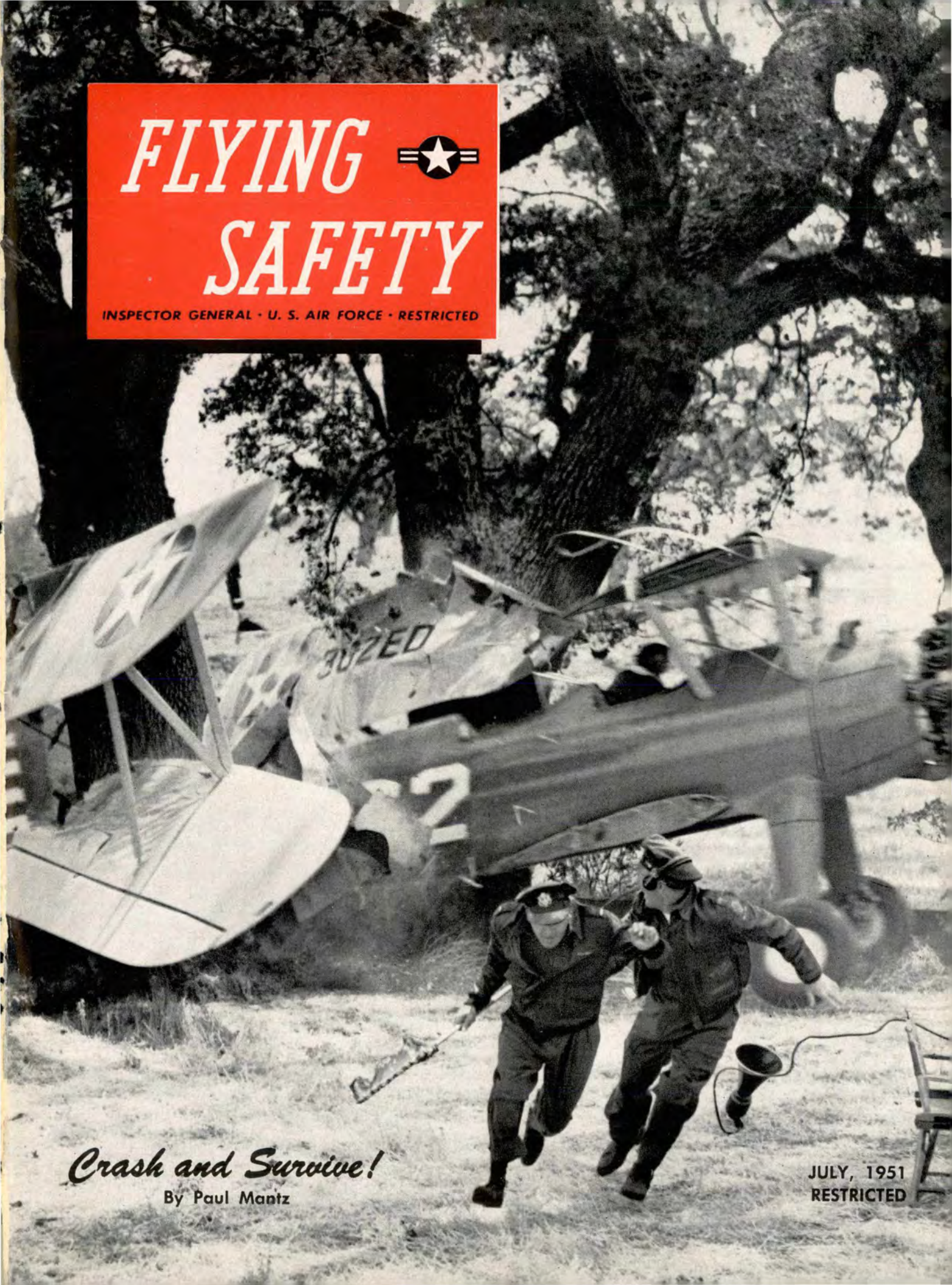


FLYING SAFETY

INSPECTOR GENERAL · U. S. AIR FORCE · RESTRICTED

Crash and Survive!

By Paul Mantz

JULY, 1951
RESTRICTED

FLIGHT SAFETY AWARDS

The bases and units of the United States Air Force, Air Reserve and Air National Guard which are listed below established outstanding aircraft accident-prevention records during the last half of 1950. In recognition of these records they have been awarded engraved bronze and mahogany plaques.

The examples which these bases have set reflect their desire to attain high proficiency in all the fundamental aspects of the art of flight. Continued efforts by these and all other Air Force Bases will result in increased combat effectiveness of our Air Force. A second round of awards, in accordance with AFR 62-9, will be made to outstanding units following the first six months period of 1951.

