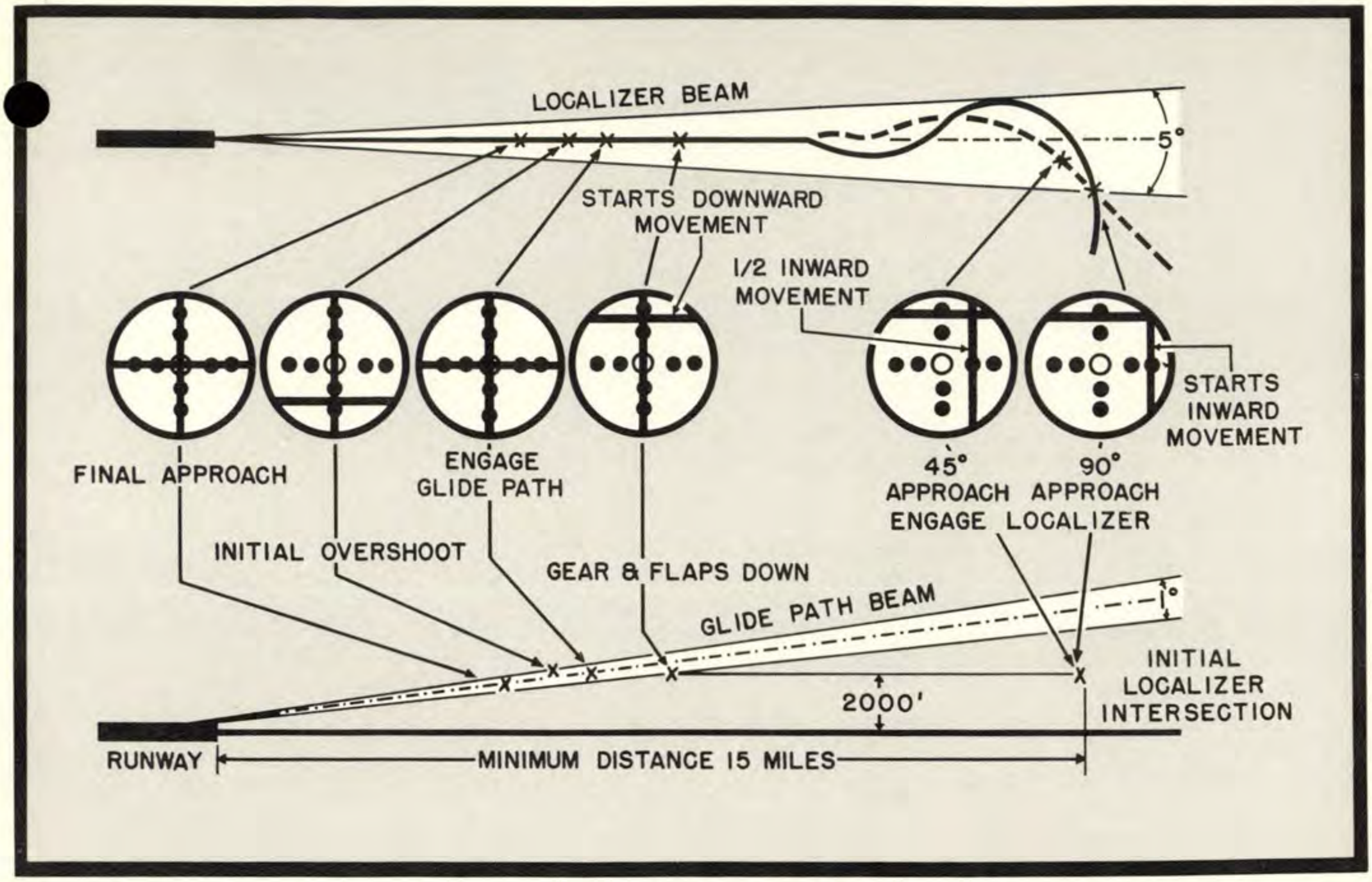
Most everybody is familiar with the auto-pilots installed in fighter interceptor aircraft. They are installed to relieve the pilot from manipulating the controls. This auto-pilot will hold the aircraft on any pre-selected course, change the course at will with a coordinated turn, or maintain the airplane level or in any desired angle of climb or dive up to 40 degrees from level flight. The pilot establishes the desired attitude and heading, engages the auto-pilot and puts his hands in his lap.

Now you should know a little about the ILAS procedure and a little about the auto-pilot. And here's the best part of the combination. You can use the auto-pilot to fly you automatically to the Omni station or down the ILAS glidepath or both. It's all done with what is known as the automatic approach coupler. In this system the auto-pilot uses the signals received through the automatic coupler to guide you to the radio facility.

Let's say you want to drive into an Omni station. To use the approach coupler to track inbound to the station, you first select the proper heading on the course indicator, making sure you have a TO indication in the ambiguity window. Next manually direct the aircraft toward the desired heading until the vertical needle is within plus or minus one-fourth inch of center position. The heading control will be automatic by engaging the localizer button on the approach coupler control and it will take you to the station.

When you get close to station passage it will be necessary to dis-engage the coupler and fly manually. The reason is that as you near the station, the vertical needle starts to dance back and forth. So will your aircraft

A low approach with the automatic coupler is "Look, no hands."



Needle positions on the Course Indicator are shown in relation to aircraft position during an ILAS pattern.

if it is still on auto-pilot, and things get a little shook up for a while. It is simply a case of the auto-pilot trying to keep up with the dancing needle.

ILAS With Coupler

After station passage the automatic coupler may be re-engaged by selecting the proper outbound heading on the indicator and pushing the localizer button.

Although the automatic coupler can be used to make a penetration, most drivers fly the aircraft manually. Selecting the outbound and inbound procedure turn headings and engaging and disengaging the auto-pilot requires more work than flying manually.

After procedure turn and station passage, change the Omni range to the ILAS frequency and take up a heading to intercept the localizer beam. You can make the initial approach from the station to the localizer beam at any angle up to 90 degrees from the beam heading. When the airplane is on a heading that will intercept the localizer beam and as soon as the localizer needle starts to swing toward center, depress the localizer button. The aircraft will intercept the beam automatically and bracket it until it settles down, right on the money. The auto-pilot will compensate for any drift so all you have to do is sit there and get the aircraft set up for the final approach.

A few words of caution. Do not depress the localizer button too soon on initial intersection of the beam. If you are too far out the coupler will not pick up the signal and will probably just turn the aircraft in circles. Conversely, if you engage the system too late, the aircraft will overshoot the beam and bracket excessively. Just remember that as soon as the vertical needle starts to move toward the center you can engage the coupler. Also, during the entire approach be sure everything is functioning normally. In the event malfunction is indicated, disengage the coupler and continue the approach manually.

As you fly inbound and the horizontal needle starts to move down toward center you are approaching the glidepath and the gear and flaps should be lowered. As soon as the needle hits the center position engage the glidepath button on the automatic coupler control and reduce power to the correct setting. The aircraft will nose over automatically and after two or three oscillations settle down on the glidepath. Now the pilot simply maintains the recommended airspeed by adjusting the throttle and rides it down. Remember, the automatic coupler will always attempt to keep the aircraft on the glide path. If you fail to keep enough power on, conceivably the coupler could stall the aircraft out.

The auto-pilot will now take the aircraft right down to the runway. As you cross the threshold, disengage the auto-pilot and round-out and land. Yes, it's too bad, but since the auto-pilot does not incorporate a round-out feature, you'll have to do this manually. Tough life. ●

REMEMBER LAST year's Carol, Edna and Hazel? Each year, as summer wanes, a series of these towering, vicious ladies come dancing over the horizon out of the Caribbean, heading north.

When they are fully-developed, robust gals they can become quite troublesome; their common failing being that they get a little too windy. And when they open up full blast, anything in their path is likely to get tossed around more than somewhat. Especially airplanes. So when the weird sisters open the ball, best move the iron birds to an area of relative serenity.

Flight Service has been delegated the authority to see that this movement, or hurricane evacuation, is carried out in an orderly, expedient fashion. A strip of land, 100 miles wide, stretching along the southern and eastern boundaries of the United States from Mexico to Maine, has been delegated as a hurricane danger zone. Normally, there are more than 8000 military aircraft based at over 100 military stations in this zone which is divided into lettered areas by Flight Service. If a hurricane threatens, the planes must be evacuated inland.

