FLYING SAFETY

INSPECTOR GENERAL · U. S. AIR FORCE · RESTRICTED

FLYING THE B-47

page 2

NOVEMBER, 1951
RESTRICTED

HEREWITH:

That's a B-47 on the cover—one of the Air Force's white hopes for countering any aggressive action that might come our country's way. And that is Col. Paul Tibbets accepting the airplane forms from the crew chief as he enters the plane. His business is B-47's, and he carries on his business at Boeing's Wichita plant where making B-47's is *the* business.

Beginning on page 2 of this issue, you can read all about how to fly this bomber that makes like a fighter. A few pages later, you will find a roundup article on GCA. It should impress you with the fact that equipment now in the making will not only make the pilot's job several hundred times simpler some day, but that there is also a possibility that GCA may come in for a new name to indicate that it is a blind landing system. That's a maybe, of course.

In this issue we also welcome back to our pages Captain David F. McCallister whose work has appeared in FLYING SAFETY before. "Davey Mach" has always shown a very strong interest in our magazine and in attempting to spread the safety word among other pilots. Thanks to you, Davey, and thanks to all the other contributors whose writings herewith appear for the first time. We hope it isn't the last time. To other readers, the pages of this magazine are always open to you.

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CLASSIFICATION CODE:

At the end of each article in this issue of FLYING SAFETY you will find either the letter R or U. These capital letters indicate the classification of the article. "U" means unclassified; "R" means restricted. Any Air Force organization is perfectly welcome to reprint any portion of the magazine. The classification code indicates how the material should be treated from the security standpoint. Non-USAF organizations should query the Editor before reprinting, indicating how the material will be used.

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DISTRIBUTION:

We have had complaints, sometimes formally and sometimes informally, that certain units receive no magazines, insufficient magazines, or too many magazines. For every one of those who complain, there are probably several in the same circumstances who go along in silence. Such situations can easily be remedied. To save personnel, and for economy in mailing, we have adopted the practice, wherever possible, of mailing FLYING SAFETY to only one addressee at each base. Usually, this is the base Flight Safety Officer. It is left to him to make proper distribution to all units of the base. If your unit is not being taken care of properly, gripe to your base Flight Safety Officer. If he doesn't get enough copies to take care of your unit, all he has to do is drop a letter, informal will do, to the Editor, FLYING SAFETY MAGAZINE, Directorate of Flight Safety Research, Norton Air Force Base, San Bernardino, Calif.

FLYING SAFETY

RESTRICTED

DEPARTMENT OF THE AIR FORCE
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MAINTENANCE MEANS AIRPOWER

By 1st Lt. JERRY N. DOWNEN, Jr., 516th Troop Carrier Wing (M)
Memphis Municipal Airport, Tenn.

Mention air superiority or airpower and most people will close their eyes and picture a panorama of multi-engine bombers or a huge troop drop—but the planes we see in the air are, alone, neither aviation nor airpower. They are merely the peak—the apex—of a gigantic pyramid that extends far and deep below to a vital base which supports the whole of aviation.

That base is manpower. It outnumbers the flying personnel by hundreds to one, and the machinery and equipment needed to maintain the aircraft in infinitely greater proportions. It is a foundation of engineering marvels, of research, trial, and repair, and above all, of mechanical ingenuity. The success of any Air Force unit must be measured by the skill, reliability, efficiency, and resourcefulness of the maintenance personnel behind it. Maintenance, as it pertains to aviation, means the keeping of equipment in a continual state of efficiency. Therefore, in a strict sense, there's no such thing as good or bad maintenance—it is something that is either there or it isn't—there's no twilight zone.

Some day soon, you pilots should wander through each of the various shops which comprise the Maintenance Squadron. The marvels of the enchanted forest of tools, testing devices, and equipment will soon be overshadowed by the fact that human skill and human hands are needed to man the equipment. Without such components, every aircraft and every piece of equipment becomes dead weight, worth just so much a pound as scrap metal. It will become quite apparent, too, that regardless of which of the various shops a man works in—whether it be props, electric, instrument, engine build-up, dope and fabric, or others—the effort put forth by each man has a direct bearing on the efficiency and safety of the "finished product." Laxity in the proper performance of even a minor operation could result in the malfunctioning of a component that would directly affect the safety of human lives.

Unless you're a maintenance man or are closely associated with maintenance, you've probably never stopped to consider that all day long, every day, there is a wrench or screwdriver slipping into place, with a pair of grimy hands on the other end. Theirs is a never-ending task down in the maintenance squadron, their only satisfaction in rolling out one completed job being in the knowledge that if they've done their job well, there'll be no squawks and it'll be a while before the same plane comes back for more maintenance or another inspection.

There's no such thing down there as being "caught up," for just as soon as they've finished one job, in comes another—and perhaps before they're through with that one, in comes another.

To top it off, their worries aren't limited to base aircraft by any means—there's no telling when a transient aircraft is going to drop in for an engine change or other major maintenance.

All of this adds up to just—"Thanks." And pilots, let's hope we never get our heads so high into the blue that we can't see the boys down in the hangar. Remember, "it takes the boys downstairs to keep 'em upstairs." (U)

This bomber which handles like a fighter is a plane to stir the enthusiasm of any pilot.

By Major ROBERT O. CELOTTO
MacDill AFB, Florida

WHAT SORT OF A PILOT can most easily "transition" to the B-47? Bomber pilot or fighter pilot? The answer, as it is emerging from our B-47 training program, is either or both. The pilot of a B-47 is neither fish nor fowl by the "old" standards. This radically new flying machine demands and is getting the best that the Air Force has to offer.

The bomber pilot immediately feels on familiar ground with this aircraft because of its size, crew coordination, and the fact that he's still doing the same old job—carrying bombs.

The fighter pilot feels at home in the tandem type cockpit, and with the maneuverability and jet "feel" of the aircraft. He finds out on his first flight that this is just another jet fighter with a few extras tacked on . . . a crew and bombs.

The B-47 has the problems and advantages of both fighter and bomber aircraft. Pilots who have experienced their initial flight in it, say, "This is a different breed of cat." So is this combination fighter-bomber fellow a different breed of pilot when he finishes checking out in the '47.

The preflight check consists of thoroughly reviewing and scrutinizing items on the aircraft which are familiar to both bomber and fighter pilots. The points checked are those which any conscientious pilot who takes a pride in his work, inspects on any aircraft that he flies.

Included in his tour of inspection is a review and signing of the Form 1A and any necessary discussion with the crew chief who is accompanying the pilot on his preflight. The inspection of the aileron, rudder and elevator boost reservoirs and packages, and the security and rigging of the drag chute compartment are necessary and unusual items to check. The flaperons and their accumulators which are not normally found on other aircraft have to be checked.

Another item which will come in for some close scrutiny is the condition of the sealed bays in the rudder, elevator and aileron systems. The flap tracks and flap motors, which were critical on early B-47's, have to be given a close examination also. Security of the radome is an item which will prove interesting to the pilot. Failure of radome locks causes a loss of airspeed indication, as the radome unstowed induces turbulence and destroys the airflow around the pitot heads. Pilots checking out are made aware of the importance of the security of this and other items.

Everything considered, the pilots preflight check of the B-47 is the same as the preflight of any other aircraft. It consists of a thorough going over of the aircraft, from a pilot's perspective, to assure him that the aircraft is ready for flight and able to perform its assigned mission.

The fledgling B-47 pilot, whether his background be fighter or bomber, usually receives a minimum of three observer rides before he is allowed to enter the co-pilot's seat. This is necessary because of the tandem seating design which limits side-by-side instruction as previously known in bombers.

During the observer rides, he becomes accustomed to the takeoff and landing characteristics of the B-47, and other peculiarities of the aircraft. He becomes indoctrinated in interphone procedure between the crewmeming the B-47

bers and if his past experience is that of a bomber pilot, he is becoming used to the fact that he is now working in a narrow, confined space as compared to that previously experienced. He also learns to be self-reliant and not to depend upon a flight engineer or other crewmembers for certain information which they previously presented. The fighter pilot, at this point, feels right at home in the enlarged cockpit which he now occupies.

The B-47 co-pilot is responsible for operation of all circuit breakers, controls and switches regulating hydraulic pressure, alternators, and the six generators, and also the inverters. He has a control column, rudder pedals, a complete set of flight instruments, engine tachometers, landing gear and flap control levers which are inter-connected with the pilot's brakes, drag chute deploy and jettison handles; six throttles are also available at the co-pilot's station. An unusual feature of the brakes is that application of any one of the brake pedals applies hydraulic pressure to all four main wheels simultaneously. Differential braking, as experienced in other aircraft, is not possible in the B-47. While taxiing out, the co-pilot advises the pilot of the hydraulic pressure of the main and emergency systems so that the pilot will be prepared in the event of brake failure.

The pilot and the co-pilot both perform their individual cockpit checks. The pilot goes through his "before starting" check list, turning on the necessary switches, coordinating with the crew chief who is standing by on ground interphone to make sure that surface controls are operating normally, both boost on and boost off. The co-pilot also coordinates with the crew chief while checking the operation of emergency motors connected to the flap system.

When the "before starting" check list is completed, the pilot signals to the ground crew that he is ready to start Number Four Engine. Starting sequence is normally Engines Four, Five and Six, Three, Two and One. The standard procedure for starting jet engines is followed. When the engine is idling at 35 per cent rpm, the pilot moves on to the next engine. An alternator is connected to Engine Number Six, and once started, this engine is set at 52 per cent before moving on to the next engine, which is Number Three. When he reaches Number One Engine, he idles that engine at 52 per cent also, as the second alternator is an accessory to this engine.

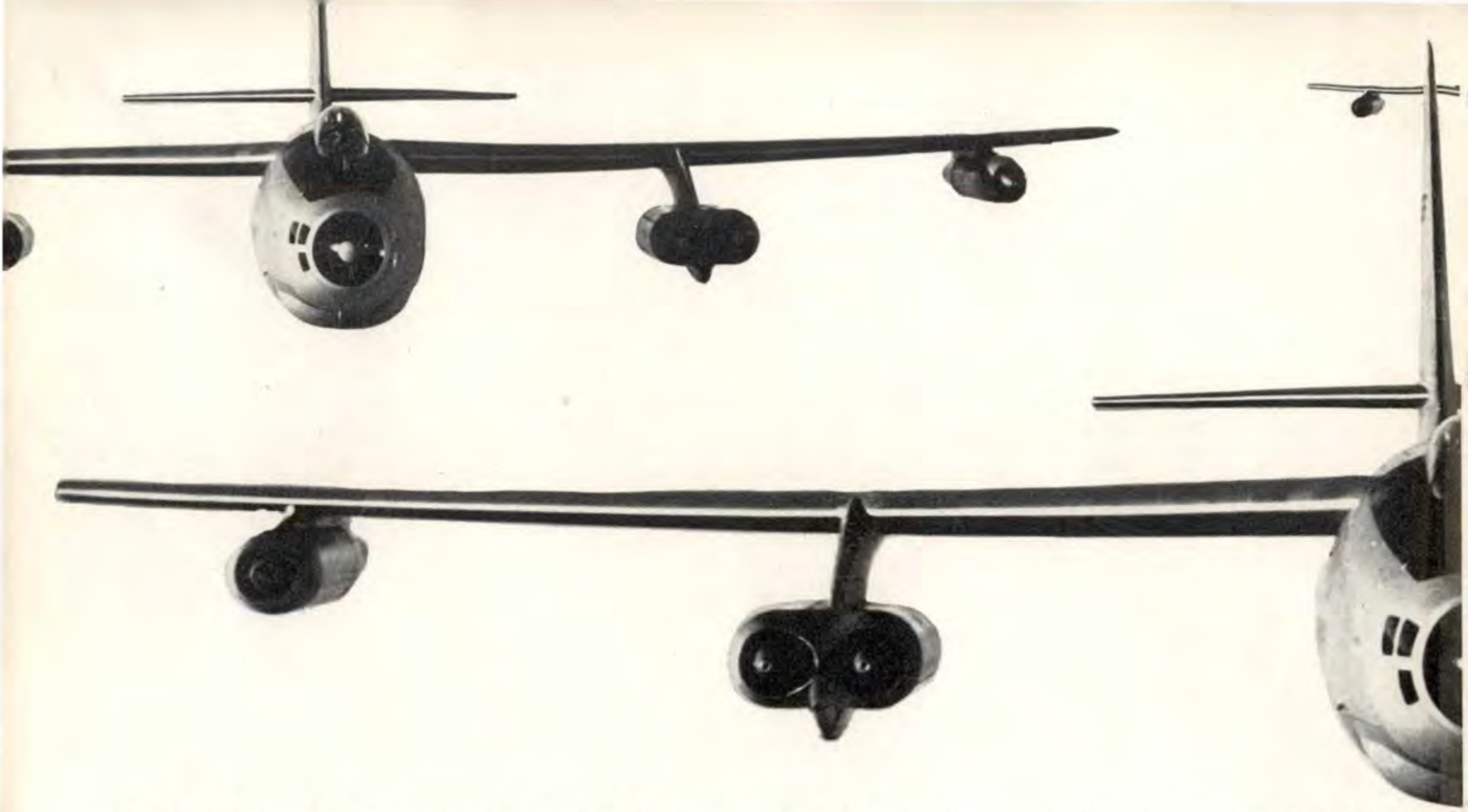
After all engines are started, the pilot directs the crew chief to remove the gear down locks and bomb bay door locks. The crew chief directs his assistants to accomplish this, and places them in a position visible to the pilot so that the pilot can check and see that all locks have been removed. After insuring that the bomb bay is clear, the pilot closes the bomb bay doors, then orders the crew chief to remove the chocks and to disconnect external starting units and the ground interphone. After this is done, the pilot gets the all clear signal from the crew chief and he is free to taxi.

The pilot advances power on Engines Three and Four to the desired amount. Just prior to advancing power, he has moved his steering ratio selector from the "tow" position, which allows the rudders to be moved without any interference or movement of the steerable nosegear, to the "taxi" position. This gives the pilot a 60 degree steering radius either side of center.