GOOSE AIR BASE

ANG BALTIMORE

ANG BUCKLEY FIELD

U. S. AIR ATTACHES

ANG WHITE PLAINS

ANG CAMP DOUGLAS

POPE AIR FORCE BASE

2584TH AFRTC MEMPHIS

MATHER AIR FORCE BASE

HICKAM AIR FORCE BASE

WALKER AIR FORCE BASE

SHEPPARD AIR FORCE BASE

RAPID CITY AIR FORCE BASE

2347TH AFRTC LONG BEACH

GREAT FALLS AIR FORCE BASE

ANG HUNTER AIR FORCE BASE

ANG KIRTLAND AIR FORCE BASE

12TH AIR FORCE HEADQUARTERS

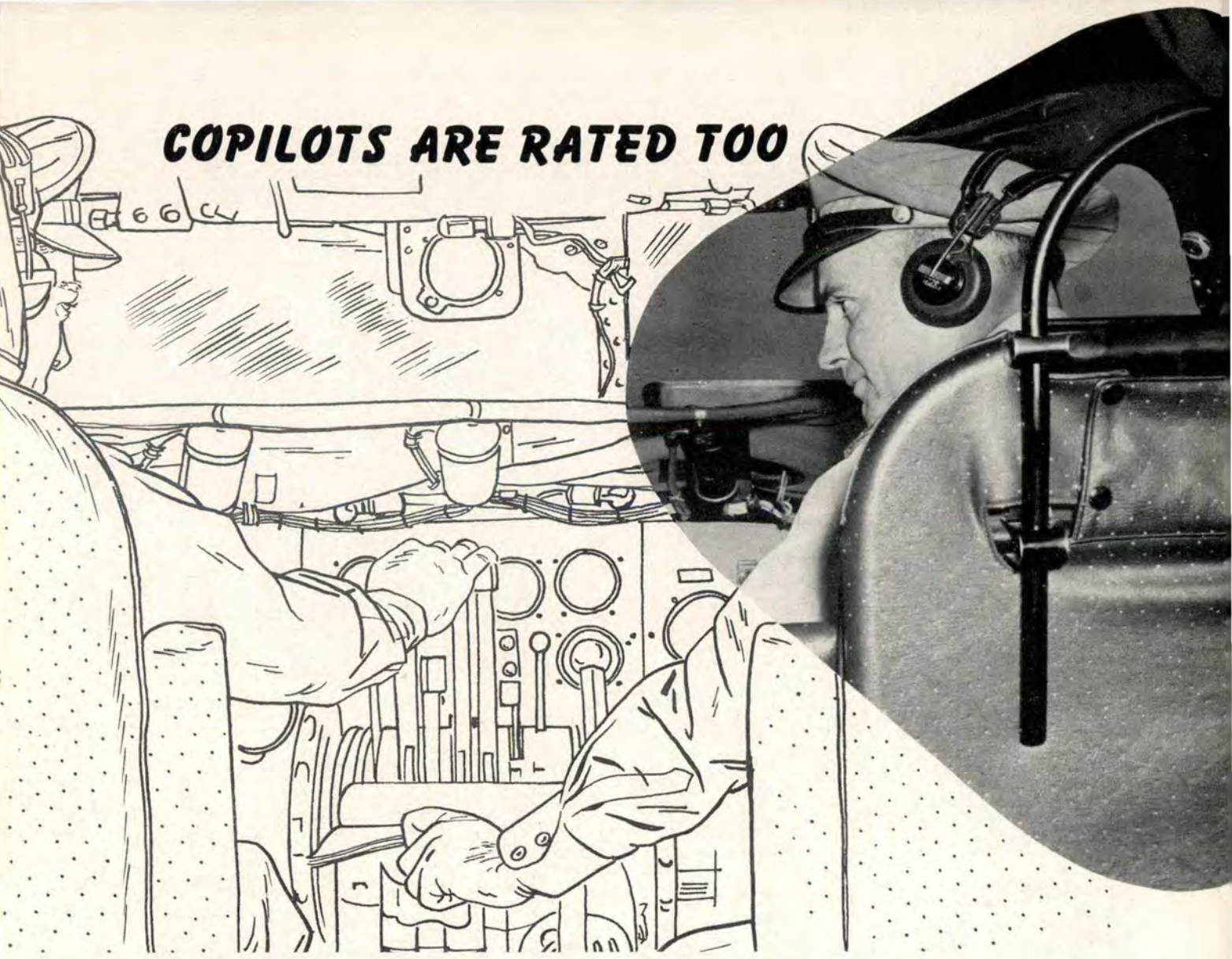
MATS, NAVY UNITS, MOFFETT FIELD

MATS WASHINGTON NATIONAL AIRPORT

USAF UNITS (3RD AIR DIV), LAKENHEATH, ENG.