Flight Service appoints Hurricane Evacuation (Hurev) Commanders for each zone in the danger area and selects inland airfields, or refuge bases, to which military aircraft can be flown when a hurricane is imminent. The Hurev Commanders are responsible for preparing detailed evacuation plans, including types and the number of aircraft at each base that will be involved in the movement. These plans are sent to the appropriate Flight Service and ARTC Centers for coordination.

The commanders act as liaison officers to assigned refuge bases also, to insure the adequacy of the facility and to arrange such support functions as billeting, mess and maintenance.

To prevent congestion of air traffic routes and to assist bases in the danger area a Hurev condition system was established. Flight Service Centers keep the bases in their respective areas notified constantly of their present status in the condition system when a hurricane is brewing. Four conditions are possible in the system:

• *Condition Four.* Seventy-two hours prior to forecast arrival. All flight crews and liaison personnel are alerted.

• *Condition Three.* Forty-eight hours prior to forecast arrival. Some of the aircraft are evacuated and liaison personnel are dispatched to assigned refuge bases.

• *Condition Two.* Twenty-four hours prior to forecast arrival. All other aircraft requiring evacuation will be sent out at this time except those whose specific mission requires that they remain available. (Hurricane reconnaissance, ARS and a minimum number of combat ready and support aircraft.)

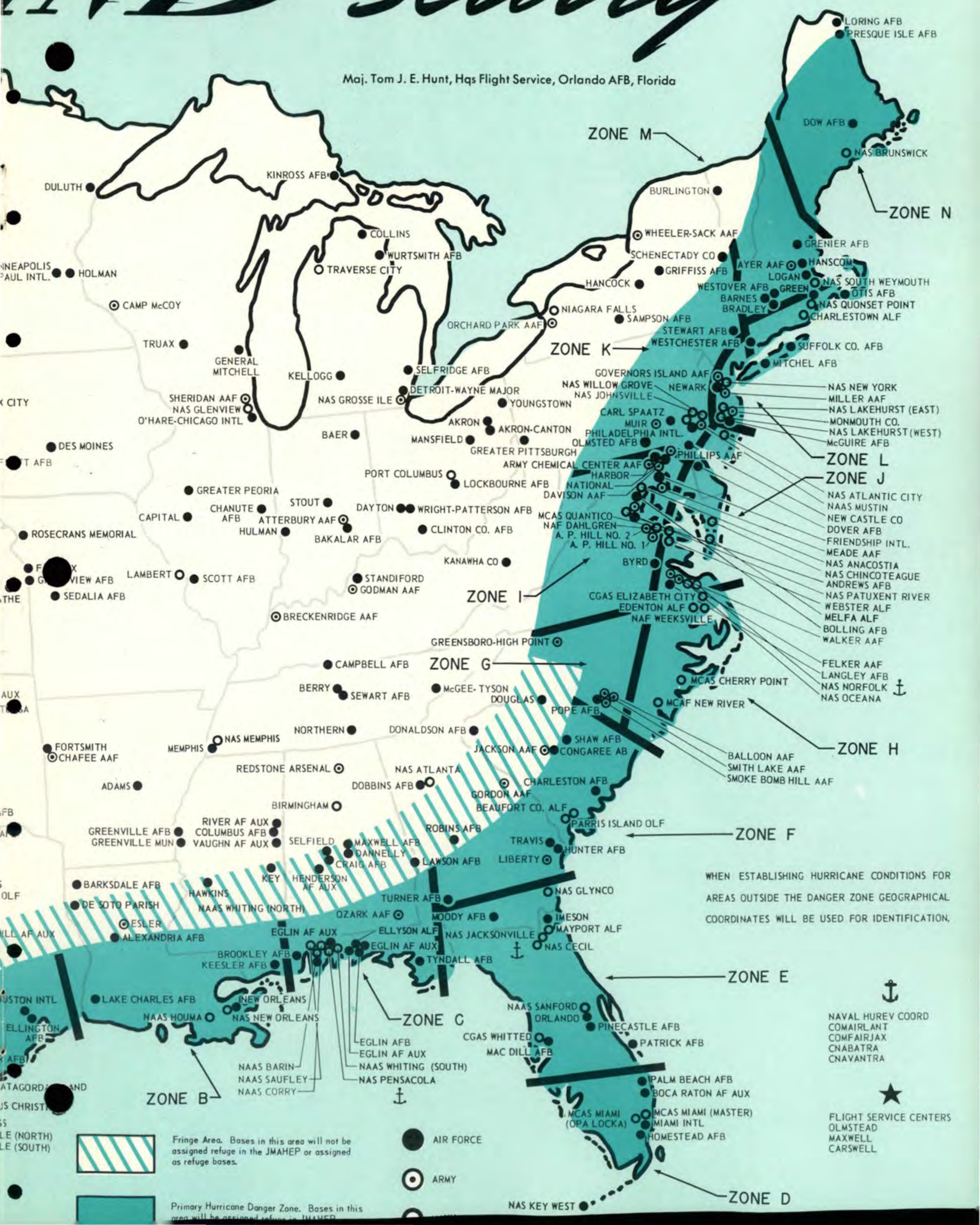
• *Condition One.* Twelve hours prior to a forecast arrival. Any remaining planes requiring evacuation are sent out. A NOTAM is issued restricting the base to hurricane reconnaissance, ARS and military necessity aircraft. Evacuation of these aircraft will be determined by the agency exercising operational control.

Where possible, evacuation should be made under VFR conditions, in flights. When it is necessary to go IFR, close coordination and cooperation must be maintained between Flight Service, CAA and other interested agencies. On an IFR evacuation, during Hurev conditions one and two, the base will notify the ARTC Center eight hours in advance of the estimated time of departure, stating the number of aircraft involved and giving any changes to the existing Hurev plan. Flight plans should be filed with ARTC four hours before ETD, if possible.

The accompanying map on these pages shows the bases in the danger area, the refuge bases, the numbered zones and those Flight Service Centers responsible for Hurev movements. For full details on the evacuation plans as they effect your area, consult the Joint Military Aircraft Hurricane Evacuation Plan 55-1, Hdqs, Flight Serivce, Orlando AFB, Florida. ●

IND Scurry

Maj. Tom J. E. Hunt, Hqs Flight Service, Orlando AFB, Florida



Typical crew prepares for a search and rescue mission. After specialized, detailed briefings to individual crewmembers, a general briefing of the search area is given by the navigator.

Helping Hand

THE CREED of the Air Rescue Service can be stated very simply: "That others may live." Perhaps that isn't very impressive, but just ask the guy who has been snatched up from the wrong side of the bomb line or the pilot who was yanked out of the briny deep. Ask the survivors of a light plane crash high in the Sierras. They wouldn't have lasted out the night without food and clothing from the preliminary air drop. Ask the lumberjack with the ruptured appendix. The H-19 beat the old man with the scythe by minutes.

When the great scoreboard is totaled and all individual case histories are closed, the Effectiveness Reports of ARS personnel will be in the highest brackets.

Basically, the purpose of this article is to remind you how to help Air Rescue Service help you. If the chips are ever down and you find yourself out on the proverbial limb, knowing what ARS needs to know can greatly expedite the helping hand. It takes but a few words to swing this tremendous organization into action and as long as you are in distress, regardless of the nature, you're strictly a VIP and will be accorded the full treatment.

Let's take an actual incident that occurred recently. It represents a typical ARS intercept mission. The report is cut and dried. You'll have to fill in the suspense and a bit of drama by reading between the lines.

Oakland ARTC advised at 1335 hours that AF-0000, a C-119, was using excessive oil in No. 2 engine and requested ARS to stand by in the event that the aircraft might feather and request interception.

The 41st Air Rescue Squadron was directed to prepare to roll on a moment's notice and a complete flight plan was obtained from Military Flight Service. Armed with this, the crew was ready for a scramble.

At 1413 hours, the Oakland Center advised that the C-119 would have to feather No. 2 in approximately one hour and requested interception. Latitude, longitude and heading of the distressed aircraft were given, and in a few minutes an SA-16 was airborne and winging out over the Pacific.