After four minutes have elapsed since Number Six Engine has been brought up to 52 per cent rpm, the co-pilot notifies the pilot and is usually told to engage the Number Six Engine alternator. The same procedure is followed on Number One Engine. The complete elapsed

ABOUT the AUTHOR

After spending a year with the B-47 Project WIBAC at Wichita, Kansas, where he logged some 170 hours flying "the jet bomber that handles like a fighter," Major Celotto checked out the first crop of SAC flight instructors for the B-47. Carefully selected for the project, Major Celotto, now a ripe 32 years of age, first saw Air Force service in 1941 and is a seasoned pilot who has logged more than 6,000 hours flying heavy aircraft like the B-24, B-29 and B-50 in which he is also a qualified IP. Currently, Major Celotto is working as the B-47 project liaison officer and as special assistant to Major General F. A. Armstrong, Commander of the Sixth Air Division, MacDill AFB, Florida.



time from the time the crew enters the cockpit to the time they start to taxi is often not more than fifteen minutes. This point alone usually causes some comment by the experienced bomber pilot.

After taxiing into take-off position, and it is ascertained that the canopy pins and locks are free of the canopy, the canopy actuation lever is moved to the closed position. The pilot then engages the locks and pins by use of a locking lever. The co-pilot and pilot both check to see that the canopy locks and latches are securely in place. At this time, the "before take-off" check is run. Both pilot and co-pilot read to each other the items peculiar to their own check list so that each may be assured that the other's switches and controls are in the proper position. The pilot places his taxi selector lever in the "take off and land" position which allows him only six degrees of wheel movement either side of center for take-off. At this point, he notifies the tower that he will be ready for take-off in approximately 60 seconds.

After receiving clearance, he slowly starts accelerating all six engines up to 100 per cent power. After reaching 100 per cent, he makes a rapid thorough check of engine rpm exhaust gas temperature indications, fuel pressures and oil pressures. The co-pilot, in the meantime, is checking generator voltages and alternator voltages. If everything is "in the green," the pilot notifies the co-pilot that all readings are correct in his position, and the co-pilot informs the pilot he is set to go. At this point, the pilot unlocks the brakes and the aircraft rapidly starts to accelerate.

About this time, if the cabin air conditioning system is on, the fledgling B-47 pilot may become concerned about what appears to be quantities of smoke pouring from the aircraft interior. This is, in all probability, heavy condensation from the refrigeration unit. It can become so intense that actual particles of snow are thrown and the cockpit becomes so fogged up that one crewmember cannot see another. In warm humid climates which aggravates this condition, it is not recommended that the take-off be made with the cabin air conditioning system turned on.

However, at this moment, all crewmembers are concerned as to their actual take-off point. Prior to flight, they have carefully completed from their performance handbook the take-off weight, take-off speed, speed at which they can still refuse a take-off and stop within the limits of the runway, and other vital take-off factors. At this point, it might be well to mention that the flaps are full down on take-off. Intermediate flap settings on the B-47 are not used as the flaps are of the high lift, low drag type. Unless the flaps are full down, flaperon control, which is an important factor at low speeds, is lost to the pilot. Due to the tandem gear arrangement and the angle at which the aircraft sits on the ground, the pilot can do little to vary the take-off run. As he approaches take-off speed, a slight amount of back pressure on the stick aids in breaking free of the runway.

After the aircraft has cleared the runway and the speed is increasing, the gear is started up. The new pilot will notice that once the gear handle is placed in the UP position, brakes are mechanically energized to stop rotation of the wheels automatically. At approximately 15 knots above take-off speed, the flap handle is placed in the UP position and the flaps slowly start up. The pilot has to be sure that his rate of acceleration is not great enough to exceed flap extension restrictions. As the air-

craft speed approaches 195 knots, the flaps will continue to the full UP position. If the aircraft does not reach a speed of 195 knots—due to climbing too steeply after take-off—the flaps will remain in approximately the 22 per cent extended position until the speed of the aircraft has reached a point where "no flap" operation at high gross weights is considered feasible; i.e, 195 knots indicated airspeed. This is a real built-in safety feature of the '47.

With the aircraft in a clean configuration, gear and flap handles neutral, the pilot maintains 100 per cent power and accelerates in level flight to his initial climb speed which has also been computed from his performance handbook. For most weights, this is approximately 365 knots. Upon reaching climb speed, the power is retarded to 96 per cent.

It will be noticed that the present vertical speed indicator is inadequate during portions of the climb. Its limits are 6,000 feet per minute and the indicating needle will be over the peg at the initial part of the climb. As the aircraft gains altitude, the pilot will reduce the climbing airspeed three knots for every 1,000 feet of altitude gained.

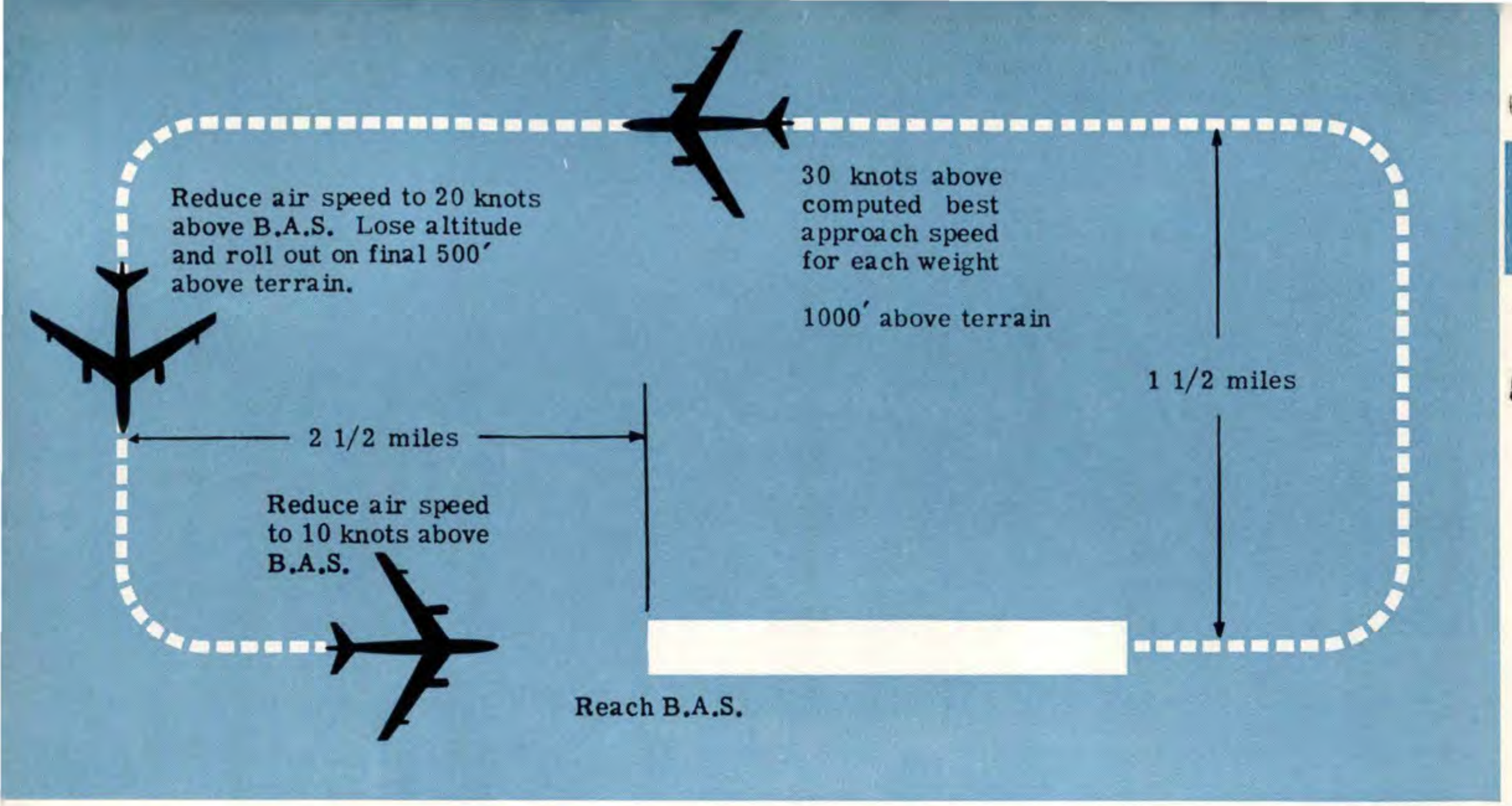
During the climb, the pilot calls out at approximately 5,000-foot intervals the cabin pressure. Up to 5,000 feet, the cabin is at the same altitude as the aircraft. From 5,000 to 24,100 feet, the cabin altitude remains at 5,000. Above 24,100, a differential pressure exists which gives a cabin altitude of approximately 12,000 at 44,000 feet of aircraft altitude.

On this initial flight, the embryo B-47 pilot is considerably impressed with the climb and acceleration characteristics of the B-47, as well as the rapidity with which the aircraft responds to aileron control. After feeling the aircraft out for a few minutes, the instructor pilot will demonstrate stalls in various configurations. The B-47 has excellent stall warning characteristics. Initial buffeting, indicating approach to the stall, will appear from five to seven knots above the actual stall speed. When the aircraft does stall, it usually breaks straight ahead. Other characterstics which are demonstrated are the differences between flap down stalling speeds and flap up stalling speeds and the high speed buffet.

Also demonstrated during this first flight are the extreme forces encountered under conditions where an aileron boost unit or an elevator boost unit is inoperative. This is demonstrated at various speeds. The forces vary with the difference between the speed at which the aircraft has been rigged to fly without control boost on and zero stick forces. This zero stick force speed is usually around 300 knots. Because of this fact, landings and takeoffs with boost packages inoperative are considered an emergency condition. Also, if the pilot were to lose a boost package at a very high indicated airspeed, he would lose control of the aircraft until it was slowed to around 300 knots. The physical stick forces encountered are greater than both the pilot and co-pilot can exert to retain control of the aircraft.

Another characteristic of the B-47 is aileron reversal. This is demonstrated with all boost packages operating normally. At extremely high speeds when the aileron is moved, the aileron actually twists the wing so that it blanks out or counteracts the effect of the aileron and a turn is usually made to some slight extent in the opposite direction from that which would be expected with the ailerons operating normally.

After demonstrating the various characterstics of the aircraft the airspeed is then reduced to below 304 knots for a letdown. A separate control called the drag gear switch is actuated which extends the two outrigger gear



and the rear main gear. Holding the aircraft in straight and level flight, the airspeed gradually falls off to about 174 knots at which time the main gear handle is actuated and the forward main gear is extended. With all gear extended and the throttles retarded to the idle position, the pilot maintains a speed not in excess of 304 knots for descent. This usually gives him a rate of descent of 5,000 to 6,000 feet per minute. If the descent has been started from an altitude above 31,000 feet, the limiting factor on descent speed is the buffet limit; below 31,000 feet, 304 knots is the limiting factor. To conserve fuel a descent in the B-47 is not begun until about 45 nautical miles from the field.

Entry into the traffic pattern is made at approximately 185 knots at which time the flaps are started down. The traffic pattern is usually flown at speeds from 140 to 150 knots depending on the weight of the aircraft.

During this time, the pilot and copilot have gone through their "before landing" check list and the pilot has computed his best approach speed from the gross weight of the aircraft. This is readily determined as the fuel tank indications are in pounds instead of gallons. The base leg is usually about two to two and one-half miles off the end of the runway and at an altitude of 1,000 feet above the terrain. The turn on final is completed at an altitude of approximately 500 feet.

After the turn, the airspeed is slowed down to a point approximately 10 knots above the computed best approach speed. The computed best approach speed is approximately four knots above the first stall warning speed for that particular weight. As the aircraft approaches the end of the runway, speed and altitude are gradually lost until the pilot crosses the end of the runway in landing position at exactly his best approach speed. Touchdown will be approximately 1,000 feet down the runway if this condition has been attained.

The pilot must plan his approach in such a way that he avoids reducing engine power below 52 per cent at any time, as the acceleration characteristics of jet engines are extremely poor below that setting. In fact, it takes longer to accelerate from 35 per cent rpm to 52 per cent rpm where there is comparatively little power than it does to accelerate from 52 per cent rpm to 100 per cent rpm where the majority of power lies.

The safest landing is one in which the rear gear touches slightly first and then the front gear falls on as the speed is further reduced. This insures that the aircraft will not tend to fly again, as runway effect and the lighter wing loading of the B-47 with the flaps extended, give the aircraft a marked tendency to float. Any error by the pilot's allowing the nosegear to touch first will result in a serious porpoising which normally can only be stopped by use of the drag chute.

At fairly light landing weights, with runway lengths from 10 to 12 thousand feet, it is not necessary to utilize the drag chute if the approach has been properly planned. However, to save wear and tear on the tires, the drag chute is normally deployed either by the co-pilot at a signal from the pilot or by the pilot himself. Deployment of the drag chute produces a 300 per cent increase in the drag of the aircraft, and it should be deployed as soon as the aircraft has touched down, as it is most effective at the higher speeds. The drag chute is extremely useful in the event that a landing has to be made with an aileron boost package inoperative. As previously mentioned at the lower speeds, aileron forces are extremely heavy.

When landing with an aileron boost inoperative, the pilot plans his approach to cross the end of the runway at speeds at least 10 knots in excess of normal landing speed, and as he crosses the end of the runway and is barely off the pavement, he pulls the drag chute while in the air. This decelerates the aircraft very rapidly so that the period of transition from air to ground is relatively short. Once the aircraft is on the ground and the weight transferred to the wheels, the pilot has good control through his steerable front main gear, plus the support of the outriggers, reducing any rolling tendency of the aircraft.

During the landing roll, the pilot cuts Engines Numbers One, Two and Five and Six. This also helps to shorten his landing roll materially, since engines idling at 35 per cent rpm still produce considerable thrust. As he brakes the aircraft to a stop, he accelerates the remaining engines, Numbers Three and Four, to approximately 45 per cent until the aircraft is fully stopped. This keeps the drag chute inflated so that it does not drag on the runway with the resultant scorching and burning of parachute shroud lines.

After the aircraft is fully stopped, the power is retarded on the inboard engines, the drag chute is allowed to drop to the ground where it can be either jettisoned for pick up by the ground crew, or the ground crew can jettison it themselves and remove the chute to an alert vehicle. At a signal from the ground crew, the pilot is cleared to taxi in. Before taxiing in, he moves his taxi selector from the "take off and land" position to the "taxi" position in order to have full control of the aircraft.