USAF UNITS (3RD AIR DIV), MILDENHALL, ENG.

COPILOTS ARE RATED TOO



AN EXPERT CRAFTSMAN doing a delicate job would not deliberately jeopardize his reputation by throwing away most of his important tools. Yet in the Air Force, some pilots are doing this very thing by deliberately refusing or not using the help of their copilots. When the Air Force made specifications for its multi-engine and multi-place planes, they realized that flying the planes was too much of a job for one man, so they made provisions for copilots with the full intention that the copilot would aid the pilot in the performance of his duties.

How the ineffectual utilization of the copilot's aid can lead to trouble is illustrated by a recent night instrument GCA landing accident, when the pilot landed a B-25 125 feet short of the runway and damaged the nosegear to such an extent that it collapsed during the landing roll.

During the investigation, it was discovered that the copilot had been in visual contact with the ground and runway lights during the last half of the final approach. He had indicated to the pilot that the runway was visible but the pilot ignored him, continued his approach on instruments and landed short.

It has always been the pilot's responsibility to insure the success of any mission by complete cooperation and effective coordination of all crewmembers, particularly in the case of copilots. Your copilot is a rated pilot just like yourself. It is up to you to qualify him in your type of plane so that he can assume your duties at any moment. He should be able to perform all the duties of a pilot as well as you yourself. Remember the more proficient he is as a pilot the more efficiently he will be able to perform the duties of a copilot, which means helping you.

If you as a pilot do everything yourself and only tolerate the presence of a copilot because regulations say he has to be there, you are cheating yourself, the copilot and the Air Force.

You are cheating yourself of the aid and assistance that a good copilot can give.

You cheat the copilot by not giving him a chance to learn enough about the plane you fly so that he might become a first pilot in that type plane himself one day.

You cheat the Air Force by not utilizing a man trained at great expense, time and effort. It is up to you to increase the efficiency and safety of your plane, crew and passengers by training and briefing your copilot on every mission.

Crash and Survive

By Paul Mantz

Your chances of survival and rescue after a crash landing depend largely on how well you succeed in making the airplane and not yourself absorb the shock. I have lived to walk away from numerous "precision" crashes because I have made it a point to learn what actually kills an airman when a plane crashes. The human body can resist terrific decelerations with little ill effect if supported properly and prevented from being catapulted against the aircraft structure.

It's a fair bet that before you graduated from primary or basic flying school you were more alert to the possibility of a forced landing than you are now, if you have several thousand hours. Remember how the instructor would close the throttle and shout "Forced Landing!"? Before that happened, your neck had already been swiveling and you had picked a field or two; you knew whether it would be upwind or downwind, and how many gliding turns it would take to hit it on the dime. You felt uneasy when the instructor maneuvered you over terrain where you couldn't pick a smooth field.

The fundamentals of successful forced landings which you learned in primary and basic are still good. In fact, if you can revive that alertness to the possibility of a forced landing, without the apprehension you felt then, you'll be ready to make the best choice if your engine quits today or tomorrow.

These "sight pictures" of forced landing procedures in your primary or basic trainer which you retain in your memory can be adapted to apply to the plane you now fly, whether it is a jet fighter or a multi-engine bomber. Of course, it requires practice in the air. The jet fighter has a higher impact speed than the trainer you knew so well, but at the same time the speed of the tactical plane is compensated by strength of fuselage structure which didn't exist in the fabric-covered planes that have figured in many of my precision crashes.

After 24 years of flying, I find that many maneuvers are done subconsciously, like walking. But I have disciplined myself to stay alert for emergencies. I don't mind admitting that with me, every takeoff is a special takeoff, no matter how many times I have flown from a particular runway. Let the hot shots taxi out for a running takeoff from the intersection. I'll back up right to the fence and check everything before I let 'er roll. And checking everything includes knowing what's past the overrun and planning what you'll do if the engines conk out about the time you start your gear up.

Paul Mantz specializes in just about everything connected with flying airplanes. He is three-times winner of the Bendix Trophy Race; he operates a charter service; he holds numerous speed records; and of importance to our purposes, Mr. Mantz has made a number of crash landings in various types of airplanes for the movies. These he does not call stunts, but rather "precision crashes." The word "stunt," he says, infers carelessness or recklessness whereas his crashes are carefully planned and executed. His observations on crash landings are well worth your careful consideration.

Never lose the technique your instructor taught you—always be looking for an emergency field.

One of the biggest mistakes a pilot can make is to cut a corner to save minutes. This is particularly true in taking off on a climbing course over cities or rugged mountain terrain. I mentioned that every takeoff is a special takeoff. It is important to get the maximum climb out of your aircraft immediately after takeoff so that you don't have to spend any more time than necessary, flying over congested areas where a successful crash landing would be impossible. If I am flying on an airway which has a dogleg and see that by cutting

straight across I can save five minutes, but by doing so will be flying over country so rough a burro couldn't pick a trail, I stay on the airway and add those five minutes to my flying log.