At 1435, AF-0000 feathered No. 2 propeller and declared an emergency. Oakland ARTC reported that the aircraft was unable to maintain 9000 feet and was descending at 200 feet

Through experience, rescue crews know the importance of having the correct equipment.

per minute. This information was passed on to the Rescue Squadron and a second SA-16 was airborne which, in turn, alerted a task force of 11 destroyers and two destroyer escorts approximately 75 miles from the track of the distressed aircraft. A third alert SA-16 was airborne, with instructions to orbit over the Farallon Islands. This plane relayed weather and sea conditions to the other rescue aircraft.

Although the C-119 was experiencing communications difficulties, VHF contact was made at 200 miles prior to actual intercept and visual intercept by the lead SA-16 was made at 1610 hours. The distressed aircraft had continued a descent to 6200 feet where the aircraft commander was able to maintain the aircraft's altitude on one engine.

The C-119, escorted by all the aircraft, arrived at Moffett NAS at 1823 hours and landed without difficulty. Mission closed.

As we said, this was a routine intercept. It went off smoothly and no difficulty was experienced in finding the C-119. However, here is the information that was transmitted to the Oakland Center and relayed to ARS: Time and position. Groundspeed. Track. Altitude. Intentions. Radio frequencies. True airspeed. Estimated winds. True heading. Number of passengers and crew. Destination. ETA destination. Nature and seriousness of the emergency.

With this information available, it was possible to plan the intercept quickly and efficiently. In other words, the C-119 crew knew how to help ARS help them.

ARS asked FLYING SAFETY to be sure to pass on one especially important factor and that is, *don't wait* for a complete emergency to develop before calling for aid. They know from experience that many pilots are prone to grit their teeth and fight out an emergency situation alone. Possibly they're ashamed to ask for help. Believe us, that's the worst thing you can do. When things start to fall away fast, get on the wireless machine and squawk. The eyes and ears of many agencies are concerned with you and your iron bird. One yell will set the wheels in motion.

It isn't always the military drivers who need help, either. A recent light plane accident and the ultimate rescue of the pilot and passenger from a snow-covered mountain were well publicized by press and radio. It is highly doubtful, however, if anyone outside of ARS knows what went into that particular mission.

At 2010 hours, Hamilton Rescue Control Center notified the 41st Air Rescue Squadron that a light civilian aircraft was overdue on a flight from Oroville, California, to Reno, Nevada. And that, gentle reader, is the worst kind of rock pile country.

The Rescue Control Center received a request from CAA to conduct a search. A full description of the aircraft and flight plan was obtained while the alert crew was being readied for a route search. Weather conditions were forecast to be very good for a night mission.

Because of expected early morning fog at Hamilton and good weather conditions expected at Reno, an assistant mission commander was appointed to proceed to Reno and set up search operations. Another officer was assigned the duty of coordinating the efforts of the California Civil Air Patrol at Marysville, California. A stand-by crew was alerted to provide airlift for the CAP coordinator and pararescue personnel.

Within the next hour and a half, an extended communications check was completed and the following agencies were alerted to assist ARS.

- Ground Observer Corps.
- California and Nevada CAP.
- State police and county sheriffs.
- Many radio and TV stations.
- Newspapers.
- Public utility companies.
- State and U.S. Forestry Services.
- Hamilton, McClellan and Stead Air Force Bases.

The alert SA-16 aircrew and assistant mission commander were briefed on all phases of the situation and given proposed search plans. Basically, the plan was to utilize maximum CAP facilities and personnel, augmented by two ARS SA-16s, one H-19 and all Air Force aircraft flying locally out of the aforementioned AF bases. Other alerted agencies would provide whatever assistance was possible within their capabilities.

The actual search began at 2245 hours, with the suspected areas being combed carefully. Little hills running up to about 12,000 feet made this touch-and-go, and the perspiration of the crews could not be attributed to overworked aircraft heaters.

The following morning at 0815 hours, the predetermined plan began to unfold and a full-scale search was in effect. Maximum effort was expended by all agencies and then one of those unpredictable things happened. A light aircraft not under CAP or ARS control, flying out of Reno on a short cross-country, located the missing aircraft. The pilot of the puddle-jumper could not orient himself navigation-wise to pinpoint the location of the downed aircraft, so the two SA-16s were notified to locate this civilian aircraft that was orbiting the scene.

As might be expected, lack of a common frequency made it impossible for the '16s to home on the light plane and just when things were getting somewhat confusing, Sacramento Radio was able to contact the pilot and told him to proceed to Marysville and land. Soon a plan was formulated to attempt a retrace of his flight path

With the engines turning, crewmembers race toward the SA-16 for a scramble takeoff.

and with the general area established, search aircraft took off again.

Daylight was fast running out when one of the SA-16s located the downed aircraft. A rapid survey of the area and condition of the survivors was conducted. From all indications there was no need for medical attention, but rather, survival gear appeared to be the order of the day. The light plane was upright in approximately six feet of snow, and both survivors were standing and waving. Warm clothing, food, survival gear and a URC-4 radio were airdropped and all equipment landed within a few yards of the two people.

Developing and positioning the various methods of rescue were then put into effect. A triangle of positive rescue methods about the downed survivors was formed as follows:

The ARS helicopter was positioned at Marysville. One SA-16 with a pararescue team aboard was placed at Reno where the weather would remain clear for an early morning takeoff, and a ground rescue team led by two pararescue men hit the trail. This team consisted of county sheriffs, forestry personnel and the local utility company personnel. Their mode of transportation was snow cats.

This activity of the search was slow but very reliable in the event weather imposed restrictions to helicopter and pararescue recovery. The prospects of sure rescue were now well within reach and qualified personnel were in position for the effort.

Waiting for the hours of darkness to pass was the worst. The air-drop of survival gear by the SA-16 eased the apprehension, for it was realized that the two survivors were now well clothed and had food for the night. It's possible to hurry almost anything except the sun. Positive action had to wait for daylight.

At 0632, one SA-16 was airborne from Hamilton, en route to Marysville to escort the H-19 to Auburn, Calif., and then to the scene. The second SA-16 was airborne from Reno at 0830 with the pararescue team. The helicopter landed at Auburn at 0840, awaiting relocation of the survivors. The ground rescue team continued on slowly in their snow cats, toiling upward through trees and snow-covered rocks. In this manner, three possibilities for evacuation were converging on the survivors, each endeavoring to perform the actual rescue as quickly as possible.

At 0956 that morning the SA-16 out of Reno relocated the crash site and radio contact was made with the survivors. Anyone who has ever had to use the little old URC-4 can appreciate just how well the trans-ceiver works. The needle-in-the-haystack is a relatively large object compared with a sport plane down in the mountains, and radio contact with the survivors took the guesswork out of relocation. Both reported that they were warm and in good physical condition. While the first SA-16 orbited the crash, the other began escorting the H-19 to the scene.

The chopper arrived at the site at 1026 and, evaluating the area carefully, the pilot evacuated the two people successfully at 1040. His evaluation of the pick-up makes for interesting reading:

"With minimum fuel, three crewmembers aboard and grossing 6546 pounds, the area was surveyed by making three passes into a five-knot wind, approaching a hover but maintaining translational lift. It was determined a hover could be made at the 5200-foot elevation. The terrain was quite rough, situated on a high bluff, and was moderately wooded and brushy.

"A slow, shallow approach was made and the aircraft was hovered with the gear in the snow. The medical technician got out and led the survivors to the helicopter. After all were on board, the return trip to Marysville where an ambulance was waiting was quickly accomplished."

The SA-16s were advised to return to Hamilton AFB and the ground rescue party was contacted by radio and told to call off their end of the endeavor. Their position at this time was five miles from the scene.

All aircraft in the search and ultimate rescue returned to their respective bases and all agencies were dealerted. Mission closed.

We have to admit that this whole business sounds rather simple. You just go out and fly around until you find what you're looking for. Call up a chopper. Land. Load your passengers and yank off again. But there's a great deal more to the overall picture than meets the eye. The thinking and planning and coordinating all the variables that are not apparent to the uninitiated. The tremendous amount of survival equipment carried aboard the average rescue aircraft is staggering. The many methods of search and intercept could fill volumes.

A couple of weeks ago, FLYING SAFETY visited the 4th Air Rescue Group, commanded by Colonel A. O. Lerche, at Hamilton AFB. With four squadrons located respectively at Hamilton, March, McChord and Lowry, this organization has a vast area of responsibility. Working closely with ADC, the functions of the two appear almost synonymous until the gong rings, then one scrambles to destroy, if necessary, the other scrambles to save.