After the fledgling B-47 pilot has received at least two rides in the co-pilot's position, he is placed in the pilot's position. He takes the aircraft off and demonstrates to the instructor pilot all of the conditions described previously, until the instructor pilot is satisfied that the student knows the characteristics of the aircraft. Because of limited visibility and the instruments, the instructor pilot must make sure before placing the student in the front seat that he is completely cognizant of the procedures and location of all controls available in the front cockpit. A blindfold check and thorough questioning is usually conducted prior to placing the student pilot in the front seat. Also, the instructor pilot has the student call off various indications of fuel tank gages, position of switches, etc., prior to take-off and landing, to make sure that the student has the control in the proper position and has completed his check list satisfactorily.

Subsequent periods of instruction are spent with the student pilot in the front cockpit and the major portion of the instructional periods are concerned with shooting touch-and-go landings. Because of its high power loading, the B-47 is extremely well adapted to touch-and-go landings and a great number of these can be accomplished in a very short period of time.

It can be concluded that whatever the background of a pilot being checked out, he will be considerably impressed with the speed and handling characteristics of the B-47. It must be acknowledged that an aircraft as large as this, that out-performs many present day fighters and still accomplishes the functions of a bomber, is certainly one to arouse enthusiasm among pilots. And it takes a pilot to fly the '47. (R)

SPIN THO

By Capt. David F. McCallister
New Castle County Airport, Del.

TO THE THOUSANDS of jet jockeys in the Air Force who have been introduced to the Slaved Gyro and ADF in the past few years, these two instruments have presented problems which heretofore were non-existent in the fighter jockey's way of life. Though these two instruments have been installed in jet fighters for at least five years, it would be a conservative estimate to say only 50 per cent of the fighter pilots in the Air Force utilize them to the full extent of their usefulness.

These instruments were designed to simplify the fighter pilot's problems by eliminating superfluous computations during IFR flight. Here are a few tips to the fighter jockeys relevant to the proper method of utilizing these instruments.

Beginning with the Slaved Gyro a primary rule is to keep the desired course at the top of the dial. The reason for this is to simplify the reading of the entire flight instrument panel.

When grinding down an airway and it becomes necessary to make a turn to a new heading, the new heading should be put at the top of the dial before the turn is made by rotating the variable azimuth scale. Why? Every pilot knows how easy it is to overshoot a turn when grinding on the gages. At the top of the Slaved Gyro there is an index. It works in conjunction with the Vertical-Horizontal system of instrument reading. When making a turn it is not necessary to concentrate on the Slaved Gyro because when the needle reaches the vertical position the desired heading has been reached.

In a 30-degree bank the Slaved Gyro should be led about three degrees to effect a roll out on the desired heading. For radio range work the Slaved Gyro is invaluable in automatically computing procedure turn headings.

At the top of the Slaved Gyro and at the bottom are indices denoting 180-degree reciprocals. Also there are indices at 45° and 90° either side of the top of the dial. With a heading of 215° on the top of the Slaved Gyro, it is a simple matter for a pilot to read off the outbound heading 45° to his left, by referring to the 45° indices on the left side of the Slaved Gyro face.

Let us assume we are flying outbound after passing the high cone and we have a heading of 215° on the top of the Slaved Gyro. Approximately one minute after passing the cone we look at the 45° index on the face of the Slaved Gyro and note that the outbound heading on the procedure turn is 170°. Before making the turn to 170° we rotate the variable azimuth scale and put 170° at the top of the Slaved Gyro face.

After making the turn to 170° we begin to think about the reciprocal heading back to the range leg. By merely looking at the indices at the bottom of the Slaved Gyro we have our inbound heading already figured out for us and staring us right in the face. How simple an operation. Before making our turn to the reciprocal heading we put it at the top of the dial (350° at the top) and begin turning toward it.

Now we're inbound on the procedure turn and for some unknown reason we've forgotten the final approach heading. Looking at the 45° index on the right side of the Slaved Gyro face, it is staring us right in the face and telling us it is 35°. As we ease into the twilight zone on a heading of 350°, we place 35° on the top of the Slaved Gyro and begin turning toward it.

Having rolled out on a heading of 35° and begun our descent to minimum altitude, we think back over the entire letdown procedure and can't remember mentally adding or subtracting one single number to complete the procedure—the Slaved Gyro did every last bit of it.

For the inexperienced instrument pilot the Slaved Gyro will enable him to overcome all mathematical problems relevant to radio range orientation and range letdown work. For the experienced instrument pilot the Slaved Gyro enables him to spend a minimum amount of time looking at a letdown manual and a maximum amount of time increasing his basic instrument proficiency.

The ADF with its variable azimuth is another built-in computer for the fighter jockey who can't mentally manipulate the figures. Using it to the full extent of its usefulness enables a fighter pilot to perform operations which heretofore were considered too complicated to perform in a high speed jet fighter.

SE DIALS

The variable azimuth scale on the ADF is rotated in the same manner as the variable azimuth scale on the Slaved Gyro. Let us take a bearing interception problem with odd figures and let this little computer do all the work for us. Assume we are tracking outbound on a heading of 323° and we want to intercept an inbound heading of 13°. Naturally, we have a heading of 323° on our Slaved Gyro, so to match things up we place the same heading of 323° at the top of the ADF. Inasmuch as we are tracking outbound on a station, the needle still points to the bottom of the dial but instead of pointing to 180°, it points to 143° because we have placed 323° at the top of the ADF. Since the needle points to 143° and it is 180° from the heading we are flying, the heading back to the station is 143°. Elementary, my dear Jackson.

As we continue to track outbound on 323° we approach the point where we believe we should intercept an inbound bearing of 13°. So we tune the ADF to the station on which we wish to make the bearing interception. As we tune in the station we flick the switch from Antenna to Compass position and the needle of the ADF swings around and points to 10°. Not 10° from the top of the dial, but 10° as indicated on the face of the variable azimuth scale. As we continue on a course of 323° the ADF needle progresses until it points to 13°. At this point we have intercepted the desired bearing of 13° and our heading to the station as computed by the ADF is 13°.

To work accurate bearing interceptions using this method of rotating the variable azimuth scale on the ADF, one primary rule must be remembered: The number at the top of the ADF should always be the same as the heading you are flying. If the number at the top of the ADF scale is not the same as the heading on the Slaved Gyro, an accurate bearing interception is not possible.

On cross country navigational flights this system of bearing interception enables the fighter pilot to make accurate radio fixes along his route where it is necessary to make a compulsory position report. As an example, flying northeast on Green 5 between Andrews Radio and Milleville Radio there is a compulsory reporting point at Hartley Intersection, three-quarters distant between Andrews and Milleville. This intersection is the southwest leg of Milleville and the east leg of the Baltimore range. Let us assume we have passed Andrews and are tracking inbound on Milleville on a heading of 65°. As we approach Hartley intersection, we tune in Baltimore Radio and Rotate the variable azimuth of the ADF until we have 65 at the top. The inbound heading to Baltimore is 280°, so when the needle of the ADF points to 280 on the azimuth scale of the ADF, we are directly over Hartley intersection. By using this method of bearing interception, the volume of the ADF can be turned to the full low position, as it is not necessary to receive an aural signal.

ADF letdowns on the Radio Range can be made without listening to the aural tone of the range station. To make an ADF letdown, just spin the dials of the ADF and Slaved Gyro and let them do all of the figuring for you.

Let us assume we have passed the high cone and are outbound on a heading of 215°. Two minutes out we start our outbound procedure turn to 170°. Flying 170° we look at the bottom of the Slaved Gyro and note our inbound reciprocal is 350°. Immediately the Slaved Gyro scale is rotated to 350° and the ADF scale is rotated to 350°. The turn to the inbound heading of 350° is completed, and by noting the 45° index on the face of the Slaved Gyro we know our final approach heading is 35°. As we travel on the inbound procedure heading, we watch the needle of the ADF progress toward 35°. As the ADF needle reaches 25° we begin our turn to 35°. (Remember it is necessary to lead the turn.) As we roll out on the inbound heading of 35° you will note that both the needle of the ADF and the needle of the Slaved Gyro are pointing vertical and we are right in the groove.

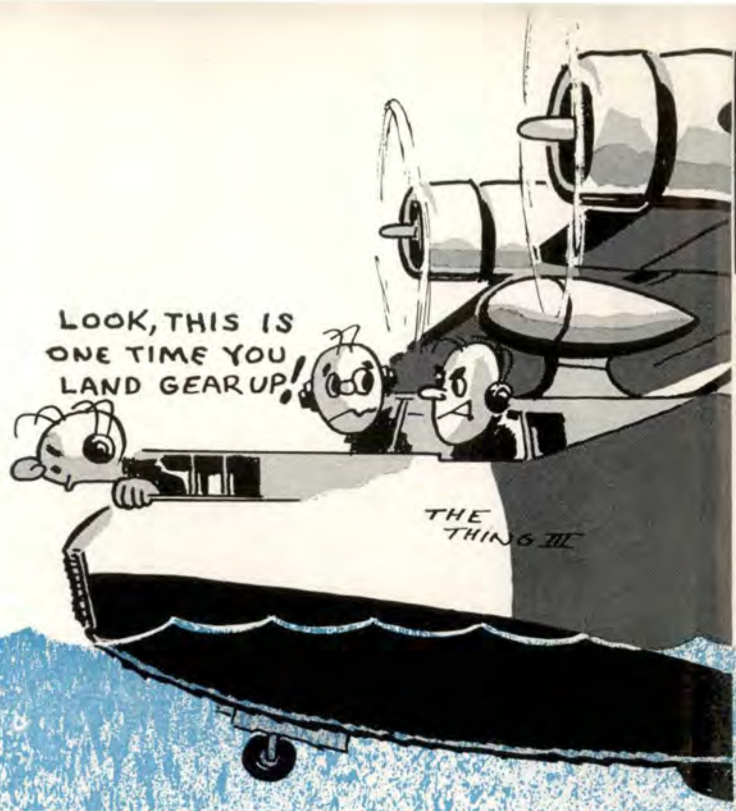
Another use of the variable azimuth scale on the ADF is when tracking inbound or outbound on a station. Assume we are tracking inbound on a heading of 180° and we have drifted five degrees to the right of track. We have to correct to the left so we rotate the scale of the Slaved Gyro to 150° and then make the turn to 150°. After the turn is completed, we rotate the azimuth scale of the ADF to 150°. As we continue on the heading of 150°, the needle of the ADF progresses toward 180°. When the needle of the ADF points to 180° on the azimuth scale, we know we have intercepted our track, so we then turn back to 180° on the Slaved Gyro and put in a little drift correction. Tracking outbound can be done in the same manner, except it is necessary to read the opposite end of the ADF needle.

These are not the only uses of the ADF and Slaved Gyro. These two instruments can save you a lot of mental gymnastics in many ways.

So, "Spin Those Dials" and give your brain a rest! (U)

A Rescue Flight:

AMPHIBS and SAFETY!



Saddled with antiquated amphibs, this Rescue Unit has established a safety record to be proud of.

By Capt. ARTHUR R. LOCKER

"I don't want to die, in a beat-up PBY!" is an old pilot's lament!

There is no doubt that the versatile amphibious SA-10 aircraft is a part of the modern Air Force's past history; that experts concerned with modern designs regard it as obsolete as the pony express and don't doubt that it might have originally been designed by one of President Lincoln's generals. Surely, its squatting ungainly shape, with wings that flap in the slightest breeze, does not inspire the confidence that one of its sleek modern heirs might. Nor can it be denied that in flight the "bucket of bolts" effect is definitely in evidence. But whatever its outward appearance, the reliable old amphib is still as stable an aircraft as was ever produced; will literally take off and fly forever, and has the reputation of getting where its going, however late.

Up northern way, in Newfoundland, there's a Rescue outfit that's mighty proud of its amphibs. The organization is Flight B of the Sixth Air Rescue Squadron, which watches over aircraft flying the North Atlantic, helps out distressed fishing vessels, and occasionally picks up stranded hunters and fishermen. The flight is located at the Ernest Harmon Air Force Base commanded by Colonel Clayton E. Hughes, an Air Force Base under the direction of the Northeast Air Command whose headquarters are located near St. John's Newfoundland.

Under the command of Major Jay W. Stansbury of Mulhall, Oklahoma, Flight B flies three of the amphibs day and night on operational and training missions and has enjoyed an enviable flying safety record for over two years.

When the outfit first received the three "pig boats" they were cleaned, polished, reconditioned within organizational maintenance limits, and beautified with attractive Rescue colored paints. The glistening transmogrifications were then respectively christened "The Thing I," "The Thing II," and "The Thing III,"—numbers indicating the order in which they were received.

An investigation of records indicated that past owners had unappreciatively condemned the awkward angels of mercy to hangar corners and that, as a result, there was still a lot of potential flight left in their creaking frames. Captain Clayton E. Larkin of Gould City, Michigan, the Flight's Maintenance Officer, immediately submitted forecast lists of supply parts to keep the amphibs flying—a unique system that is working out very nicely. So far only a few AOCP groundings have been necessary and these only for a few days, in spite of the Flight's far away location.

These SA-10 aircraft the Flight B pilots fly are only an interim measure, pending future assignments of more modern types, but mission-wise they have done very well. Take the time a few months ago when a mariner was seriously injured aboard a tugboat during a storm at sea. Beached in a desolate area far from modern transportation, it radioed a call for help. Two hours later the injured seaman was resting comfortably in a modern hospital ready for direly needed surgery, thanks to the Flight B crew of Captain Emil P. Walke of Friendship, Maryland, and an SA-10 aircraft. "Everyone lived happily ever after"—a fade-out which MATS' worldwide Air Rescue Service is becoming famous for. In this instance, the "obsolete"

amphib performed a lifesaving task that would have made its more powerful and bejeweled sisters turn tail.

Safety plays an important part in the success of the Flight and everyone assigned is a crank on it. The present record was not attained without effort and to watch a crew prepare for a mission, inspect the aircraft, and go through every procedure ever printed, you'd think their destination was the moon. But however tedious the operation might appear, it actually takes little time as is evidenced by the Flight's average time from alert to take-off of from 15 to 30 minutes, the latter time necessary only when the crew members are home in bed.