If you have learned how your plane glides power-off, and if you are always aware of what type of terrain is under you, you will be better able to make a sensible decision—whether to bail out or crash land in the event of engine failure. In choosing to crash land, the first requirement is for terrain without solid objects. If you can't land without hitting solid objects, such as large boulders, dikes, stone fences or mounds and gullies, it is only wise, if you have enough altitude, to bail out.

The type of terrain determines how far you slide after touchdown. I have landed wheels up on hard stubble and slid almost as far as I would have rolled on a runway using brakes. In freshly ploughed ground you really come to a scraping halt and if the soil is muddy and loose, this type of terrain decelerates you, much like ditching in water. Hard dry ground is always a better spot for a crash landing than is a cow pasture which might look smooth as velvet but might have drainage or irrigation ditches concealed by the grass. For the same reason if you have to abort a takeoff and you don't know definitely by having previously walked over the overrun that the area is smooth, it is best, I believe, to pull your wheels up because if your gear strikes a concealed bank or ditch, you run the danger of being flipped over on your back, but violently.

On a good surface an airplane with the sturdy structure of military aircraft will decelerate without shaking up the pilot. For instance, when I crash-landed the B-17 for the movie "Twelve O'clock High," I had to make the landing with a slight downwind and the plane slid along for at least 1,200 feet on the mowed grass. I have landed wheels up on a dirt strip and kept the plane going straight ahead for 500 feet.

In the case of the B-17, I had rudder action practically the entire slide after touching down and steered it straight ahead like a sled. Too often, I believe, the fellows give up right at the point of contact—take their feet off the rudder pedals and wait for the plane to rip apart. Now, I don't advocate keeping your feet on the pedals during all crash landings. It depends on the type of plane you're flying. Pilots have suffered severe leg injuries because they didn't get off the pedals. However, in some of the sturdier airplanes it pays to keep your feet on the rudder pedals. You might be surprised at how much control you can get out of those rudders even though the plane is sliding down the runway or field on its belly.

Maintaining rudder control as long as possible is specially important if you run out of field because you have overshot, or because the field is too small anyway, and you're approaching trees, barns or fence posts. Only by keeping this rudder control do you have a chance of getting the fuselage between the trees and letting your wings take the shock. Similarly, if you have to come down suddenly, in a built-up area, make your decision at once to go between buildings rather than into one of them, even if the space between is narrower than your wingspan.

Besides knowing as much as possible about choice of landing terrain and how to keep control of your plane after touchdown in crash landing, give yourself the benefit of all the safety devices built into the airplane. These include tightening your shoulder harness, wearing protective clothing and opening your canopy. I have used a standard Air Force shoulder harness in deliberately crash landing military planes for the movies, and if I were an Air Force pilot on routine missions, would never be without it. In fact, years ago I devised a shoulder harness for my own use and consider it essential in preventing impact injuries. Another thing you should check for every flight and which can influence your chances of surviving a crash landing is the storage of equipment, cargo and baggage. You have your own Air Force rules on this. Don't neglect them.

Fire after a crash is always a hazard and it is encouraging to know that the Air Force, the Navy and the Civil Aeronautics Administration are doing extensive research and testing in an effort to eliminate this hazard from crash landings. Meanwhile, there are a few points about fires in crashes now known that I would like to pass on. To start a fire, you need fuel and a means of igniting it. If your crash landing is to be for

Paul Mantz and his F-51 "No. 46" hold a number of speed records. He is the only man to win the Bendix Race three consecutive times. Mantz has never been injured in any of his "precision" crashes.

Mantz crash landed this B-17 for the movie "Twelve O'Clock High." The photo on page 5 is the same plane after it slid to a stop.

other reasons than engine failure, get rid of as much fuel as possible, either by running your tanks nearly dry or by salvoing them. Just before impact remember to shut off the flow to the engines.

You cannot always control the ignition sources. You can cut off electrical switches but hot exhaust stacks still remain. Most fires occur as the plane slows down or after the plane comes to rest when the fumes from fuel or oil are ignited. CAA recently reported that hot exhaust stacks have ignited fuel as long as 40 seconds after a crash and oil has started burning as late as six minutes after a crash. It would seem apparent that since it is impracticable to carry sufficient quantities of fire extinguishing agents to blanket an engine from first impact until six minutes after the crash, the best time to use an extinguisher is after the plane slows down. Then lose no time in getting out of the plane after it comes to a rest!