Inasmuch as ARS personnel never know whether they'll be called on to head out into the desert, skim over the Rockies or grind long hours at sea, the SA-16s are always loaded with a variety of survival equipment. Everything is designed for easy and accurate parachuting to survivors.

Take a crew forced down in the wilderness, for example. Once located, the ARS crew will drop them a carbine and ammunition, heavy clothing which includes jackets, pants and long johns, as well as gloves,

In case of injury, paramedics will bail out at once and spot-land close to survivors.

boots, sox, parkas, blankets, food and a portable stove for cooking.

Normally, they'll also receive a radio (URC-4), and yellow message streamers giving whatever instructions appear to be necessary. If there are injuries among the downed party, paramedics bail out and spot-land within yards of the camp. These highly trained medical technicians, as devoted to duty as any doctor who ever came down the pike, are as physically fit as all other paratroopers.

Sea rescue presents problems peculiar to that medium. It isn't often that we have to ditch these days but there again, *if it becomes necessary*, try to get word to someone—anyone for that matter—then play your cards as carefully as possible. Regardless of where you are, if your "Mayday" gets through, ARS will be on the way within minutes. If you can't squawk because of communications failure, they'll be alerted shortly after your time runs out.

The SA-16s carry a great deal of water survival equipment, too. The droppable PP-1 Kit consists of two 20-man rafts. Actuated by a staticline paradrop, the rafts will inflate on the way down. Because they're secured together by eight hundred feet of line, a bit of bombardiering on the part of the SA-16 navigator insures that they'll hit upwind from any downed party and then drift down where the line can be snagged without lots of swimming, paddling or praying. There's plenty of grub and water and emergency medical equipment attached to allow for a rather protracted sea journey. If the rescue craft splatters the area with sea marker dye, don't be surprised. Makes for easier relocation in case an open sea landing isn't practical at the moment. Remember though, like the famed Royal Mounties, ARS always get their man. Probably you don't realize how important you are!

There are, of course, many reasons why the Air Rescue Service is a tremendously efficient organization, but by and large, the most important factor is training. Training and retraining. Constant crew up-grading. There isn't a single pilot or other crewmember within ARS who can rest on his laurels.

It is highly doubtful if any unit within the structure of the military demands any greater air crew discipline than ARS. And, we don't mean spit and polish, either. On the contrary, rescue is such an exacting business, every man must not only know every phase of his part in the program, but also is required to have a working knowledge of the next man's assignment. Then and only then can a crew function effectively regardless of situation or predicament.

The Civil Air Patrol, a USAF auxiliary, is trained by ARS and lends invaluable assistance on search and rescue missions. Their aircraft are best utilized for terrain search operations.

Plane commanders and those being up-graded must practice constantly to assure maximum personal performance under the most adverse conditions. Standardized procedures include proficiency in the following:

Normal and cross-wind takeoff procedures from land. Instrument and night takeoffs. Maximum performance takeoffs with and without JATO. Standard range, GCA and ILS approaches including engine-out configuration. Landing site evaluation. Maximum performance landings.

As far as water work is concerned, ARS pilots constantly practice evaluation of sea, sheltered water and rivers so they will be able to recognize best landing areas. They must have a thorough and efficient knowledge of basic seamanship. They must know and appreciate the limitations of SA-16s in various water conditions. They practice normal and abnormal takeoffs from water and must know how to get the maximum performance from their aircraft, both in sheltered waters and the open sea.

They are experts in abnormal landing conditions which includes night, instrument, glassy and rough water. Ramping and beaching procedures and evaluation of the surf are other factors that they must be able to understand and master.

The various methods employed in actual searches require the greatest coordination between the navigators and the pilots. Many different patterns are used, depending upon the nature of the mission, such as the expanding square, expanding rectangle, creeping line or the combined parallel expanding square search, to name but a few.

The specialists who make up the Air Rescue Service are, for the most part, men who have devoted years of their lives to the organization. Some say that, like death and taxes, you can't escape from ARS. We happen to know that such isn't true. The real rescue man stays because he wants to. He's a highly trained specialist in a tight-knit organization, and the average pilot, navigator or paramedic is in there to stay just as long as he's needed.

We'd like to reiterate some of the things you can do to help ARS help you, if it ever becomes necessary:

- Get the word out fast if you run into a bind.
- If so equipped, turn IFF to EMERGENCY.
- If far at sea or over vast wastes, maintain the same course until advised to change by ARS.
- Don't wait for the full-fledged emergency to develop before asking for help.
- Try to give a complete picture of your position, altitude, speed, number aboard and the nature of the emergency to the nearest contact point. If you can't reach ARS direct, don't worry, the information will be relayed immediately. Above all, play it cool. You've got the best rescue organization in the world working for just one guy. YOU. ●

FLYING SAFETY suggests that all personnel charged with training, regardless of echelon, obtain and show the new film titled "Know Your Rescue Service." It's available for distribution Air Force-wide and gives a complete and comprehensive coverage of exactly what ARS can and does do. Every pilot and crewmember in your organization should see this 20-minute film.

For a comprehensive rundown on ARS procedures, see the Supplementary Flight Information document. There's a wealth of information in a few pages and such reading is time well spent.

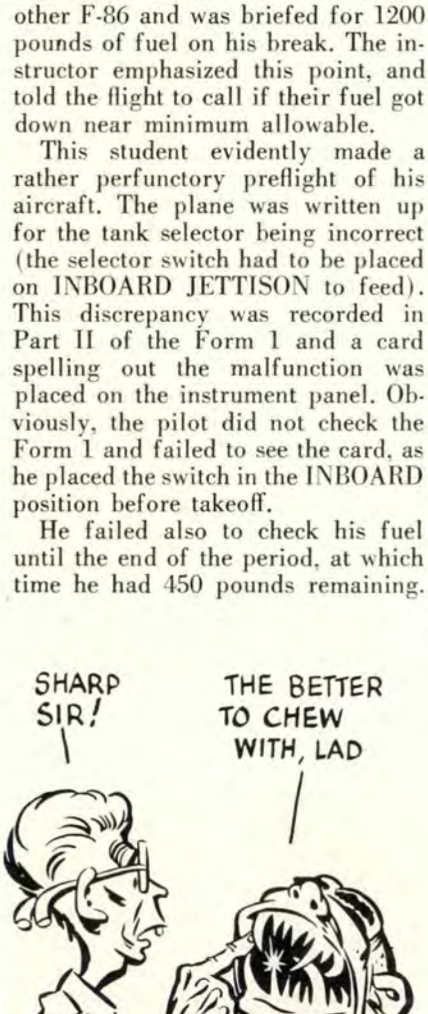
REX SAYS

ONE OF OUR STUDENTS recently got himself involved in a comedy of errors, which fortunately didn't lead to something far more serious. This boy's trouble started as far back as his briefing.

He was scheduled for a formation mission with his instructor in another F-86 and was briefed for 1200 pounds of fuel on his break. The instructor emphasized this point, and told the flight to call if their fuel got down near minimum allowable.

This student evidently made a rather perfunctory preflight of his aircraft. The plane was written up for the tank selector being incorrect (the selector switch had to be placed on INBOARD JETTISON to feed). This discrepancy was recorded in Part II of the Form 1 and a card spelling out the malfunction was placed on the instrument panel. Obviously, the pilot did not check the Form 1 and failed to see the card, as he placed the switch in the INBOARD position before takeoff.

He failed also to check his fuel until the end of the period, at which time he had 450 pounds remaining.



Despite the fact that the fuel was lower than allowable minimums according to his briefing, he didn't call the flight leader during the letdown. (The flight leader had 1800 pounds of fuel at this time.) Finally, just before entering the initial, the student informed the flight leader that he had 50 pounds left. The leader immediately brought him in on a straight-in approach off the initial and the faltering tiger made a normal landing on the runway, flaming out as he touched down.

After the aircraft was towed off the runway, a check showed that there was still 240 gallons of fuel remaining in the drop tanks!