Commanding Officer Stansbury is not content with just letting someone take care of his safety program; he often conducts the sessions himself. His classes are attended by maintenance personnel, as well as the fly boys, his message to them being a warning that there'll be no screw loose anywhere on Flight B aircraft even if an inspection takes a little longer.

Once a week the Flight presents a radio program dubbed "Your Rescue Hour" on which occasionally a character by the name of Dimwit Smitty shows up and gaily smashes airplanes against mountains or through treacherous storms just to show what a good pilot does not do. Listeners still remember the sound of a crash to end all crashes that, through the radio technique of tape editing, lasted over two minutes. It was preceded by a painfully long skid. The befuddled radio pilot emerged with the admission that his landing was a "widdle wough!" If nothing else, the skits help to keep crew members safety conscious at all times, including those of other organizations who tune in on the program. The Flight isn't selfish with its safety gospel.

Safety films are shown whenever available and that's quite often. A safety council meets once a week and the minutes of the meeting are passed on to everyone. Perhaps the most unique measure yet to be instigated in the Flight's ambitious safety program is the installation of magazine racks in Rescue hangar commodes. These are at all times supplied with an ample supply of every safety magazine printed—no funny books allowed! Sounds crazy, but there's no one in Flight B who hasn't read a safety magazine.

By now it should be evident that the B for Baker outfit intrinsically believes in the adage that an organization's aircraft are only as good as its safety program. And safety doesn't mean just being careful, the fallacy being that in that case the best measure would be to stay on the ground. The opposite is true. Proficiency of pilots is stressed and this proficiency is only attained through long hours of flying. There was many a blistered hand from day long sessions of rough water landings during the transition to amphibs which every pilot, desk or otherwise, was required to go through. They still practice them frequently. In addition, each crew member, maintenance, and, for that matter, paper shuffler, is considered as important in his particular role as the man at the controls, and he is also exposed to a continuous program of proficiency-means-safety!

Which brings us to the story of one pay-off that came a short time ago involving a young airman who only a couple of years before its occurrence was sitting at a

CO of Flight B, Maj. Stansbury, is safety conscious as they come.

Sgt. M. J. Jones saved safety record on first flight as engineer.

Below: Lts. Jones, Bennet, S/Sgt. Towler, Cpl. Draper, THING III.

Russel High School desk in Atlanta, Georgia, studying everything except airplanes. His name is Sgt. Martin J. Jones, a pleasant, soft-spoken young Southerner. Shortly after enlisting in the Air Force in 1948 he made the Berlin Airlift team as a mechanic and soon learned a lot about airplanes. When assigned to Flight B, he continued these duties until, a short time ago, a shortage of flying crew chiefs developed and his services were volunteered. After going through the rigorous OJT paces, he one day found himself flying solo engineer on "The Thing II"—his first solo flight aboard any type aircraft as a crew member.

Everything went peacefully for the first four hours of the flight, the fledgling engineer peacefully unaware that a mean little engine-driven pump was gaily gushing precious hydraulic fluid all over the pretty forests beneath, instead of into the system as it was supposed to be doing. Suddenly, the hydraulic pressure gage took a dive to zero and the crew's troubles began. When the field came into sight, pilot 1st Lt. Donald G. Jones (no relation) of Berrien Springs, Michigan, called for wheels down, and Sergeant Jones manually lowered the main gear. The main gear finally locked in the down position, but a cantankerous up-lock on the nosegear wouldn't budge, to force or wicked language. In addition to not having a nosegear, there would be no brakes on landing, and terrain at the end of Harmon's runways isn't exactly smooth.

Proud of his Flight's safety record and aware that even a small fuselage dent could ruin it, Crew Chief Jones vainly tried to remember some portion of the maze of Tech Order print that pertained to the present emergency, but could recall none. (There isn't any described.)

Convinced that he would have to rely on his own ingenuity, the airman spied a connection in the hydraulic line near the emergency hand pump. Somebody had mentioned something about osmosis in his high school days, so, deciding to put the theory to a test, he disconnected the feed-in line and submerged it in the emergency fluid can. He then pumped as fast as he could and was rewarded by a rising pressure indication. One twist of the gear control and the nosegear came clanking down. There was still the matter of brakes to contend with, and all the way down on the final approach Sergeant Jones continued his pumping, keeping up the pressure. Aside from one stiff-armed engineer, the landing was uneventful, and Flight B's safety record remained unmarred. A simple solution, except that no one had ever thought of it before!

And so Flight B goes! Their not-so-new aircraft are doing a good job, though occasionally some newly assigned pilots, fresh from flying rockets and wings stateside, are at first inclined to regard with disgust these antiquated apparitions of the past. But it only takes a little indoctrination, a few hours in the air, and a shot of Flight B's contagious esprit-de-corps, and soon they have developed a chip-on-the-shoulder attitude about their faithful old buzzards. Then, they, too, go conscientiously about their outfit's business—that of saving lives! (U)

LET THE FORECASTER *TALK*

By Capt. JOHN H. SEWARD
Det 1-16L, 1st Weather Squadron
Olmsted AFB, Pennsylvania

"A wise old owl sat in an oak
The more he heard the less he spoke;
The less he spoke the more he heard.
Why can't we be like that wise old bird?"
—Anonymous

Have you ever come away from a Flight Service weather briefing with your head whirling like a stalled out Link trainer? Bases and tops, icing levels, winds aloft, terminal forecasts, suggested altitudes, jumbled together and with pieces sticking out all over? It might very well have been because you drew a lousy forecaster. That monotone at the other end of the wire may be a human being just like you. There is also an excellent chance that you loused it up yourself.

A conversation has a person at each end and either can contribute to the confusion. The more one knows about how to get information from someone else, the more information he is likely to get. In other words, there are right and wrong procedures to get a weather briefing from Flight Service. Thus it behooves every pilot to think a little on how to make the best use of Flight Service forecasting facilities.

The actual procedures are quite simple. Contact Flight Service by Plan 62, tell them what you wish to know, then listen to the reply. That's all there is to it. The trick lies in how you phrase your questions.

Perhaps the best way to show the right method is to describe a few of the wrong ways of going about it. Forecasters are trained to give weather briefings in a precise, logical and connected manner that presents a picture easy for the pilot to grasp. Unfortunately, however, pilots sometimes interrupt such briefings with questions which would be answered anyway in the normal course of the discussion. Here's an example:

Pilot: "What's the weather between Scott and Bolling?"

Fcstr.: "That will be IFR. Base of the clouds . . . "

Pilot: "What's the freezing level?"

Fcstr.: "Freezing level is 5000 MSL over Scott, sloping up to . . . "

Pilot: "How's the visibility at Bolling?"

Fcstr.: " . . . sloping up to 8000 MSL over Bolling, where the visibility will be two miles in . . . "

Pilot: "Can I use Pope AFB for an alternate?"

After such an exchange the pilot will have only a hopelessly confused picture of the weather—while the forecaster is ready to ask for a transfer to Cooks and Bakers School.

How much better it is for the pilot to ask for his briefing, then let the forecaster give him one before asking supplementary questions. This way the pilot gets a much better picture, and valuable time is saved for use in briefing others.

Frequently a pilot fails to tell the forecaster his problem. He asks for the latest reported weather at a dozen different stations, one at a time. If instead he would state that he only needs an alternate within two hours' flying time of Wright-Patterson, the forecaster could help him out in a matter of seconds.

Before you state your question, figure out exactly what it is you wish to know.

Do you desire actual instrument time? Ask the forecaster where it may be found—not what the weather is between Fort Worth and Kansas City.

Do you wish to avoid clouds? Don't ask whether there are clouds at 7000 MSL; ask at what altitudes you can be in the clear.

Think before you speak. It will save time for everyone —time which can be a critical commodity upon occasion.

There is some misunderstanding about what an alternate is for. If you can't get into Hamilton to see Mabel, there's always Virginia at Sacramento. Following that line of reasoning a pilot is apt to scream: "But I don't want to go to Bakersfield!" You will, brother, if Mather and Hamilton are zero-zero and you're gasping for petrol. It's amazing how quickly Virginia dims out of the scope under such circumstances. Let the forecaster help you select an alternate on the basis of fuel and weather—not your tangled love life.

But most important of all, don't let anything in this article dissuade you from making maximum use of the forecaster. Ask questions and more questions, until you are completely satisfied that the forecaster has given you all the information you need, which he has in his possession. He will appreciate it if you will try to save time by helping to keep the briefing simple and orderly. But either way he is there only to give you the best service you will let him provide. (U)

AIR DEFENSE ID

ADIZ

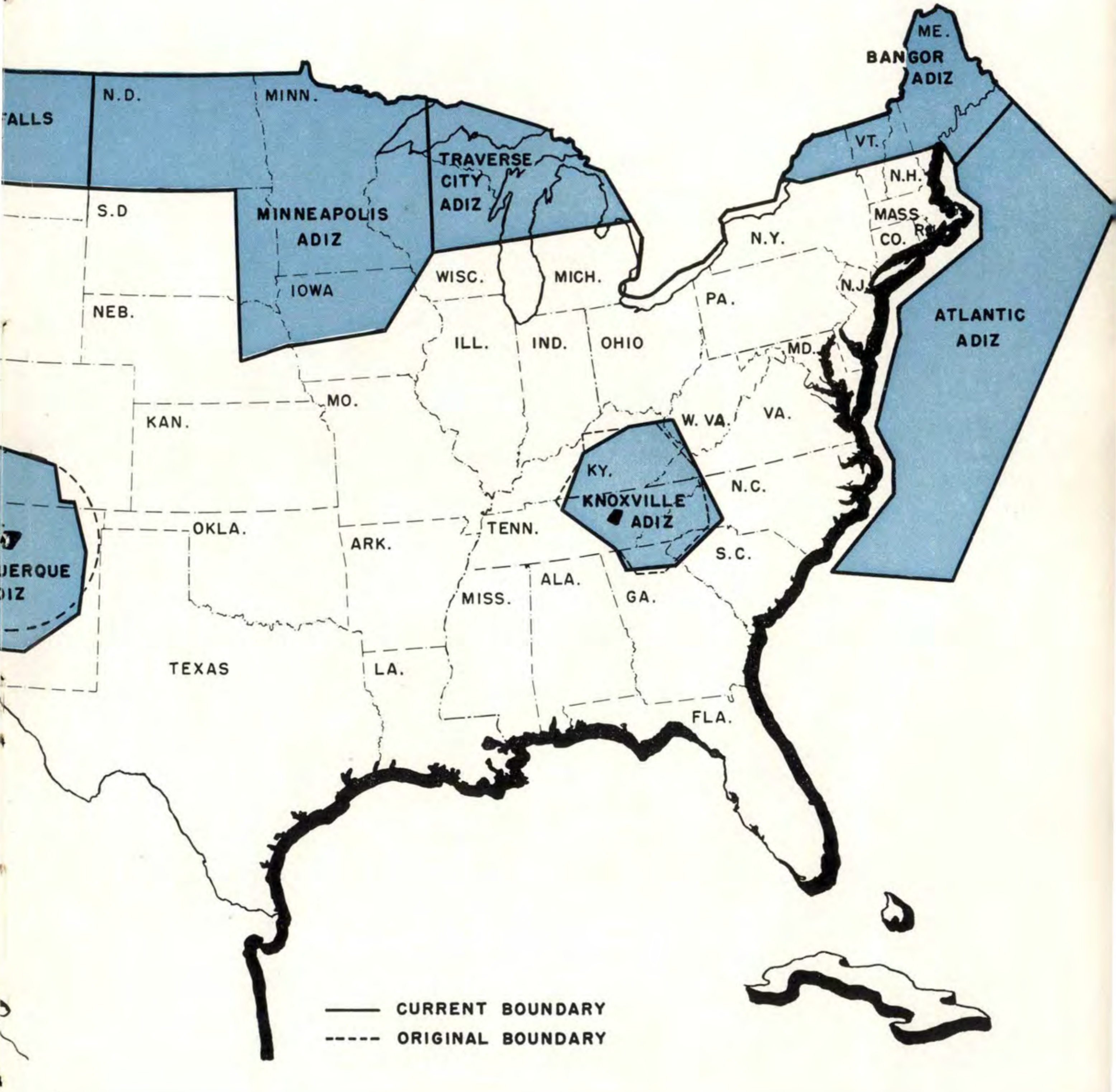
FOUR new Air Defense Identification Zones were recently established to assist in defending the Continental United States against air attack. The new zones lie along the northern boundary of the country and are known as the Great Falls, Minneapolis, Traverse City and Bangor ADIZ's.

In addition to the establishment of the new areas, the boundaries of already existing ADIZ's have been adjusted to make position reporting easier for pilots. All ADIZ's are shown in the diagram on these pages.

There are certain procedures which must be followed for flights above 4,000 feet within, into or through these areas. These procedures are given in your Radio Facilities Charts and in AF Reg 60-22. Follow them and save yourself a lot of embarrassment. Flights in the three prohibited areas are strictly not permitted and you may suddenly find yourself making like a clay pigeon if for any reason you should wander into these areas.

The security rules which apply for flights in ADIZ's are designed to provide continuous identification of friendly aircraft, so that unidentified planes, which may be unfriendly, can be intercepted by our fighters. Don't become the target for an intercept mission. (U)

ENTIFICATION ZONE



Cross Feed

A BOUQUET AND A SQUAWK—I have just received your September issue of FLYING SAFETY Magazine. Let me compliment your office on the efforts that have been expended in the publication of these magazines. It is one of the most effective instruments of flight safety that I know of.

I was particularly impressed with the article on pages 13, 14 and 15, "Park 'Em Right." I wrote an article something similar to it for our Tenth Air Force Flight Safety Bulletin.

Your article is excellent, to the point, and I believe it covers most of the discrepancies that are usually made, although there was no mention of the "chock signals." Nevertheless, I believe I noted a few technical errors in your pictures.

Picture No. 1, top page 14, depicts the Sergeant with his palms facing outward. AFR 62-10 states the palms of the hands will be facing each other. In the picture of the Sergeant and the B-25, on page 15, he has his hands in the correct position. Picture No. 1 could be mistaken for a Stop Signal!

AFR 62-10 states that the signalman will be positioned in a line directly forward from the *left* wingtip. In the picture at the bottom of page 14, where is the Sergeant standing? I say that he is standing off the *right* wingtip.