There are hundreds of different ways to make safe emergency landings and I would be going out on a limb to give any hard fast rules, because every time an engine quits without you or your crew members pulling the fuel shut-off, you are faced with a different problem at the start. The start has a great deal to do with the ending, but we can get down to a few fundamentals to make those endings successful. If you make these fundamentals subconscious habits, they will be with you when you need them:

(1) When you are flying, keep in mind the wind direction and strength. When you are at high altitude, in the soup, or in an overcast, obviously you can't observe riffles in the water or smoke from Dinah's chimney, but you can listen to the radio weather broadcast at 30-minute intervals along your route and mentally file away the information about wind direction and velocity on the surface.

(2) Fly high over rough ground. I would like to elaborate on that rule and say that the only place a pilot has any business flying low is in approaching for a landing, taking off, dusting crops or attacking ground targets. During the rest of the time, get and keep lots of altitude.

(3) The technique for landing an airplane in an emergency, wheels-up on a clear area actually is no different from coming in wheels-down on a runway. Don't forget that you must use a normal glide and land the plane in the same attitude as if you were trying to grease the wheels on a paved runway.

Now for a slight elaboration on these three points. From the first one, regarding wind, don't get the idea that I think you should always make your crash landing into the wind regardless of all other conditions. I should much rather land downwind on a long, smooth carpet than into the wind on a short, rough field with obstacles. Even so, knowing the wind direction and velocity is an important part of getting ready for a crash landing.

What I have said about keeping plenty of altitude is based on first hand knowledge of pilots who weren't believers. I've heard many pilots say that sometimes they just have to buzz to work off steam. I can't swallow that, because it seems that they always choose the girl friend's house, their own homes or homes of friends to buzz—and to have their accidents. I can always get rid of any extra steam by taking a plane up to a respectable altitude and doing some precision acrobatics. If you really work on those acrobatics you can get rid of plenty of steam.

The third caution I mentioned about the similarity between a crash landing and a regular landing is certainly true. Many times pilots are hurt because they don't realize this and try to do something differently just because they think it should be different. In this respect, you can help ready yourself for the emergency by making every landing a "practice" crash landing. By this I mean practice precision landings. I realize I'm using that word "precision" a lot, but it fits. Pick out a touchdown spot on the runway to land on and then land on it. Practice it with full flaps, half flaps and no flaps. Don't be satisfied with just getting it on the runway. This sort of practice might make a big difference some day when you have to make a spot landing—or else.

I have not been hurt landing in small trees and even on a haystack because I try to make just as good a landing—three points—as if I were coming in on the runway. But, on the other hand, you know and I know that pilots have been killed by stalling and falling in from the last few hundred feet. Also, you know of pilots who have been killed because they thought they *had* to come in extra hot on the final approach. Remember a good field is of no use if you overshoot or undershoot.

This calls for a little discussion on selecting fields and setting up a pattern, but I'll not attempt to enlarge on this—instead I'd like to suggest that you go back to your old primary and basic flying manuals and study them thoroughly, then adapt the basic procedures—which are still good, by the way—to the circumstances of your faster and flatter gliding airplanes.

Modern airplane engines are increasingly dependable. Whenever engines do quit, the odds are that the pilot forgot to switch tanks, miscalculated fuel supplies, got lost and ran out of gas or some other such thing, rather than out-and-out materiel failure occurring. What you should be ready to assume is that forced landings invariably come at the most inopportune times. You just have to be ready.

EMERGENCY TIPS

• Don't dive down on a field and expect to land on it. Too much speed is just as bad as not enough.

• Don't prolong a glide away from a field at low altitudes and expect to land on it.

• Don't try to stretch your glide.

• Use a normal approach, with a normal glide.

• Avoid violent turns.

• When flying at low altitudes, always try to have a suitable field within easy gliding distance.

• Don't change your mind. When the necessity for a forced landing arises, pick out a field and stick to it.

• Don't get over a field at low altitude until you are ready to land on it.

THE Air Attaches SAFETY WISE

OPERATING ON A GLOBAL BASIS, THIS MINIATURE AIR FORCE HAS ESTABLISHED A RECORD FOR THE REST OF THE AIR FORCE TO SHOOT AT.

FOR MOST PEOPLE it would be pretty hard to conceive of any use our modern Air Force could have for horses. Even the cavalry has reluctantly conceded that Dobbin's day is done. But to one small Air Force detachment located in a rather remote section of the world, a team of horses came in mighty handy this past winter.

The Air Attache to Afghanistan spends a good share of his time battling the wolves away from his back door and dreaming up ingenious devices which will allow him to keep his lone C-47 flying with the meager amount of equipment available.