REX SAYS: *Man alive, (it's a wonder this boy still is, after that one) our accident prevention people and Ops officers are constantly pounding home the importance of preflight checks, why you must read the Form 1 and the reasons for following SOPs and briefings. This joker made enough mistakes to start a whole file of Form 14s. It's hard to figure why he wouldn't check the Form 1, see the placard or follow his briefing. He probably had other things on his mind, which can get real rough when you're flying an airplane, especially a jet fighter. However, it figures that by the time his instructor and CO finished chewing, he won't be so neglectful in the future.*

Something else enters my mind concerning this near-miss. Seems that the noted discrepancy could be construed as being a safety of flight item. As such, the aircraft should have been carried on a red cross. In short, earth-bound until said gripe was properly corrected.

I WAS LEADING a flight of four jet fighters on an IFR cross-country mission and as a result of some admittedly lousy flight planning ended up over the range with 30 minutes less fuel than I had entered on my flight plan. Not that one goof was enough, I called in and requested a letdown without bothering to tell them that our supply of juice was somewhat critical. I figured that with a normal letdown I had plenty of fuel, which was true, but after being cleared to 20,000 feet I received an expected approach time of 1329. Still okay, but at 1328 the tower advised that the expected approach time had been moved up to 1341, then later it was again changed to 1353. Finally, I advised them that unless I received immediate clearance, I would be forced to declare an emergency because of fuel limitations. The next thing I got from the tower was that they couldn't clear me until 1408. At this time I declared an emergency and started my descent. We all landed successfully but not one of us had more fuel than it takes to fill a Zippo.

REX SAYS: *With the current inflation you are now valued at 89 cents in varying amounts of calcium, iron and such. Add to that the cost of pilot training, roughly $60,000, and the total soars to about $60,000.89. Now strap a one-million-dollar airplane to your posterior and the taxpayer ends up with $1,060,000.89 worth of man and machine hustling around the wild blue. Everytime you "goof," you hit Uncle where it hurts. But likewise, everytime you use the old noggin in an emergency, you save money.*

Now, that this guy pulled a few boners cannot be denied. With proper flight planning all of this mess would not have come up in the first place. But his declaring an emergency and executing an immediate letdown is a typical example of how a small amount of common sense results in a large saving.

That ARTC can and does handle a lot of traffic when the birds are walk-

ing, is a foregone conclusion. They really do a job; still there may come a time when it is necessary for you as a pilot to take things into your own hands and pull a "ready or not, here I come" stunt. It is certainly not the ideal situation but if you gotta, you gotta! Let them know what you HAVE to do, then do it.

★

I WAS RETURNING to base having cleared from Amarillo, Texas, to Long Beach, California. Takeoff was at dusk and most of the flight was carried on in darkness. There was a moon but the night was quite black. Since the cited event took place between Holbrook and Prescott, Arizona, the countryside was quite black, too, being sparsely populated and with little lighting on the ground. I was flying airways going west and was at an altitude of 10,000 feet which is the published minimum for that airway in that particular locality. As I approached Winslow, I got ready to make my position report and to consult my computer so as to give an ETA for Prescott.

I used my flashlight momentarily, got my computation and gave a look around. Much to my surprise I saw another aircraft approaching me from the right and at the same altitude. I don't believe he saw me but I managed to get out of his way. I don't know if he was flying local or was going south on his way from someplace to someplace else. He was apparently on a course of about 180 degrees or more and hence if he was using the quadrilateral course system he was at a proper altitude, to wit, even thousand altitude. After I passed Winslow and before reaching Prescott, I overtook another aircraft going the same direction and at the same altitude as I. In neither case did I see the aircraft until it was almost too late to avoid running into same. It certainly would be advisable, what with all the air travel these days, if all flights were required to be on the basis of an IFR clearance regardless of weather conditions, and they be monitored by ARTC to provide time and altitude separation.

REX SAYS: *Well, you have a pretty good point. There are a lot of pros and cons concerning requiring an IFR flight plan during the hours of darkness, regardless of the weather conditions. I have to sort of go along with the idea especially in controlled areas. Of course the big difficulty is that there is a lot of delay involved in providing positive separation and theoretically, if the visibility is good enough for VFR conditions they figure that you should be able to see other aircraft.*

There are several European countries that require all night flights to be IFR. The United Kingdom is one of them, I believe. I've flown around there and it is nice to know that you are provided separation when the sky is black as ink.

★

I'D LIKE TO JOIN the parade of "learn and share it" with this little lesson that I learned the hard way. It happened on an administrative flight, B-25 type aircraft with provisions for seating in the waist. Just prior to takeoff, I requested one of my passengers to hang my extra uniform in the aft end of the airplane. He did. The spot he picked may have been convenient but it was also hot.

When the time came to retrieve my neatly pressed uniform, I found that instead of the customary two holes in the trouser legs, there were now eight from which to choose. My shirt too had suffered a slight change in tailoring by way of two gaping holes dead center aft. All liberated material lay charred and crumbling on the aft-section floor and left little doubt as to what happened. That's right, the heater system of the B-25 must be about as hot as Mom's old flat-iron because the results of over-exposure are the same.

Aside from the loss of clothing, I thought of the far more serious series of events that could have taken place as a result of my carelessness. No, I personally didn't hang the clothes next to the heater, but I didn't make sure they weren't hung there, either.

REX SAYS: *Safety is a small thing except when measured by its absence. In this case, its absence could have resulted in an inflight fire of serious consequence. The loss of the uniform was getting off easy. Our newly joined confessor has just pointed this out himself so there's no point in my rubbing it in. But, to belabor the point . . . by virtue of their function, heaters are hot.*

No, this is not the latest garb for the well-dressed USAF type. Actually, it is the result of carelessly hanging a uniform too close to a B-25 waist heater.

that Magic Area

B. A. Martin, Chief Pilot,
Georgia Div., Lockheed Aircraft Corp.

AFTER HAVING FLOWN quite a lot in a little of everything, most pilots are probably in the same boat as I. We're creatures of habit, and habits in this flying business sometimes can and do lead to accidents. I know that I have to watch my own habits closely and you should too. Let me amplify that a bit.

Let's say you've been flying a C-47 for several years. You've been in and out of every pea-patch from Able to Zebra, along with every big field in the country. You've flown in all kinds of weather and made as many night landings as day landings. No sweat. You know your plane and can put it exactly where you want it.

Okay, that's fine, but now let's say that you transition into a larger aircraft. It's bigger and heavier than your Gooney and has four fans instead of two. It cruises faster, carries a much greater load and although it dwarfs the C-47, it's still a kindly aircraft. You learn the plane thoroughly and you get to like it. Then one day you run into trouble.

This is completely unexpected. You're coming in for a landing on a 10,000-foot runway. It's a clear day and the surface wind is almost calm. Two miles out on final you're holding recommended approach speed for the load. One mile out and you know you've got it made. You're all set up. You're coming in real nice . . . then it happens. Before you can lift a hand, the main gear slams onto the ground with a spine-shattering wallop and the big bird bounces back into the air with a vicious leap. You

Fly the aircraft all the way down on the final approach. So far you have merely concentrated on arriving at the magic area at a given airspeed, not on touching down.

slap on full power and somehow catch it before all is lost, but you can't stop the next downward lunge. The big plane smacks down again. This time it hits on the very edge of the runway and you hold your breath, wondering if the gear is going to collapse. Then you chop power and hold the nosewheel off as long as possible. Finally, after using reverse thrust and tapping the brakes gingerly, you coast to a stop. You're shaking like a leaf and even now, you hate to look over at the copilot. It goes without saying that you are more than thankful that the overrun was relatively smooth and graded and not full of big ruts or chuck-holes. There's about 4000 feet of runway left and you wonder how in the world you managed to hit so short.

Basically, the answer is very simple. Your *habits* got you into the predicament and out again, too. It was habit or reflexes, or whatever you want to call it, that prompted you to firewall the big bird after initial contact with the ground. And it was these same habits that allowed you to complete a more or less successful recovery. In those few seconds your body was responding automatically to messages from your brain—messages that resulted from years of training and experience.

So you say, "Well, how did habit get me into an unsafe attitude? Do you infer that habit made the plane stall out? If so, you're nuts. One doesn't develop a habit of dropping in short. It just ain't habit-forming."

All right. I'll go along with you part way. Normally, short landings aren't habit-forming but it was a habit that caused you to hit short, and this was something that developed 'way back in the days of your early instruction.

Let's take a Dash One for any airplane. Look up the recommended speed for the landing pattern. You'll find tables for varying loads. Okay so far. Now, note that a speed is established for the approach phase and another slower one for over the fence. Please don't think I'm getting too basic, for it's this over-the-fence speed that can get you into trouble. What we mean by this over-the-fence speed is the IAS as you pass over the end of the runway.