And, believing the aircraft in that picture to be a B-25, not a four-engine aircraft, what is he doing signaling a right turn to an aircraft whose engines are not running? I realize that the picture is posed, but still it has that fallacy.

Trusting that I am not being too critical by taking you at your word that you want comments, good or bad, I shall remain,

Respectfully,
LeRoy R. Yagel
T/Sgt., 10th AF
Selfridge AFB, Mich.

Ed. Note — We thank you for the flowers, Sergeant, and you can be sure we do want "good or bad" comments. You're right on your first criticism; the crewman's palms should be facing inward. On the second count, if you could see the alert man's right hand describing circles, you'd know he was giving the signal to start the engine, not to turn right. But it's not a movie, so it does appear to be a turn signal. Before you ask, his extinguisher is close by, but blocked out of the picture by the engine.

Your comments are certainly appreciated. Try us again.

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FLAMEOUT—I read with interest the article entitled "Project Flameout" in the August 1951 issue. In the article, it states "the F-80 may be slipped or fishtailed on final with good handling characteristics." This is certainly true; however, an incident which occurred while I was making a flamed-out landing may be of interest.

It was necessary because of trees and the short runway available (2600′) to sideslip drastically on the final approach, and to hold the aircraft in this position for an unusually long time. During the sideslip, the aileron boost failed. This I attribute to falling off of windmill speed due to reduced airflow through the ducts of the T-33 in this attitude, plus the gear having been actuated only a short while before. The landing was fairly successful, but uncomfortable for a minute or two after the boost failed.

This may not be the proper explanation of the occurrence; however, I would like to pass it on for what it may be worth to others.

Lt. D. S. Mellish
3595th Tng. Sqdn. (CCTS)
Luke AFB, Arizona

• • •

MONITOR YOUR RADIO—Monitoring your radio can pay off, not only for yourself but sometimes also for the other fellow.

On a recent flight from Atterbury AFB to Maxwell AFB, Captains R. E. Davis and L. J. Kaposta, and I were flying at 6000 feet in the vicinity of Louisville when we heard an insistent plea for help from a Navy Corsair fighter piloted by a marine. As it later developed, he was headed for Godman AFB but visibilities were low; he had become lost and was unable to orient himself. His urgent calls were apparently not being received by any radio aid stations or other aircraft. As his signal was about R2, S2 to us, we orbited our position so as to maintain contact, and relayed his request to CAA airways for help. None of the surrounding stations could receive him to give him a steer. He advised us that he had only 13 to 15 minutes of fuel and was going to look for a field for a wheels-up landing.

About this time he passed over a small town and we suggested he "buzz" the depot and find out the name. He gave us the name of the town, which we could not find on our maps but which airways control, when advised, was able to locate in about a minute. We relayed his steer of 26 degrees and advised him he was about 30 miles southwest of Lexington. He headed for Lexington on the course given and called us on his final for a straight-in with about three minutes of fuel remaining.

The assistance we gave him required about 10 or 12 minutes deviation from our flight plan which was a small enough price to pay when considering the possible eventualities that could have taken place, had this pilot been forced to belly-in or abandon ship.

Lt. Col. Verl B. Schoenfeldt
Dept. of Air Science and Tactics
Ball State Teachers College, Ind.

Ed. Note—A fine example of cooperation! FLYING SAFETY *congratulates you . . . and probably the Navy does, too.*

• • •

VENETIAN SCREEN? — Just finished the August FLYING SAFETY Magazine and wish to present an idea regarding the article "The Solution to One Problem Has Caused Another Problem."

Would it be possible to install a movable screen on the order of a venetian blind? It could be closed while on the ground and opened in flight by a simple, two-way electric motor. Of course the shutters would be made of screen rather than metal so as to permit free flow of air when closed. When open, the sections would be parallel to the airstream. The width of each section would depend on the clearance behind the installation. I don't believe ice would present a problem if they were over four inches apart.

Obviously, without heat or de-icing, this unit could freeze open. Still, the number of times it would remain closed during take-off and landing would far offset the few necessary "open" landings. Furthermore, chances are, often as not, it would melt close to the ground and remain in operation.

Does it make sense or not?

2nd Lt. James G. Cubbison
El Paso, Texas

Ed. Note—This idea makes a lot of sense, but unfortunately, engineers say no dice. Biggest objection is that airframe structures would have to be modified to handle a larger air guide. Others are (1) very rugged structural strength required; (2) donut shape of the screen would necessitate at least eight separate sections to be actuated and this would be over-complicated; (3) hinge segments of screens and actuating rods would pose critical icing points, and (4) turbulence and friction losses would be greater with shutter screen.

But it's still nice thinking, Lieutenant Cubbison. Keep it up.

• • •

PHYSICS, YET—Attention is invited to the article "In Jets, You Eject" in FLYING SAFETY Magazine for September. You state, "The seat, being light, does not fall as fast as the pilot, . . ."

My old physics professor left with me the impression that weight made no difference in the speed of free-falling objects. Could it be the seat and pilot part company due to "lifting" of the seat by airblast forced against it during the forward speed in space or the free fall?

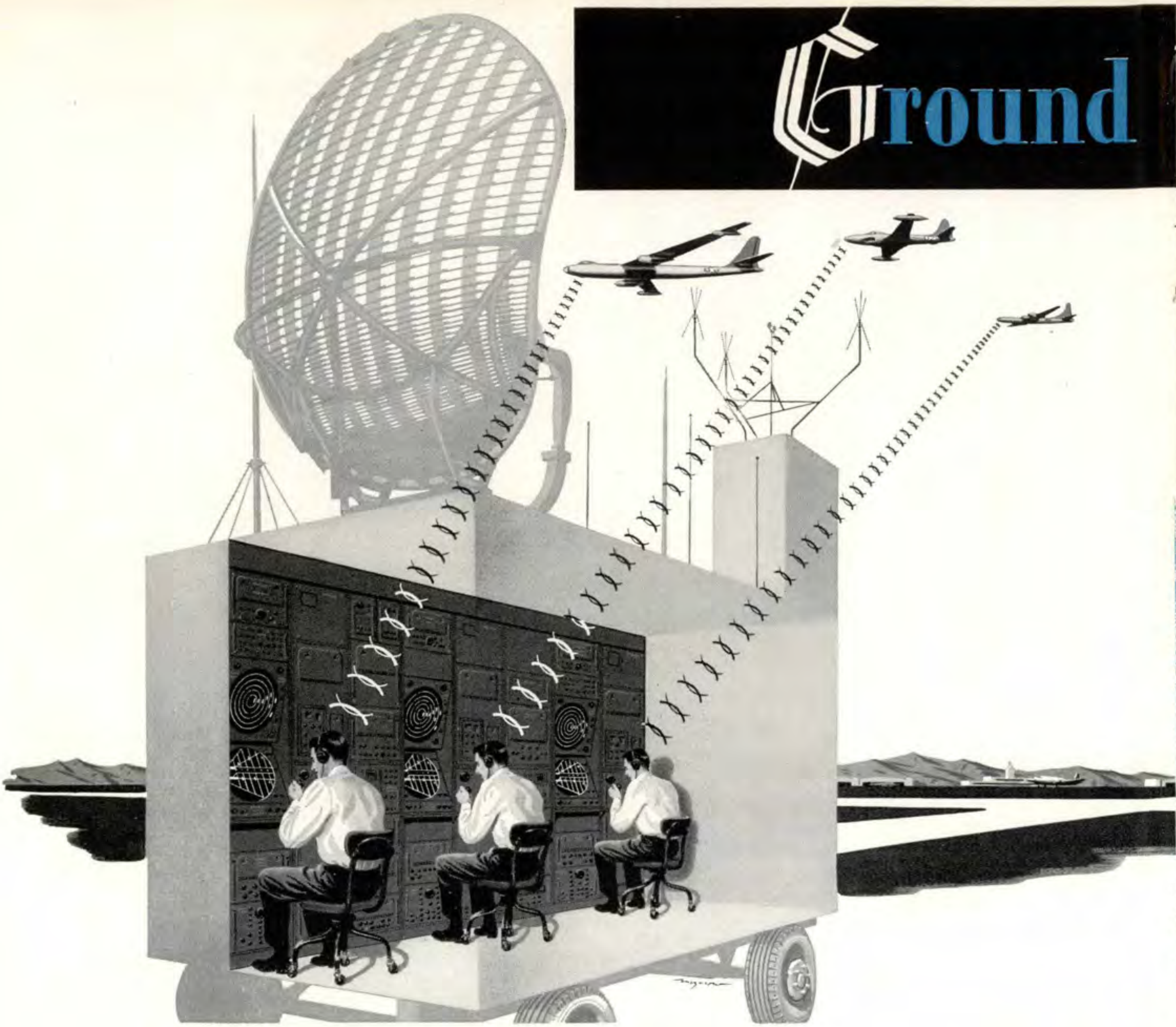
I still think FLYING SAFETY is an excellent publication and does much to help keep the Air Force Flying Safety conscious.

Lt. Col. Fred Turner, Jr.
325th AB Group, McChord AFB

Ed. Note—Long ago we learned never to argue with professors, physics or otherwise.

In this case, since there is no vacuum, it isn't the weight, but the exposed surface area which causes the seat to slow up more rapidly. We apologize all over the place. (U)

Ground



FOUR MILLION DOLLARS worth of safety for the pilot.

In round figures, that's the amount of money being spent by your Air Force in an accelerated research program to improve GCA. This program is paying off in the development of two new CGA units. The first is CPN-4, an air transportable "one man" compact GCA unit designed to assist three aircraft to land simultaneously. The second is AGCA (automatic GCA) which is just what the name implies and operates as an accessory to the standard GCA.

The first of the new CPN-4's are now being delivered to the USAF by the manufacturer, the Gilfillan Brothers, Inc., of Los Angeles. Following extensive field tests at Eglin AFB, Florida, the new units will be channeled to various bases to replace the MPN-1 GCA now in Air Force service.

It was in 1943 that Air Force Colonel (now Brigadier General) Stuart P. Wright became the first pilot to make a completely blind GCA landing under actual instrument conditions. On a visit to East Boston airport as an observer for Major General H. M. McClelland, then director of technical services, Colonel Wright volunteered to test the equipment when sudden snow flurries and soupy weather grounded the regular pilot who lacked the necessary instrument card.

With Dr. Luis W. Alvarez, creator of the GCA system, acting as final controller in the laboratory model, Colonel Wright took off in the testing plane and made ten approaches and landings before convincing himself that the first few GCA letdowns were not just a matter of luck. With high enthusiasm the Colonel then insisted on General McClelland's making a special trip to Boston to witness more of the GCA trials.

After personally flying some GCA approaches and seeing the potentialities of the radar system to land aircraft safely, General McClelland returned to Washington and arranged a demonstration at the Washington airport in May, 1943, for Pentagon officials. After this, the general convinced the Air Force that GCA was not just another

Controlled Approach

The ultimate in GCA has not been reached, but long strides have been taken.

monstrous gadget but a working solution to the pilot's worst problem—how to land his plane safely at the destination in bad weather.

A short time later a contract was let for the further development and production of ten experimental GCA mobile trailers. The first of these units rolled off of the production line some seven months later and was designated the MPN-1. This unit was tested in January, 1944, and later shipped to the ETO.

Basically, this MPN-1 set, as currently used, is a surveillance radar and a final approach system. The surveillance beam provides range and azimuth information on all aircraft within 30 miles of the equipment up to an altitude of 4,000 feet.

The final approach part of the GCA system presents to highly skilled operators three dimensional information showing the precise location of the aircraft in range, azimuth and elevation. This data displayed on four scopes is relayed to the pilot of the plane by radio as instructions for the course to fly in making a correct approach.

The communication system of the MPH-1 includes three transmitters and receivers in the high-frequency band and three others for the VHF band.

The new CPN-4 is literally three MPN-1 sets in one. One man now replaces the original five man team required to "talk down" an aircraft. A single 12-inch three dimensional scope replaces the four scopes and the error meter in the old GCA. A remarkable radar discovery called MTI (moving target indicator) removes all confusing ground clutter from the scopes. Former headaches of identification are now completely solved by IDF (instantaneous direction finder) which unerringly points out the aircraft on the surveillance scope automatically when the pilot presses his microphone button to call GCA.

Coverage of the surveillance system has been stepped up to 40 miles and 12,000 feet elevation. The four azimuth elevation and range scopes have been combined on one 12-inch scope called the "Az-el." For jet fighter planes the range of the search system is set at 20 nautical miles.

One of the more notable features of the CPN-4 is that the set can be operated with only one man as compared with three to five men for the MPN-1. Facilities, of course, are in triplicate with each station equipped with individual search and precision indicators, and three complete sets of communications give each operator complete independence. Six 10-20-40-miles ranges can be selected on the scope, which can also be instantly off-centered for better surveillance of a particular area.

Other modifications and developments brought out in the GCA research program include the CPN-18 which was designed for airport surveillance. The set scopes show the operators a "picture" of the surrounding space and any or all aircraft within the surrounding area.

Radar set FPN-16 is a fixed final approach GCA radar system for installation at permanent USAF bases. The range on jet aircraft is around 12 nautical miles on the final approach course.

The FPN-16 is the final approach portion of the CPN-4 and all components are interchangeable. Being fixed, information is remoted by means of coaxial cable to the control tower or IFR where the data is displayed on desk-size consoles. The set is for usage with the CPN-18 for complete approach and landing control radar.

To keep pace with the recent advancements in GCA, more intensive training for the operators and maintenance personnel is being emphasized by the USAF Technical Training Schol at Keesler AFB, Mississippi. Until the new CGA units hit the field in quantity to effect changes in the personnel complement of USAF radar approach installations, an AACS technician handles the approach control section of the GCA system.

The pick-up controller for the MPN-1 is responsible for locating approaching aircraft and identifying them as a target on the scope. A holding controller is then held responsible for the control of identified traffic once they are in the traffic holding pattern.