Keeping a landing strip on a sod airfield free of snow during the winter months without the aid of snow removal equipment was one of his problems. Apparently, it doesn't snow too often in Afghanistan, but when it does, it snows a potful. Perhaps this attache was a farm boy from way back; in any case the winter's first snow didn't stump him for long. He simply got hold of a team of horses, hooked on a large, heavy log and went snow plowing. Not quite so efficient perhaps as a regular snow plow, but the end results served the purpose and the C-47 was not earthbound for long.

This rather primitive procedure was later modernized slightly by replacing the tired old hosses with a "6 x 6" truck, but the horses were probably more reliable when the snow was deep. Of course, there was a catch to this procedure. After the fifth time the homemade snow plow was used, the landing strip was covered by a six-inch-thick layer of ice. Also, frozen snow and ice ridges made the strip unsafe for any except emergency operations. The log couldn't dig deep enough to do a perfect job, but at least it kept 'em flying for a while.

The Air Attache system operates on a global basis. It operates aircraft in a good share of the countries of the world and in almost all the major ones. The attache office in Korea was recently reopened even though fighting was still fierce and bloody. It is understandable that the Air Force cannot afford to provide all attache detachments with the comforts, conveniences, equipment and supplies which are to be found at established air bases. The Air Force does the best it can, of course, but often, particularly in newly established, isolated detachments, the attache has to lead a rugged life. Sometimes shortages of equipment cannot be avoided.

Take the case of the attache who was woefully short of aircraft maintenance tools and equipment. Even the relatively simple task of repairing a flat tailwheel tire became a major undertaking without the tools and facilities normally available. The picture on this page shows how the job was finally done. A heavy duty automobile jack, a stack of lumber, and a wheel borrowed from an "A" frame hoist, just in case the jack system gave way while the tire tube was being repaired, provided the makeshift means for the task. About all that recommends this system of tire repair is the fact that the job was done. It isn't recommended for an SOP, but the ingenuity displayed is something to be proud of.

Admittedly, these examples of snow removal and tire repairing are not everyday occurrences in the Air

Attache system. The examples given indicate that the accident potential of attache aircraft is considerably greater than normal. Even if maintenance were no problem, the areas over which these pilots operate, often uncharted mountain or jungle areas, seldom with adequate navigation facilities, would make flying a dangerous game.

That the attache system has overcome these many obstacles and established a safety record over the past year which is better than the Air Force-wide average is a commendable feat.

In March, 1950, an air attache airplane crashed in Canada and among others, the United States Ambassador to Canada was killed. The publicity and the effects of this tragedy were enormous. One very important result was the realization that the establishment of a coordinated flying safety program in the attache system was an absolute must. The matter of flying safety could no longer be left up to the individual attache offices.

So the position of Aircraft Maintenance and Flight Safety Officer was established within the Air Attache office in the Pentagon. The job of this officer was, briefly, to improve maintenance control and to conduct a personalized flight safety program for attaches.

One of the first acts of this officer was directed at what had been found to be a cause of at least half the accidents occurring in the attache system—lack of flying proficiency. When an officer is accepted as an attache he attends school in Washington, D.C., before departing to his overseas station. This provides an excellent opportunity for the Attache Branch, in the Pentagon, to do a little crusading in the interests of flying safety. C-47's were obtained for the purpose of developing flying proficiency of attaches during their stay in the Washington area. Thus, the Flying Safety Officer can now ascertain that each attache is highly proficient in the airplane he will fly before he heads overseas.

The "pre-proficiency" program is taken seriously within the attache system. Even though an air attache designate has completed his schooling, if his proficiency in the type aircraft he is to fly overseas is not up to desired standards he is retained until he meets those standards. This careful screening of pilots prior to transfer overseas is believed to be a contributing factor in the overall safety program.

Maintenance has always been one of the bigger headaches of the attaches. Few if any of them are equipped to accomplish major aircraft maintenance and repairs. The result has been that airplanes were flown when they were known to have been overdue for required inspections. In some cases, where the attache was stationed thousands of miles and many flying hours from the nearest depot, a good share of the flying time was spent in just traveling to and from depots for major inspections and maintenance work.

This situation has been considerably eased by contracting some of the routine work to commercial concerns such as airlines which operate at or near the attache's station. Also, Air Force Regulation 66-16 was issued in November, 1950. This directive spells out responsibilities of major commanders for the support of attache aircraft. Among other things, it requires that

the major commander schedule each attache airplane in his area for at least two depot inspections per year. Provisions for contractual services and for replacement airplanes are included in the regulation. The result is that attaches have been relieved from much of the pressure under which they used to fly.

Even though this spelling out of major command responsibilities has eased the job of attaches, one area still suffers from maintenance difficulties. Attaches in the near and middle-east have to fly their planes long distances for overhauls and major inspections. By the time the trip is completed there isn't much flying time left before another trip to the depot for an inspection must be scheduled.