No, the Dash One isn't wrong. You were, when you landed short. Somewhere out on that final approach you stopped flying the airplane. Right at the point where you said, "I've got it made," you quit flying the airplane and started guiding it and then trouble caught up with you. What you actually did was cut the instruments in the cockpit out of your crosscheck and concentrate on visual reference to the runway only.

There's one point in every landing pattern that I call the magic area. If you can reach this area while still flying the airplane, your landing will be assured, and I mean every time. Even if you wanted to, it would be impossible to hit short, for when you reach this magic area there is some solid runway under the airplane.

Let's take a hypothetical case. Our airplane stalls at 80 mph so we add 30 mph to that for our over-the-fence speed. In other words, we should arrive over the threshold at 110 mph. This exact speed is all-essential if we're to make the landing properly.

Now let's say the average angle of attack for touchdown is about seven degrees, nose up. This means that we've got to rotate the plane from a near-level attitude to a nose-up attitude through an arc of seven degrees after we reduce power. The average rotational rate is approximately one degree per second.

If our speed is just right when we reach the magic area, all that remains for us to do is close the throttle and rotate the plane until the desired landing attitude is obtained. You will never land short.

The important thing is to fly the aircraft up to this magic area and reach it at the correct airspeed. Prior to reaching this area you have not committed yourself to land. All during the approach you have merely concentrated on arriving at this point over the runway at a given airspeed, not on touching down. This means that you must still read the airspeed as well as look out at the runway. When you reach this magic area, then and only then do you start to land.

Whether you bounce or paint it on at this point is not really important, is it? Yet, you will be surprised to find out that you will make consistently good landings because you are making them the same way, every time. Of course, the big thing is that you will never be caught short—of the runway, that is.

Now, say we cross the fence too slowly. It will be necessary to speed up our rotation rate tremendously if we are to achieve the correct landing attitude before we run out of airspeed and altitude. You know what usually happens in a case like this. Somehow, you just don't quite make it and hit with a vengeance. And, of course, you are setting the stage for having the bird drop out from under you, short of the runway.

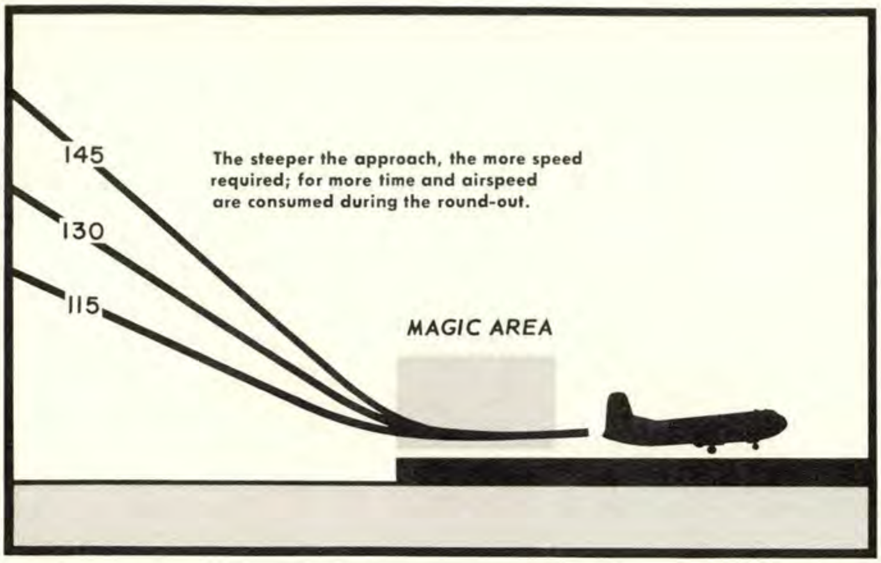
Conversely, arriving at the boundary with too much speed results in a period of floating. What the pilot really says to himself then, is, "I can't rotate as fast as usual." In other words, he doesn't have his airplane under control.

So where is all of this leading? It's leading to just this and I repeat: Any pilot in any airplane can make good, safe approaches and landings if he knows his exact speed right into the magic area. Once he has arrived there, and not a second before, can he completely disregard the cockpit instruments, concentrate on the runway and complete the landing, or if necessary, initiate a go-around.

It has been my experience that all too many pilots are prone to watch their instruments carefully until almost to the runway, say a quarter of a mile out, and then at the most critical moment, shift their attention from the cockpit to the runway. They can't tell by many miles an hour whether they crossed the boundary too fast or too slow and every now and again one will fall short and wonder why.

Part of my job has been checking out pilots in Connies. This is a big

Control your airspeed just as when making an instrument approach until reaching that area over the end of the runway.



airplane with lots of power. It is kindly and forgiving yet I have been amazed at the number of experienced men who make good approaches only to throw it all away when they reached the critical threshold area.

I really don't care what sort of a final approach is made. Long and flat or high and steep. Conditions usually dictate the approach. But the airplane has got to be just as carefully controlled up to the threshold as when practicing instrument procedures.

I believe that one factor often overlooked is that of time. If we have to make a steep approach we carry more speed to insure a controlled flareout. This takes time. Here again, we have to plan ahead. The steeper the approach the more speed required and the more time needed to round out, slow down and hit the magic area at the correct speed. Obviously the area behind must be sacrificed. These are factors that you have to practice yourself. Reading about them won't produce one whit of ability.

One thing that I'd like to point up a bit is this business of airspeed keeping you flying. Remember when your instructor told you that the only thing that kept you in the air was airspeed? Well, actually, that wasn't quite true for the propeller wash over the wings had a lot to do with it, too.

Take a case of undershooting slightly.You open the throttle or throttles and immediately feel the airplane surge. However, if you've ever watched the airspeed indicator under such conditions, you noted what you thought was increased speed was in reality an increase in lift. The increase in power resulted in increased lift provided by the propeller slipstream over the lift areas of the aircraft. The end result, of course, was lifting yourself by your bootstraps.

Along with this idea of flying the aircraft right up to this magic area, never forget that power is your fourth control. You must use it as a control agency just like the surface controls. Use it to help you get and keep the correct speed. It is also wise to remember that you should not chop the power abruptly any more than you jerk back on the stick for landing. When you do you are immediately taking lift away from the wings. Use it like the other controls, smooth and easy.

Now this lift by propeller slipstream actually provides more margin for airspeed error. But today, as we get closer to an all-jet Air Force, we have to change our thinking about such factors quite a bit. In any jet plane, airspeed is your only salvation. Unlike the reciprocating job, you don't have a fan to create lift.

What the man said about airspeed keeping you flying is now perfectly true in a jet. With your indulgence I'd like to speak briefly on some of the jet problems. Testing B-47s has given me a reasonably good insight to this puzzle so, for whatever they are worth, here are my ideas.

One factor that's applicable to any aircraft, but particularly jets, is the critical threshold speed and that magic area again. It's important to be in this area at the right airspeed in reciprocating jobs; it's an absolute necessity in a jet aircraft. As a rule of thumb, you can figure that every five knots above recommended over-the-fence speed will account for 1000 feet of runway. If you come in too hot you'll find yourself fresh out of runway in spite of drag chutes, flaps, brakes or any other aid. Yank up the net, lads, I'm coming through.

This then is really what I've been hammering at. One of these fine days you'll find yourself strapped to a blow-torch for the first time. I predict that you'll love every moment of flying it too. But if you're sloppy about this magic area business, you're in for trouble. You just don't have the leeway to play with in jet aircraft.

Let's take another hypothetical example and see what can happen. This job stalls at 120 knots and we use 130 knots for our over-the-fence speed. Okay, we could build in all sorts of possibilities that might louse us up. Maybe the airspeed indicator is a couple of knots on the high side. Possibly the plane is dirty and our aerodynamic efficiency is lowered by three or four knots. So there's about six knots shot and we don't even know it. Where are we? Just four knots above a stall and that doesn't allow for any horsing around. Let the pilot apply one-tenth of a G at this point and we lose six more knots and that's all she wrote!

Fortunately this is an imaginary case and we never have to fly 'em at quite so critical a speed. But, you can see from the example that we've got to know our airspeed all the way to the threshold. Naturally, in gusty air we'll add a few knots. You do that in a reciprocating job, and the jets are no different.