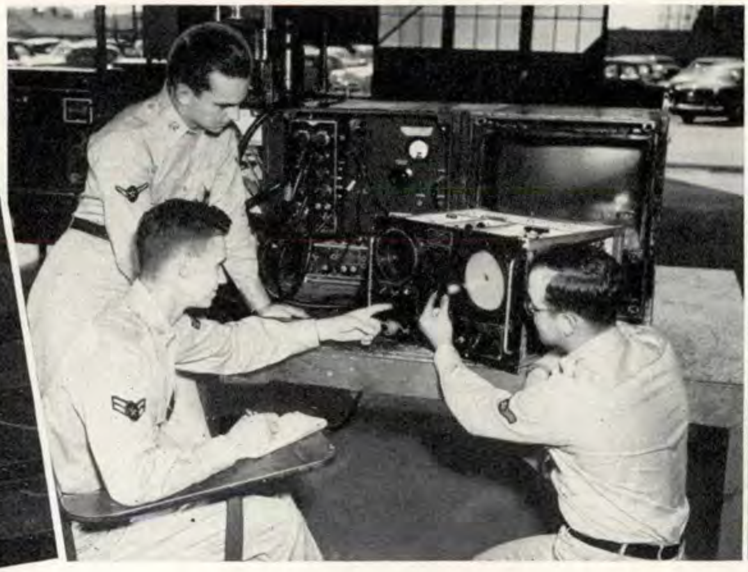
A feeder controller is the operator who vectors the plane through the traffic pattern onto the final approach. Over these men, a supervisor is in charge of the GCA operations. For light traffic, the work of the pick-up, holding and feeder controllers may be carried out by one man. In some equipment, the job of approach control is normally done by a two-man team.

The team is organized so that the first man does the work of pick-up and holding controller, and the second man acts as feeder controller. This team set-up is adaptable for the PPI type of approach in which no precision system is used.

For instance, if the precision system in the MPN-1 trailer gets out of whack the operator can still effect a successful GCA approach with certain limitations. This procedure is called a PPI letdown and with the exception of practice is used only in cases of emergency. Generally, the limitations placed on a PPI letdown are usually the IFR field minimums where the GCA system is located. Also, the instrument rating of the particular pilot and the visibility limitations will govern the letdown.

The bright, future picture for the AACS radar approach system is to deliver the aircraft to a radio fix which is within range and scope of the precision system. This will be done by ARTC centers through standard radio navigation aids or area control radar. The plane will be picked up at the radio fix by the precision radar and the final controller will direct the aircraft to a landing.

In the event that aircraft must wait for an approach clearance they will be held until the preceding planes have


Before entering the school for GCA, the student must check out on HF-VHF equipment, (upper left), have a background

completed their approaches. Primary reason for this system is to eliminate the surveillance system in the radar approach set-up.

Under current SOP's, an actual ground controlled approach is a simple procedure and there will be little change when the new GCA (CPN-4) units go into operation. The more important parts of the procedures to remember are:

- ARTC approval is necessary before making a GCA under weather conditions when the destination is on or involves civil airways.
- Do exactly as the approach controller instructs, and if for some reason his instruction cannot be followed, notify him immediately.
- If no transmission is received during any one-minute period, while in the GCA pattern, return to the original fix that was given.
- On final approach, if no transmission is received during any five-second period, follow the missed approach procedure for the particular field and contact the control tower for further instructions.
- Read back all headings and altitudes given, and acknowledge all other transmissions except when instructed not to answer during final approach phase.
- Radio transmissions should be confined to those necessary and should be as brief as possible.

When a pilot has been cleared by ARTC for a GCA, the GCA controller gives instructions to the pilot when he reports his position to a radio facility at or near his destination. These are the initial instructions to the pilot which enable him to get into the GCA pattern.

The most common patterns used are the conventional rectangular pattern, and a straight-in approach pattern from a range of ten miles or more. Regardless of the type of pattern flown, the complete approach procedure is divided into four phases: the initial approach, the final, the pre-landing phase, and the touchdown and landing roll.

Technique for automatic GCA functions will be in the same manner as the standard GCA. But instead of a human operator advising the pilot, an electronic tracking circuit of AGCA observes the location of the aircraft, transmits to the autopilot impulses which activate the autopilot servos and bring the plane down the ideal approach.

AGCA, as an accessory to the basic GCA unit, consists of one rack of central equipment, one monitor scope, plus a small control and communications panel. Six tracking units occupy three additional racks and these units control six aircraft simultaneously on final approach. The total requirements in the aircraft is a regular VHF (or UHF) communication set, plus a standard electrical input autopilot with a ten-pound decoder unit.

The use of one radio frequency channel to control six aircraft plus voice communication and cross-pointer meter data is a decided saving over other existing landing systems. Utilization of the subcarriers on the single frequency provides up-down and right-left control for six aircraft, plus a spare subcarrier to provide throttle and braking control for all six aircraft. In addition to the voice communication on this same frequency, there is sufficient room in the remaining portion of the channel for omnirange information. These telemetering circuits have been proved in field tests.

Plugged in to a regular GCA unit, the AGCA tracking Channel No. 1 scans back and forth over a rectangular block of space on the final approach course eight to ten miles long and one mile wide. When an aircraft appears in this zone, Channel No. 1 locks on to it and Channel No. 2 starts scanning the same area. Channel No. 2 does not "see" the first plane as Channel No. 1, by locking on,



of control tower work and know radar fundamentals (center photos). Photos at upper right show instructors working with the GCA trainer at Keesler, and a new CPN-4 being checked at the factory.

has caused the plane to be "invisible" to all other tracking channels. Similarly, Channel No. 3 will not see planes numbers 1 or 2, etc. As each aircraft appears in the zone, the six tracking channels successively take over their respective planes. Control signals to the autopilot are transmitted on a VHF channel. The aircraft automatically confirms the information to the ground by radio.

Behind each aircraft, AGCA provides a protective electronic "tail gate" two miles long. If plane No. 2 should start overtaking plane No. 1, it would enter the "yellow zone" of plane No. 1's gate. Immediately, a bell and a yellow light in the plane and on the ground warns the pilot and the monitor of the overtake. If plane No. 2 can now slow down sufficiently, nothing further occurs. But if plane No. 2 continues the overtake into the red zone of the protective gate, a red light and warning bell are activated, both on the ground and in the air, and plane No. 2 is automatically sent around.

If, during an automatic approach, an aircraft should fail to keep within limits permitting the plane to land safely, the tracking unit will also detect this situation and give the aircraft an automatic go-around. Similarly, when an aircraft enters the zone initially and the tracking unit detects that the plane is not responding to the automatic control (airborne equipment out of order or not equipped with autopilot, etc.), the ground monitor is notified by warning light and bell. Identification of the aircraft failing to respond is also shown and the monitor can instantly communicate with that particular aircraft by semi-private line communication and give the aircraft a regular GCA talkdown or a go-around.

In the ultimate air navigation systems, the aircraft will be given its clearance onto AGCA automatically. Under existing navigation systems, the pilot, on reaching the AGCA zone, requests landing clearance from the control tower and receives the reply, "Actuate AGCA." The pilot need only push a button on his instrument panel. AGCA then automatically finds the particular subcarrier of the radio channel to be assigned to that aircraft.

The pilot can constantly check his approach by observing his crosspointer meter being simultaneously activated by AGCA.

Another airborne meter shows the pilot his distance from touchdown. This DME (distance measuring equipment) type indication requires no additional airborne or ground equipment and displays exact range from 10 miles to touchdown.

A further indication on the instrument panel advises the pilot "fast or slow" by anticipating overtakes. Lights and bells give a preliminary warning of impending overtake and a wave-off light and bell if the aircraft does not slow down causing an automatic wave-off.

"Rate" circuits provide a smooth turn on to the approach course and prevent overshooting. They also furnish a "zero reader" type indication to the crosspointer meter in the aircraft. The instrument zeros when the aircraft is put into a bank and turn that will make good the desired approach.

A safety feature of AGCA is that its control signals to any aircraft on approach are independent of effects of another aircraft. No beam bending effects can occur. An operational advantage is that parallel runways can be served simultaneously by a single unit.

Automatic GCA even checks itself constantly to make sure it is functioning properly. It cannot do anything to cause an unsafe condition. With virtually all of the AGCA system on the ground, it is easy to maintain and prevent breakdowns or equipment failure. Complete duplicate equipment may be provided on the ground in a stand-by condition, ready instantly to replace the inoperative unit.

Tube failure or other temporary malfunction of the

AGCA system causes an automatic wave-off or fly-up signal to all aircraft under control and corresponding light-bell and fly-up signal on the crosspointer meter. Even total failure of the automatic equipment does not present an unsafe situation as the basic GCA talkdown is always available.

Until all airfields are equipped with the ultimate in landing control, practice and more practice for pilots is the best recommendation for accident-free GCA technique. Without practice it's almost impossible for a pilot to make glide-path corrections smoothly and to follow instructions instantly. Once a go-around is started it must be followed through. It's the only assurance of making another approach.

TIPS

ON EMERGENCY PROCEDURES—

• For an aircraft low on fuel making a GCA, a shortened pattern is set up. The pilot will be directed to the final leg in the shortest possible time.

• Only four instruments are necessary for a normal GCA: altimeter, airspeed indicator, rate of climb and gyro compass. The airspeed indicator is necessary only for determining the turning point to final and the initial rate of descent. The rate of climb is used to start the pilot on the glide path. If all means of directional indicators are inoperative, the plane can still be brought to a landing using a method of timed turns with the turn and bank indicator.

• If an engine is lost in the pattern, the pilot should continue flying as instructed, but should not lower the gear until three miles from touchdown.

• If an engine is lost after descent has been started, it is best to leave the gear down and continue the approach, making every effort to stay on the glide path and center line of the runway.

• If communications fail on GCA frequency, contact the control tower for alternate frequency.

The "pull-up and go-around" directions from the GCA controller sometimes bring about the most common of all accidents involving the use of GCA. Usually, the pilot will follow a normal GCA approach until about a mile from the touchdown point. Here, the aircraft would go slightly above the glide-path. At one-half mile the plane would be 50 feet high on the glide-path and the controller gives instructions to pull up and go around. So the pilot begins the pull-up but on crossing the end of the runway he sees the runway and decides to land. The landing is long, the runway is wet and the crash alarm is sounded.

This same type of pilot will do fine on a GCA approach until he spots a runway through haze and scud—then he obeys that impulse and dives down to stay under the stuff and completes the last part of the approach at an altitude of about ten feet. Sometimes, that is!

On the other hand there are a few pilots still living, who, when on instruments are instructed to pull up, mull over the decision for a few moments before taking a positive course of action. On final approach at one mile an airplane on the average glide-path is about 250 feet above the ground. The hesitant pilot diving his plane through the glide-path at this altitude may never make up his mind.

Other common pilot errors are failing to use power; overcontrolling the pitch attitude in trying to get back to the glide-path too quickly; not cross-checking all available instruments; using too much bank to make a small change in heading, and being slow to make corrections when directed by the controller.

The transition from IFR to VFR after breaking out of the overcast is often difficult and the pilot should continue to fly instruments and follow the controller's instructions until the runway is clearly visible.

Practice still makes good GCA's—and good teamwork. Analysis of GCA traffic records show that a minimum of 200 approaches a month are necessary to maintain the operating skill of a qualified GCA team, while at least 300 approaches a month are necessary in the training of a new team.

Since actual GCA's are made only during weather conditions, many GCA facilities depend upon practice approaches to meet training requirements. The more approaches made—the sharper the team—and the pilot. The better the teamwork, the better the safety and all pilots can be a better member of the team if they take the time to practice approaches and make maximum use of GCA crews and equipment.

GCA teams on the Berlin Airlift were hailed by pilots as "miracle men" and "the hottest GCA crew I ever flew." These AACS operators were not supermen; the secret of their proficiency and skill was the 3000-4000 GCA runs racked up at Tempelhof each month. (R)

"I EJECTED . . ."

By Capt. CESAR J. MARTINEZ
Kirtland AFB, New Mexico

When I was scheduled for an engineering test flight on an F-84 one day last August, I had no premonition of the events that were to take place within the hour. I didn't know that soon I would be using the ejection seat and bailing out of an airplane, much as my brother, Lieut. J. E. Martinez, did over a year ago when he left an F-86.

I went out to the plane and after a thorough external check, I climbed in, started up and taxied out to the runway. The runup was normal and shortly afterwards, the tower gave me clearance to take off. The first few minutes of the flight were devoted to the checking of the landing gear and flaps and the operation of the fuel system. While cruising at 10,000 feet indicated altitude at 90 per cent rpm, an explosion suddenly shook the plane.

Simultaneously, a severe vibration started and the plane was thrown into a bank to the right that could not be corrected with left aileron control. I succeeded in righting the plane with aileron trim, but then a second explosion occurred, followed by smoke in the cockpit and loss of elevator control. That's when I decided that the plane and I should part company.

I called the tower and notified them of my intention to leave the aircraft. As I passed over the field, I ejected the canopy by pulling the first lever on the right side of the seat in the F-84. It came off with a bang, and —thanks to the pneumatic bottles— was thrown clear of the plane without tucking under and hitting me.

I waited a few seconds before ejecting myself from the plane. During this time I was getting my head back against the head rest and trying to place my feet in the stirrups. I found that the stirrups were too close to the seat and I had to bend my legs back considerably to place them squarely in place.

The sensation I had when I pulled the ejection seat lever was that of being in the cockpit one moment and out in the air the next. I felt no kick or sudden acceleration nor did I hear the report of the gun as it went off. Sensing that I was clear of the airplane, I reached for the ripcord. I stopped myself just before pulling it, and did the right thing. The seat left me immediately when I unfastened the safety belt. Then I pulled the ripcord.

My worst fears failed to materialize when my chute opened, giving me a hard jolt. As I floated down, I turned to watch the plane going down. It was trailing flame and less than 15 seconds after I'd gotten out of it, the tail section burned off and the plane spun into the ground. Had I hesitated in my decision of leaving the burning plane, or had I waited any longer, I might not have been so lucky.

The chute was oscillating as I came down but I found no difficulty in stopping it by pulling on the risers. I saw that I was drifting backwards and tried to turn around by crossing my arms and pulling on the opposite risers like the paratroopers do. But I guess I'd never make a paratrooper because try as I might, I couldn't turn myself around to face the direction in which I was drifting. I had no sensation of falling and it actually seemed as if I weren't coming down at all.