To correct this situation and to ease the maintenance problem for attaches to these countries, a flying maintenance shop has been developed. A C-54, equipped with tools and equipment required to accomplish major maintenance work in the field, will soon be flying a regular maintenance run to the more remote attache stations. This will save attaches many days of unnecessary travel and will assure them of periodic maintenance and repair work of the quality they would receive from a depot.

The C-54 mobile maintenance shop will carry eight airmen and two officers. The latter will serve as pilots of the plane and have been chosen from experienced maintenance officers. Each airman will be a specialist—hydraulic, electrical, engine, radio, structure, etc. They will, of course, have to be able to lend a hand to others when no requirement for their specialties exists. These crews will be on the road almost continually, with a regular route; however, their schedule will not be inflexible. If a call comes in for rush maintenance work from a station several stops away on the schedule, the route will be interrupted to take care of it. What this boils down to is that maintenance will come to the attache and the attache will no longer have to disrupt his duties to go to the maintenance.

Gen. Vandenberg presents flying safety award to Col. Cassady of Air Attache Branch in recognition of outstanding safety record.

In spite of their sometimes isolated locations and the often difficult flying conditions, attaches are required just like all other pilots to comply with Air Force flying requirements. One big difficulty in this respect has been in getting their instrument checks within the sixty-day period prior to birthdays. Sometimes it has been next to impossible to fit into the work schedule a trip to an Air Force Base where facilities and personnel for giving checks are available. This situation was relieved by obtaining permission from Air Force headquarters for attaches to take instrument checks any time in the six-month period preceding their birthdays.

The Air Attache Branch has also initiated a series of personalized "flying safety letters" to attaches. These periodic letters have so far covered such varied subjects as oxygen use, aircraft inspections, health, weather planning, maintenance, survival equipment and accident rates. Each letter deals more or less specifically with one subject, yet at the same time serves the general purpose of keeping the attache's attention focused on flying safety.

During the 12-month period subsequent to the launching of the coordinated flying safety program in April, 1950, the Air Attache system had only one major accident marked up against it. In the same period nearly 12,000 hours were flown. This results in a major accident rate of eight per hundred thousand flying hours. By comparison, the over-all Air Force average for the calendar year 1950 was 34 major accidents per hundred thousand flying hours.

For this outstanding achievement the attache system is deserving of high praise. In partial recognition of the feat, a special flying safety award in the form of a bronze and mahogany plaque was presented the air attache system for the six-month period July-December, 1950. During that half year no accidents were charged against air attaches.

Major General C. P. Cabell, USAF Director of Intelligence, under whom the air attaches operate, has this to say of the flying safety problem insofar as attaches are concerned:

"Air Attache aircraft are based at foreign Air Force installations and civilian fields where little or no facilities are available. Many of the normal base facilities such as weather forecasting, traffic control, technical assistance and adequate supplies, are not readily available and language barriers further complicate matters. In spite of these difficulties the attaches have given their support to this flight safety program with wholehearted enthusiasm. Consequently, they are overcoming these difficulties through ingenuity, improvisations and every possible assistance of the Air Attache Branch."

NEW LIFE FOR OLD PLANES

They "Look Younger, Live Longer" After Going Through Norton Depot for Inspection and Repair

The outdoor storage area at AMC's Norton Air Force Base in San Bernardino, California, was crowded with a variety of tired looking aircraft in old battle dress. F-51's and C-47's rested on blocks, with tails anchored firmly to the ground. They were more suggestive of faithful horses put out to pasture than of airplanes that would serve again . . . and better than before.

These aircraft had arrived from storage spots and using organizations all over the globe for a complete Depot Inspection and Repair. A production line which could well be the envy of any manufacturer and a rigid system of continuous checks assured maintenance safety to flying personnel.

Brushing wings in the storage area with their dejected looking sisters were sleek, new-looking aircraft . . . fresh from their final inspections and flight tests.

A few days later ferry pilots arrived to fly them back to service. Prior to acceptance by the using organization, another flight test of at least an hour was flown by the ferry pilot, accompanied when possible by one of Norton's test pilots.

Here, at the beginning and end of the DIR line could be seen a "before and after" which was of vast importance to flight safety. Norton was equipped to do the job . . . with specialists, equipment, procedure and esprit de corps. The men working on the planes displayed an interest and enthusiasm for the job of reconditioning their old friends that assured the extra attention to little things which always spells Safety.

"Some people think all we do here is change the plugs and run 'em up. If they could go through the line they'd know that when a plane is through here, it's as good an operational airplane as when it came from the factory." The mechanic was readying an F-51 for disassembly. "That might sound a little out of line, but a lot has been learned about these airplanes—the hard way. Most of us working here know them inside and out by now. Why, some planes have been through here two or three times. By the time all the T. O.'s have been complied with, and the DIR line is through with them, the pilots who are going to fly them can take our word for it that they have a practically new airplane. Some old 'dogs' come in here, but they don't go out that way."