Unlike your old Goonies and other allied craft, jets have no propellers to act as brakes. I don't mean reversible fans, either. Those big blades present some genuine drag and many a pilot who has landed long can thank his props for getting stopped. By the same token, they've caused some undershoots, too.

I'm not attempting to teach the mechanics of flight in this brief article. That will come with training and practical application. However, in any airplane, jet or reciprocating, if you control your descent, enter the magic area at the proper airspeed, you've got it made—and not a mile or two short. ●

Capt.
Edward C. Jackett

3215th Drone Squadron
Eglin AFB, Florida

KNOWLEDGE
TRAINING

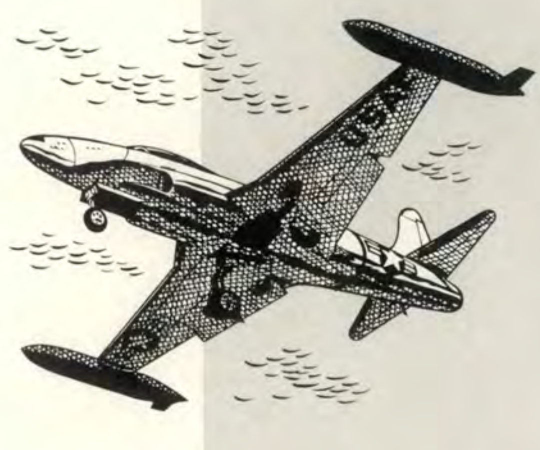
WELL DONE

CAPTAIN JACKETT was flying a T-33A which had just undergone major modification prior to use in drone operations. The aircraft had been released for the short flight between Eglin and an auxiliary field, minus workable radio equipment.

In accomplishing his check prior to landing, he found that the gear handle could not be moved. All attempts to do so were futile. This not only prevented lowering the gear normally but also precluded using the emergency gear procedure.

Rather than resign himself to a wheels-up landing, the captain mentally searched for a solution. Remembering a recent T. O. change regarding the T-33A gear system, he suspected where his trouble might be and methodically proceeded to make inflight corrections. He first removed the access plate over the gear controls, broke off the gear handle and released the cable. He then removed the gear handle lock pin from behind the gear handle support. It was the lock pin that had prevented the gear handle from moving. Next, Capt. Jackett rotated the gear selector valve to the "down" position, using the rear seat connecting rod. He held the valve in the "down" position during the landing and until gear safety pins could be installed on the runway.

Capt. Jackett's thorough knowledge of the aircraft, and his exemplary ability to think analytically under emergency circumstances, make him well deserving of a "Well Done."



Electronic Weatherman—An electronic weatherman is opening the door to a new concept in weather forecasting. Meteorologists say it is the most significant advance in weather prediction in the last 30 years.

A giant electronic data-processing machine, tabbed the Model 701, will soon be turning out daily weather charts at the Joint Numerical Weather Prediction (JNWP) unit, located at Suitland, Maryland.

Precise mathematical formulas based on the dynamics of the earth's atmosphere are the basis of the numerical system. Electronically calculated, the movement of the air masses which cause weather variations can be predicted with reasonable accuracy by the machine.

Data used by the 701 comes from reports received by teletype from weather stations in the U. S., Canada and Mexico. These reports contain information collected at the various sites by rawinsonde balloon runs. The machine computes the data and then produces charts showing predictions of pressures expected at 3000, 10,000 and 23,000 feet over the United States for the next 24 and 36-hour periods. The pressure at these levels vary as weather conditions vary, and the charts will be used by weather forecasters to predict the weather for their locale.

In answer to many requests from the field, this picture shows the redesigned altimeter dial face, with the 10,000-foot pointer. Present altimeters will be modified to have a window which shows a striped warning sector when a plane descends below 16,000 feet.

The JNWP is a joint effort of the USAF Air Weather Service, U. S. Naval Aerology Branch and the U. S. Weather Bureau under the direction of AWS. Its experts estimate that 64,000 men, working 24 hours a day would be required to forecast weather on a world-wide basis, using the numerical system without the 701 computer.

★ ★ ★

T-37A-Trainer—December will mark the delivery date of the first T-37A twin-jet trainer to the ranks of USAF aircraft.

The twin-jet is a product of the Cessna Aircraft Company and is powered by two Continental J-69 turbojet engines. The USAF will perform an 8000-hour flight evaluation program on the T-37A, starting with receipt of the first aircraft.

Eleven of the little trainers are scheduled to be delivered between December and May, 1956. The USAF is planning for Cessna to go on a six-a-month production schedule in June, with an ultimate goal of 17 aircraft per month.

★ ★ ★

Pogo Planes—"Pogo" planes, like bananas, seem to come in bunches. The latest elevator type job is jet-propelled and with the exception of its "Otis" characteristics, performs like a conventional fixed-wing airplane. The first of its kind to be flown anywhere, the new Bell Aircraft Corp. development uses twin jet engines to provide thrust for vertical operation and horizontal flight.

Unlike the so-called "tail sitter" VTOL (vertical takeoff and landing) aircraft, the new Bell plane takes off and lands in a normal horizontal position, thus eliminating the need for special ground-handling equipment and crews. Two Fairchild J-44 turbojet engines, each delivering about 1000 pounds of thrust, can be rotated from a vertical position for takeoff and landing to a horizontal position for forward flight.

Incorporating a glider fuselage, a commercial light plane wing and a helicopter landing gear, the test model was built as quickly and cheaply as possible to prove the theory. It weighs about 2000 pounds, is 21 feet long and has a wingspan of 26 feet. It carries only the pilot.

For takeoff and low speed flight, compressed air is ejected from nozzles at the wingtips and tail of the aircraft to provide pitch, yaw and roll control. When sufficient forward speed is attained, flight control is provided by conventional control surfaces, ailerons, rudder and elevators. The test pilot demonstrated complete mastery of the control techniques within 40 seconds of takeoff on the first flight.

Miniature Radar System—The old saw about good things coming in small packages has proved itself again. This time the small package contains the smallest and lightest radar set so far publicly announced. Tagged the APN-59, its miniature tubes and other tiny components, including a five-inch radar screen, are contained in a compact aluminum case only 6½ x 6½ x 16 inches in size, overall.

The set has been flight-tested thoroughly, and despite its small size, is capable of "seeing" distances as far as 250 miles apart. The tests further demonstrated that the new unit can be used for any of the following capabilities:

- Two beam configurations - - pencil beam or fan beam.
- Gyro-stabilized antenna - - 18 or 30-inch as space will allow.
- Two types of presentation - - ground pattern or various cloud levels.
- Weather warning - - near or long range search.
- Adjustable contrast of ground pattern - - short and long range.
- Multiple pulse lengths - - automatically applied.
- Radar beacon interrogation and reception.
- Full 360-degree or sector scanning.
- Terrain clearance or to spot nearby aircraft.
- Ground mapping and exact drift measurement.
- Delayed and expanded sweep magnification.
- Pressurized as required for non-cabin components.
- Variable range marker - - plus fixed range markers.
- Remote gyro installation - - used for less space in the radome.

★ ★ ★

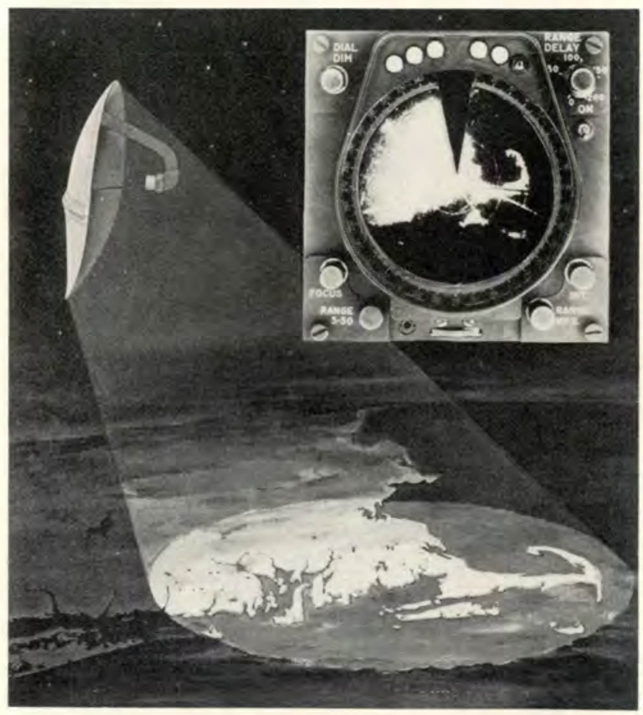
Beeper Pilots—This business of flying aircraft with two feet planted solidly on terra firma has received a new boost with some late refinements in the system. The new UHF radio guidance system makes it possible to take off, climb, dive, cruise, orbit and land jet fighter aircraft with split-second remote control. And what's more, the gadget box now has a built-in safety factor in case the control signals should be cut off by ground power failure or bomb damage.