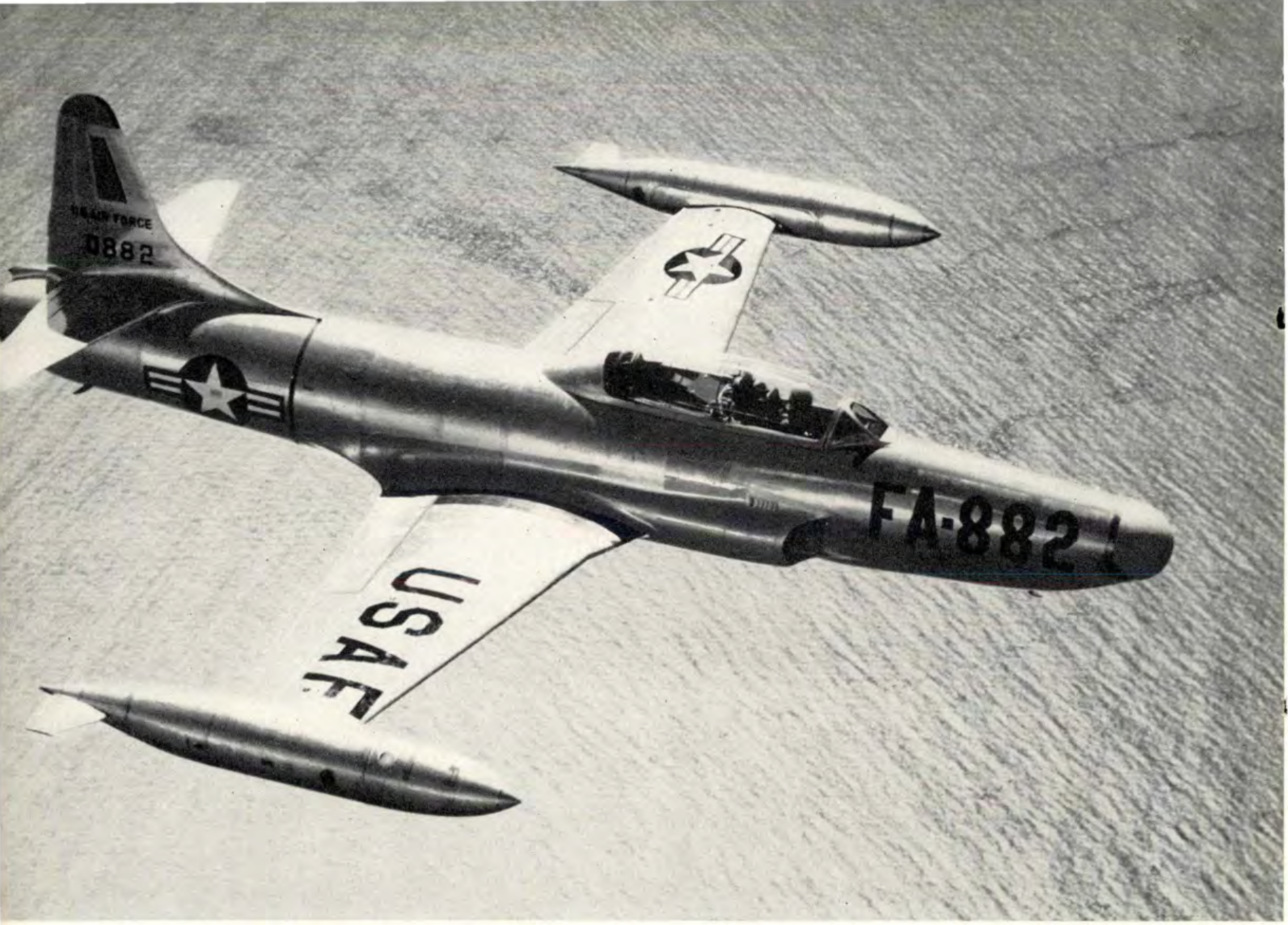
Then, at what seemed to be about 300 feet altitude, the ground suddenly rushed up. I hit the ground drifting backward long before I expected to, rolled on to my back and got up unhurt. The chute collapsed immediately so I wasn't dragged through the brush. Except for a few sore spots and a couple of gray hairs, I was not injured the least bit.

Once before, over Germany in 1944, I bailed out of a B-17 and much the same thing happened then as on this occasion. But then, I didn't have a seat attached to me as I left the plane. I only had the ripcord to pull. Maybe that's why this time I instinctively reached for the ripcord first instead of the safety belt release. Others before me may have done the same thing and pulled the ripcord before releasing the seat. That may account for seats becoming entangled in the shroud lines. More indoctrination in bailout procedures for both new and older pilots will pay off when the chips are down, as it did for me.

Another thing coincident to both of my bailouts is the fact that each time I hit the ground drifting backwards and each time I was not injured. I believe that I can attribute this to the relaxed position I was in as I landed. Each time, I made contact with the ground long before I judged I would from the way the ground was coming up at me. Because of this I was not tensed up in anticipation. Of course, I was very lucky on both of these jumps and if there is a next time, I may not fare so well. But I think that this landing by chute drifting backwards may have a few merits and should be investigated in the interests of saving other pilots from broken arms and legs and other injuries.

The one important thing that I would like to see other pilots gain from my brother's and my own experiences is the elimination of any doubts or fears they may have concerning the use of the ejection seat or of bailing out of an aircraft in distress. Records show that many pilots have been killed because of fear of jumping or by waiting too long before leaving an airplane. Take it from us, the seat is easy to use and also safe. It's the only safe way to get out of an airplane at high speeds and at low speeds as in my case. The seat will clear the tail with you in it, whereas you might otherwise hit it if you tried jumping out.

If you know your ejection seat and bailout procedures for your particular aircraft, you too will live to tell others of your experiences. And remember, once you make your decision to leave your airplane, don't be slow in executing that decision. As the old adage goes, "He who hesitates is lost." (R)



TESTING—FIFTH PHASE

Weather flying experts evaluate new airplanes and develop weather procedures for pilots.

THE FIFTH PHASE TEST BRANCH of the All-Weather Flying Section of Flight Test Division, Air Research Development Center, was formed in September, 1949, following a decision made earlier in that year that there was a requirement for the testing of all new production aircraft under adverse weather conditions.

The purpose of the tests carried out by the Branch is, primarily, to evaluate a given airplane's instrument flying qualities both from the standpoint of equipment carried and its inherent handling qualities. The secondary purpose, although of more immediate importance, is the production of recommended piloting techniques for the various phases of instrument flight in which the aircraft is required to fly.

In order to gain the information as quickly as possible, the test program is divided into four stages: the Preliminary, First, Second and finally the Report Stage. These stages may be outlined briefly as follows:

- Preliminary Stage—familiarization flying is carried out and initial assessment made of the airplane.
- First Stage—flights are made under VFR conditions to determine best speeds, power and flap settings, etc., for various phases of instrument flight. For example, GCA's and radio range letdowns. When these details have been established, they are checked by the pilot flying "under the hood" in VFR conditions. During this particular part of the tests a safety pilot is always carried in the larger aircraft and, in the case of fighter aircraft, a "chase plane" flies alongside the test aircraft.
- Second Stage—the techniques and procedures arrived at in the First Stage are tried out under actual weather conditions. Also, in this stage, flights are conducted at night and through turbulent and icing areas.
- Report Stage—the aircraft is flown by other pilots as a check on the findings of the project engineer and his assistant. The final evaluation report and pilots operating instructions are also prepared at this time.

The final evaluation report includes recommendations and changes of equipment that will improve the aircraft's instrument flying qualities and also such details of design as could be improved. This latter point is, of course, of a more long term nature but may well have a considerable influence upon specifications for future aircraft.

In order to further speed the dissemination of the data obtained during the tests, an Indoctrination Board has been formed within the Branch and upon completion of tests of any given aircraft, the officer in charge of the Board arranges for the pilots who carried out the test program to accompany him with the aircraft on a visit to the various units who are or will be equipped with the same type of aircraft as tested. By means of lectures, films and informal talks, the benefit of Fifth Phase experience is passed directly to the members of the using agencies.

A part of the report stage mentioned above is the preparation of pilot operating instructions for All-Weather Operation. It is intended that these operating instructions will find their way into print as a part of Section V of the "dash 1" tech order for the particular type of airplane being tested.

For example, when the evaluation of the F-94A was completed, a very comprehensive set of instructions was compiled by the pilots who had actually accomplished the tests. Among others, there were sections on prestarting, after starting, taxiing, instrument take-off and initial climb, cruise, icing, GCA, etc. The findings of the Fifth Phase Testers can safely be passed on to pilots who may fly the airplanes evaluated, because those who participated in the evaluations are experts in their profession. The information given here also applies to the F-94B.

Flying the F-94, like all jet fighters, requires constant attention to flight instrument readings at all times, particularly the attitude gyro. The airplane is very sensitive to the touch. To prevent over-controlling, light control pressures should be used at all times. Entries into and out of turns should be slow and the plane should be kept properly trimmed at all times. The attitude gyro on the pilot's radar scope should be used as an additional attitude reference from take-off to landing.

Here is the procedure developed by the All-Weather pilots for instrument take-off in the F-94:

- Line up visually on the runway.
- Set the needle of the gyrosin compass at the top of the dial on the runway heading.
- Set the attitude gyro.
- Turn on pitot heat.
- Run up to 100 per cent rpm.
- Afterburner ON—use of afterburner is recommended to lessen ground roll required and reduce the possibility of drifting off the runway before becoming airborne.
- Release brakes.
- Use brakes to maintain runway heading until rudder control becomes effective at 65 to 70 knots.
- Take-off at normal airspeed—about 115 knots.
- Establish initial climb.
- Raise gear.
- Start flaps up after reaching 140 knots IAS.

The procedure thenceforth is that for normal instrument climb and cruise, which are also given in detail.

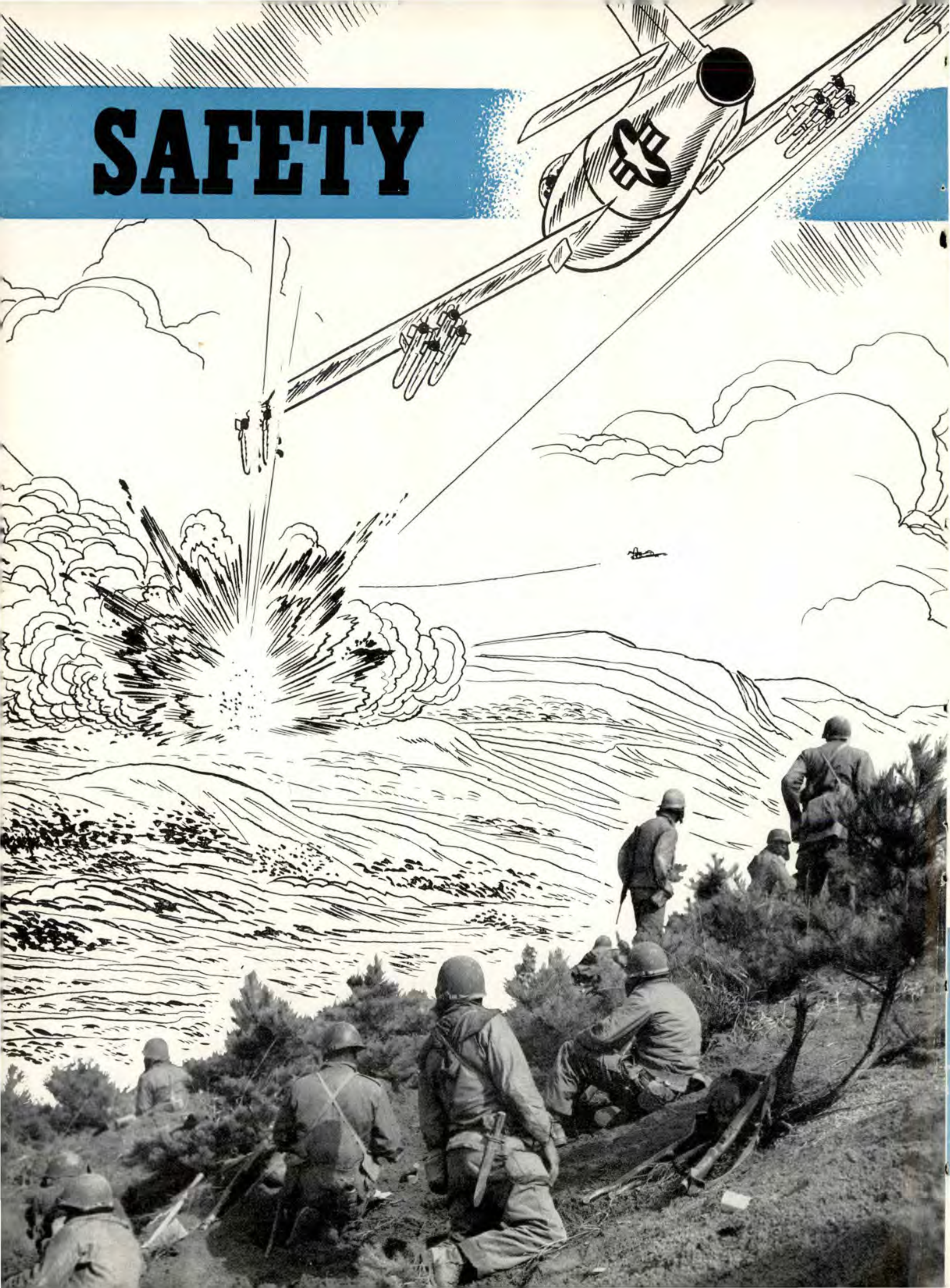
On the subject of GCA, the procedures are very thorough. Essentially, the procedure is as shown in the diagram on this page. Other items not covered in the diagram include the use of the afterburner for go-arounds, the fact that lowering the gear usually causes the altimeter to drop about 100 feet, and that at GCA pattern speeds a double needle width turn should be used as standard.

Other types of letdowns covered in the F-94A procedures recommended by the All-Weather pilots are radar and radio range. For radio range letdowns, it is recommended that the gear be left up because there is less chance of heavy accumulations of ice which will create hazardous drag conditions after the plane is leveled out.

The actual procedure for a range letdown is to maintain altitude until passing the cone, then drop dive flaps and reduce power to idle. The descent should be started outbound on a range leg at 250 knots. After two minutes, make a procedure turn at one needle width and fly inbound. This is continued until the initial approach altitude is reached. If you are then on the standard approach leg, all you need to do is lower the gear and half flaps and reduce airspeed to 150 knots by the time the low cone is reached. From an altitude of 40,000 feet, it should require about 15 minutes and 50 gallons of fuel to complete this type of letdown.