If the drone is below a pre-selected altitude when the carrier signals are shut off, an electronic "brain" takes over the aircraft's controls within five seconds. It establishes a full-power climb of exactly seven degrees, retracts the dive brakes if they are extended and at 200 mph starts a climbing turn to the left until the pre-set altitude is reached. Altitude control is then engaged and the plane is orbited to the left at a constant airspeed until the signal is restored and the plane can be landed.

If the signal is lost above the pre-set altitude or during the initial climb-out, the safety device still will control the aircraft to the proper altitude and keep it orbiting until ground control is restored.

The new ground-control system, designed as a standardized production version for both jet and reciprocal-engined drones, is a decided improvement over former beeper methods, and was used during the recent nuclear exercises in Nevada on both the QF-80s and QB-17s which were employed in the tests.

Bell's experimental, vertical-rising airplane obtains forward thrust by rotating the twin-jets 90 degrees.



Miniature radar screen shows Cape Cod. Dark wedge at top swings to any heading for exact drift measurement.

Beeper pilot brings in a QF-80 using the new remote control system designed for Air Force drone aircraft.

Goof— and LIVE!

HARDLY a day passes without someone giving vent to the old cry against complexity. New airplanes. New gadgets. Gadgets to help gimmicks and gimmicks to amuse and confuse the pilot.

To a certain extent we have to go along with such complaints. However, at long last something has been developed to make the pilot's job a bit easier, rather than more complex. It is called the F-84F Cockpit Procedure Trainer.

Built by Stanley Aviation Corporation, the first '84F trainer is currently being evaluated at Luke AFB, Arizona. Here it should be pointed out that this bit of electronic equipment is not a simulator; it's a trainer.

This unit consists of two separate components. A cockpit which is a duplicate of the F-84F-10 series aircraft and an instructor's console which includes a system of tell-tale indicator lights and cockpit repeater instruments with the necessary controls to operate the trainer.

The scope of this trainer is such as to permit complete cockpit familiarization, afford practice in normal and emergency operating procedures and to allow instruction in the operation of the numerous systems of the F-84F.

The '84F trainer provides realistic simulation of such systems of the aircraft as the engine, engine controls, fuel system, electrical system, hydraulic system, landing gear, flaps and surface trims. All instrument and light indications associated with the systems respond automatically and correctly to actions taken by the student.

The concensus of those who have examined the trainer is that it gives the correct steps in procedures for both normal and emergency operation; that it is a definite asset in getting away from classroom chalk talk; it tends to build self-confidence in a new pilot, and it provides a method to prove to old pilots that there is a need for reviewing emergency procedures. Further it provides a definite test of a student's learning by doing.

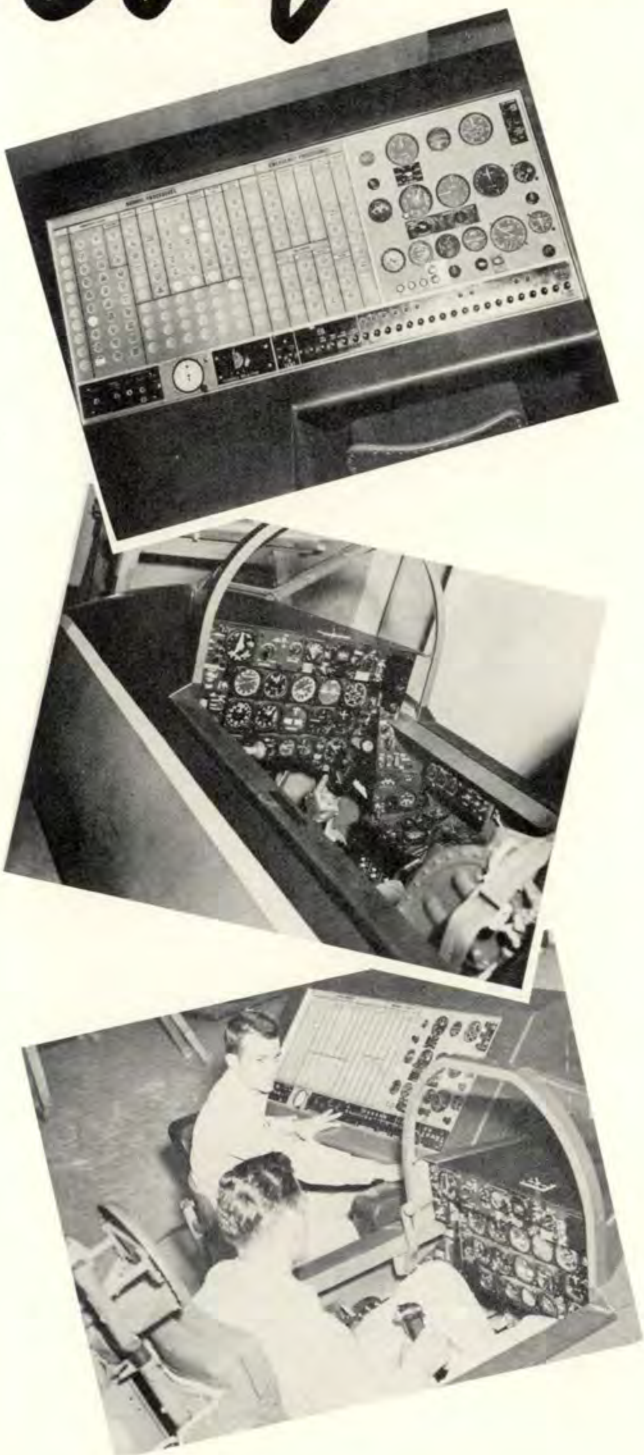
To illustrate the training advantages afforded by this type of integrated design, let's review the operation of the trainer under a "flameout" condition.

This emergency is introduced with the instructor depressing a malfunction switch. As a result, the engine speed will automatically decrease to windmilling RPM, the tailpipe temperature will drop, oil pressure and hydraulic pressure will decrease, the DC generator will cut out, the AC instruments will fail to indicate and the hydraulic equipment will become inoperative.

Okay, here you are at 20,000 feet, hanging by your throat mike and no fire in the pot. This is where the "procedure" business means just that. If the student has the correct procedure down pat, he will go through all steps for an airstart automatically.

Each step of the procedure is followed by the instructor who monitors the successive lighting of tell-tale lights in the "airstart" channel of the console. The situation thus created is realistic and the instructor can monitor and guide the student as necessary.

Although the F-84F trainer that we examined is the first model, word has it that there are more to follow, soon. If the experience at Luke is any criterion, it would appear that the cockpit procedure trainer should have a definite place in the USAF pilot training program. It really simplifies the pilot's job and that certainly is a step in the right direction.



The F-84F trainer is used to teach a student complete cockpit familiarization, for practice in both normal and emergency operating procedures and to instruct in the operation of the aircraft's numerous systems.

This chick is digging up a little dirt on her approach . . . but she's not necessarily short of the runway.

In her case, it doesn't matter; she'll get there anyway. But with you bird drivers, whether you're pushing a jet or a large reciprocal type, it does make a big difference.

This business of touching down short is getting sort of rough and it looks from here as if there can be no excuse but poor flying technique.

Run through the article on page 22 and see if it doesn't make a lot of sense. It was written by a real pro, who is in the know. . . .

Do You Dig It?


Mal Function
RUSH
Flying Safety Mag-a-zine,
Arrives each month on air base scene.
Now Mal, who's low on barrier lore
Should read full story on page four.
But uninformed, he fails to drop
Big pylon tanks; thus doesn't stop.
Accident tagged as pilot err,
But real culprit's over there.
F. S. MAGS
Now this story goes to show,
That magazine hoarding deals low blow.
One copy for many is all we send,
So pass it along to pilot friend.
PASS IT ON