There is no doubt that the work of the All-Weather people has done much and will do much more to improve the effectiveness not only of Air Force planes, but also of the pilots who fly those airplanes. One thing they say should be emphasized is that flying jets is no different in most respects from flying any other type of airplane in weather. The main points of difference are that everything happens and must be done much more rapidly, and that the high rate of fuel consumption means that delays become something that can't be tolerated. For example, a pilot making a GCA normally will have plenty of fuel to complete the approach without too much sweat. He may have enough to go-around once comfortably, but he will seldom have sufficient fuel to make two or three tries and then be told to go elsewhere for his landing. This is not too uncommon for conventional airplanes, but for jets it may cause a lot of trouble.

As in most other types of planes, the big secret of successful instrument flying is proper preflight planning. Know how you will get to your destination, consider the possibilities which may arise to cause you trouble, and have solutions for them . . . you'll make it, all right. (R)


SAFETY

IN CLOSE SUPPORT

IN PULLING OUT OF A STEEP dive after a strafing pass on a ground target the jet fighter plane mushed through to within a few feet of the tops of some small trees and flew along for several hundred yards at this groundscraping altitude before gradually climbing to where the sweating pilot dared take the time to consider just how close he had been to clobbering the landscape.

The mission was training for close air support for the ground forces. At a post-mission briefing later the pilot reported that he was unaware that he was going to such a low altitude when he started the pass.

This was a shining example of a pilot who had become so intent on hitting the target that he temporarily forgot the safety rule minimums. Other mistakes being made by pilots training in gunnery and other low altitude work include dangerously low firing passes, recovering too low or diving too steeply.

In training for air support missions, some of the principal flying safety SOP's emphasized by the Tactical Air Command are thorough briefings for air to ground gunnery; complete operational planning; safety regulations covering safe altitudes, minimum time intervals between aircraft, target area, and, of course, the range control officer.

Most of this information the pilot has learned in the past and the fine points and techniques of close air support afforded by the training mission will pay off when safety principles of low altitude work are absorbed and are more or less followed automatically when the day comes for the "real thing."

And the real thing, as broken down by TAC, covers tactical training missions of several types which are based on the aircraft used and the techniques to be followed. Included are fighter sweeps, bombing missions, strafing runs, photo reconnaissance, escort flights, air patrols and interception work.

Typical "real thing" targets covered by these close air support training missions would be gun positions, vehicles, command posts, convoys and any other target strike mission made specifically, or called for, by the ground assault forces.

As for the planes and equipment, pilots have already learned from flying the real tactical close support missions in Korea that the jet fighter plane can withstand pretty rough treatment. This treatment has included damage caused by flak, small arms fire and "G" loads up to the design limits.

Rugged though the aircraft and equipment may be, the big rub is met in training for close air support missions. Here, the jet and conventional pilots are faced with some hairy problems that are solved only by a high degree of pilot proficiency. Specifically, these problems include the angle of dive, slant range, firing speed, starting altitudes, terrain clearances, accelerations required for recoveries, aircraft altitudes at firing positions and sighting allowances.

For conventional aircraft, the wing-line method is used to solve all of these problems of ground attack. The wing-line method does not apply to jet-type planes because of the distance the cockpit is forward of the wings; instead, a simple method using part of the canopy has been worked out.

The canopy estimating method was designed to standardize training procedures, to provide a large margin of safety, and to develop the proficiency required. Both of the methods are used so that the pilot can place his airplane at a known angle in relation to the target. After a few practice missions he learns the positioning angle and just when to begin the diving turn.

Due to high speed and the large turning radius of jet planes, the turn into the dive has to be anticipated in advance for a 90-degree turn which takes up about 8 to 10 seconds time for the pilot to complete, resulting in 3.5 to 4 "G" 's in the turn. Then, once the wing is dropped and the time-delay count is started, the pilot is committed to a dive angle and direction.

Because of the jet's high speed acceleration, accurate time counts are important. Any time delays past the SOP's for dive bombing and high angle strafing by even two seconds will cause exceedingly low pull-outs.

"Flying safety is not only a peacetime precaution of the Air Force, it pays off even more in war. The Air Force policy to convert to the jet concept for certain types of tactical aircraft has been vindicated in Korea and continuing field tests. The jet's simplicity of operation, less man-hour maintenance and greater ability to withstand all types of enemy fire represents a higher degree of pilot safety and economy of equipment. This greater degree of pilot safety and equipment economy is directly related to the ultimate purpose of tactical combat operations, in fact all combat operations—success in battle."

William M. Gross, Brig. Gen. USAF
Commandant, Air-Ground School of Operations.

In conventional aircraft the pilot's use of the wingline method is simple. This technique positions the airplane with the correct dive angle and slant range, and with the correct diving speed.

In high speed dives, the pilot's estimation of range is difficult and this difficulty poses one of the most unreliable factors in working problems of ground attack. With several methods employed, slant range is estimated by using the altimeter reading in conjunction with the line of the estimated dive angle. But the altimeter is very difficult to read accurately at high speeds and dives.

To do this, the jet pilot sets up his approach leg so that by leaning to the side that the target is on and keeping his crash helmet from touching the canopy, he can barely keep the target in sight as it apparently slides along the canopy rail. Some adjustments must be made in the cases of the short and the tall men to get the correct dive angle.

The high angle strafing run is usually entered from around 7,000 feet altitude with a power setting of 92 per cent for the F-80A. The dive angle is approximately 45 degrees. Dive flaps are not used. Instead, for training work, they should be held in reserve in case of an emergency recovery.

Low angle strafing is another type of attack stressed in ground support training. For this mission the flight path of the plane tends to stay on the sight line or even slightly above. This is a safety factor in clearing the top of the target where low speeds would put the plane in a hazardous flat firing pass.

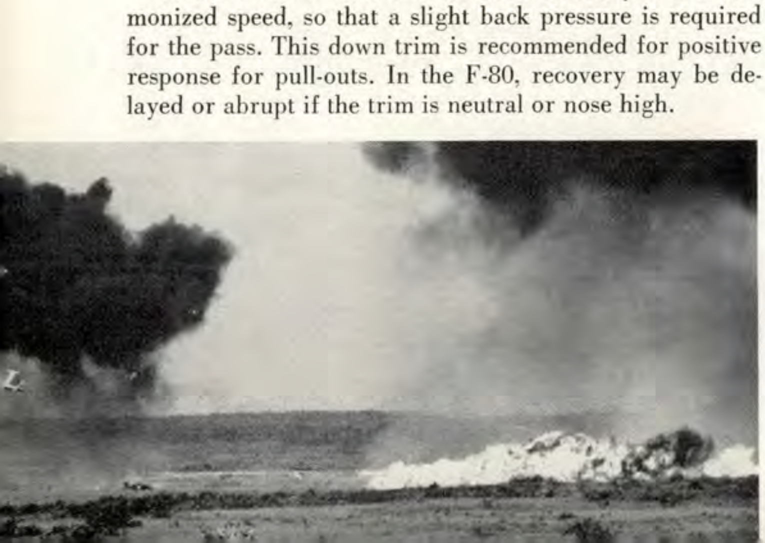
Jets are more stable at higher speeds and safety in correct firing speed is a function of three factors. These are the initial entry speed and distance from target line, altitude and dive angle, and the power setting.

Since these factors are all variable in relation to the individual pilot technique, some general rules have been made in choosing the proper angle for safe, effective operations:

1. The flatter the approach angle, the greater the tendency to fly into the ground, especially when concentration is on hitting the target.

2. The pilot should keep in mind on recovering from steep passes the mushing effect of the airplane. The first phase of pull-out merely levels the flight path.

3. The aircraft should be trimmed laterally at the harmonized speed, so that a slight back pressure is required for the pass. This down trim is recommended for positive response for pull-outs. In the F-80, recovery may be delayed or abrupt if the trim is neutral or nose high.



Safety in close air support must be a two-way proposition. It's for both the fighting men on the ground and the men flying the planes—and the pilot is sitting in the driver's seat. (U)

FEAF TIPS

Fighter organizations in FEAF have been the first to make use of large tip tanks on F-80's. From their trial-and-error experiences, here's a list of a few recommendations and some DON'TS that are worth remembering:

- **Don't exceed two-and-a-half "G"s acceleration with full tips. If a pull-out is necessary, it should be gentle and straight ahead. Tips sometimes hit the tail if they come off during a pullout.**
- **Don't employ excessive G forces. Excessive G forces imposed by turbulence and/or improper pilot technique during a pull-out are the usual cause for the loss of tip tanks in flight. The failures usually occur in the bomb shackle or the rear shackle support.**
- **Don't overlook take-off dangers with tips partially filled. The acceleration occurring during a take-off will cause the fuel to go to the rear of the tanks. After breaking ground, a forward stick force is necessary to prevent the airplane from getting in a nose-high attitude. If the pilot is not experienced in making this correction, a fore and aft pitching may result.**
- **Don't turn off the fuel switch even after the fuel is exhausted. The pressure differential may collapse the tips during a letdown.**
- **Don't gamble with speed. Big tips should be dropped from a nose-high attitude at cruising speed. Empty or nearly empty tanks may damage the wingtips if they are released at too high an airspeed.**
- **Don't land with either or both tips full until all means of getting rid of them have been exhausted. It is generally conceded to be a safer procedure to rip tanks off by application of G forces than to attempt a landing with one full tank.**

Recommendations

- **Check the sway brace torque before each flight.**
- **Be careful in taxiing with large tips because of the reduced ground clearance. This clearance is especially critical in rough airfields.**
- **Recommend leaving the caps loose until just prior to take-off. On a hot day with the fuel caps tight, fuel may expand and seep back past the check valve into the defroster air line and later be blown into the cockpit.**

Watch out for your NECK!

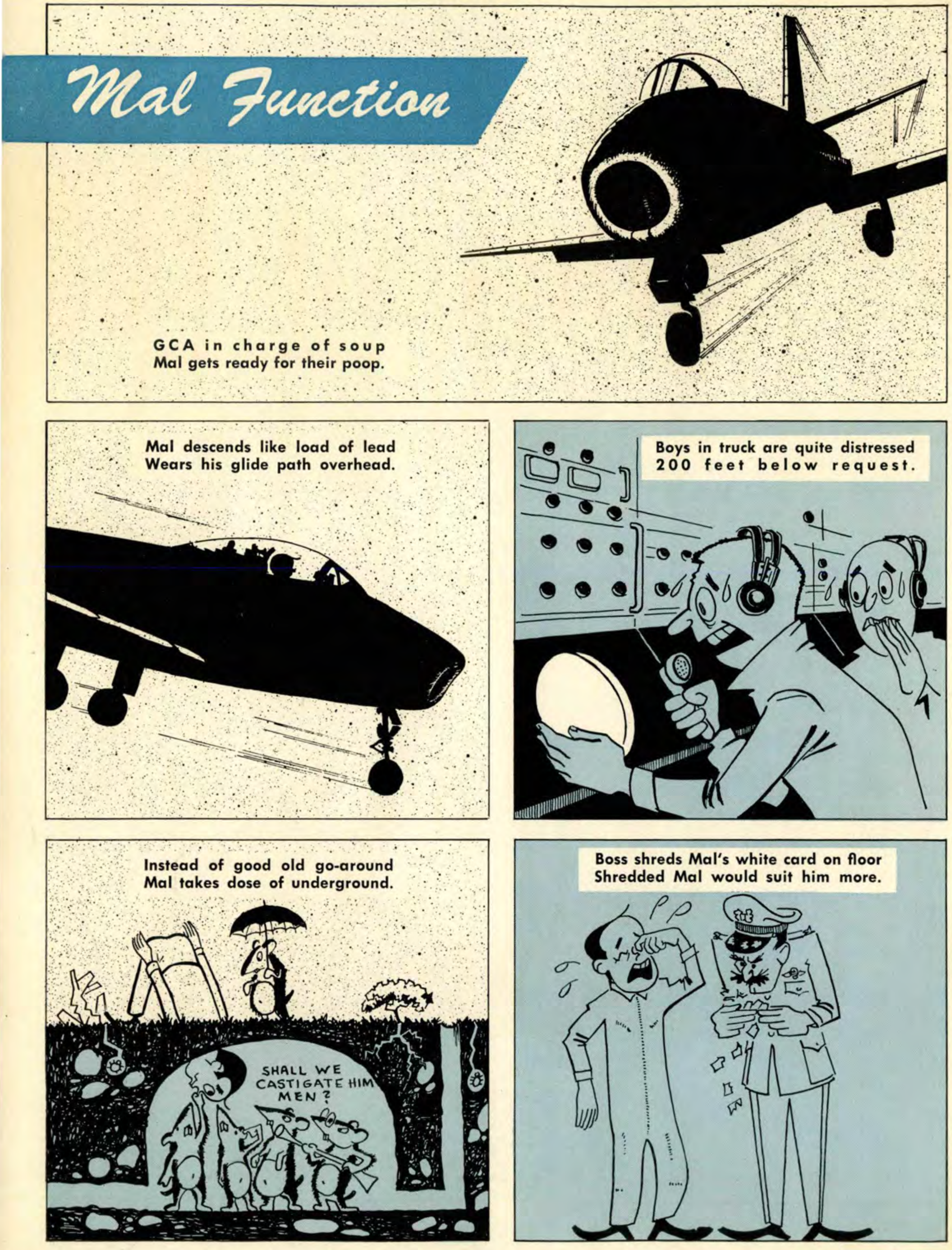
The turkey receiving the salt treatment doesn't know that it's really his neck and not his tail that's in danger. Come the latter part of this month, he won't be such a proud looking bird.

We relish the thought of what the turk will look like minus head and feathers, done to a golden brown and dominating the center of the dining room table on Thanksgiving Day. But we pity him for being so ignorant as to stand idly around awaiting his inevitable fate.

Aside from the fact that they also have wings and necks, some pilots are quite a lot like turkeys. The difference is that they usually realize they don't know much—about the planes they fly, that is. Still, they do nothing about it, and in their way they await their fate, just like the gobbler.

Do you suppose the turkey pities them for the way their necks are sticking out? (U)

MITZI GAYNOR, 20th Century-Fox



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