The process, in the careful transition from old to new, was the same for both the F-51's and the C-47's, with the exception of special installations in some of the transports.

The 51H's came to Norton from dead storage, where they were placed, with ferry time only, at the end of World War II. These aircraft had been "depickled" and given a one time flight transfer inspection before being flown into Norton. The balance of the 51's were the D models with an average of 1,800 hours.

The C-47's had no "average." Truly representative of the varied duties and backgrounds of the Air Force's faithful "workhorse," their "hours" ran from 2,000 to 12,000. A few of these had also come from dead storage.

"Once in a while we run across one whose engines were assembled from parts out in India or somewhere. Not even a serial number . . . the fellows out there just put them together. And do they run!" The maintenance inspector of one phase on the 47 DIR line ran his eye over one nearing the final station. "There's one that's

NEW LIFE FOR

been in here twice since '45 . . . still going strong. Just like anything else, good care does it."

All of the 47's going out of the ZI were being fitted with long range fuel tanks. Special equipment was being installed in those which would see Arctic duty and go to Air Rescue Service. Regardless of future functions, all of the aircraft went through the same thorough tear-down, build-up, check, check, check, from which no small malfunction could be overlooked.

In the words of the Director of Maintenance: "We make every effort to give the using organization an aircraft as good as when it came from the factory. We can turn out a safer operational airplane by complying with T. O.'s and by installing safety items that have been found since the aircraft left the factory. Besides the necessary maintenance, we can bring it up to date by the use of improvements learned from operating and maintaining these aircraft over a period of time."

Following an F-51 through the line was a lesson in safe, thorough, fast maintenance. First, the aircraft was brought in from the storage area and the aircraft checkers removed and labeled all loose equipment.

Disassembly was the first big step on the way. All major external components, including the propeller, were removed and sent through the "feeder" shops for cleaning, corrosion treatment, repair or replacement. The instrument panel was removed at this time. Each instrument was checked and, if necessary, replaced.

The aircraft was then wheeled outdoors to be "de-painted" and cleaned. Any necessary corrosion treatment was done at the same time. Small parts were immersed in vats of cleaning fluid and washed in the outdoor "clean-up" station.

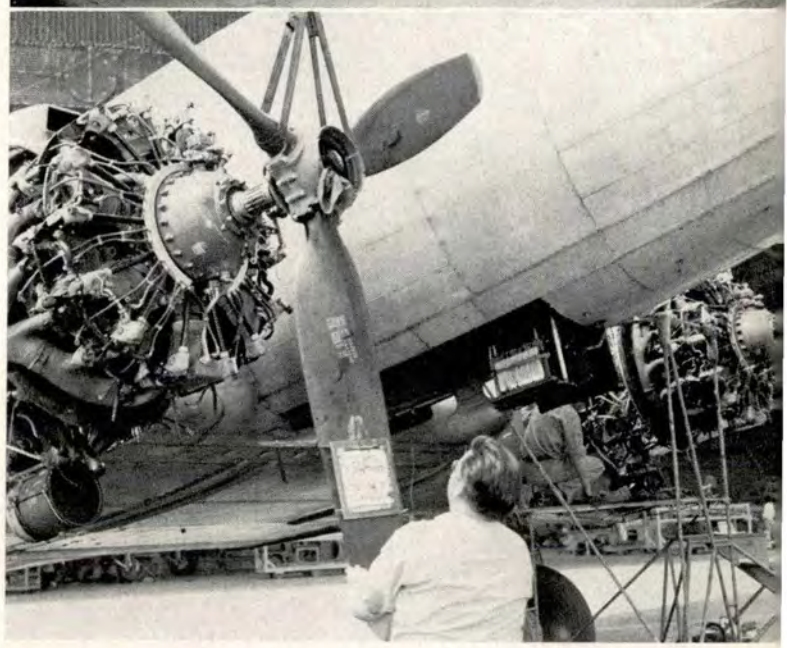
The plane then received a new coat of paint, with standard AF markings and was wheeled back into place in the assembly line. Here, before assembly, the first of many inspections took place. This inspection caught even small dents in the fuselage or accessories, which were repaired before the aircraft was permitted to enter the assembly stage.

The components were then replaced and all final aircraft installations and adjustments made. It was now the 51's turn for a "final" inspection which, when passed successfully, graduated it from the initial section of the line.

The engine was not touched here unless it was found that it was time for an overhaul. In this case, the engine was removed and replaced with another.

The 51 then went to the Flight Line Conditioning Unit, better known at Norton as the "Little Flight Line." Specialists were assigned to this unit and from here on in were responsible for both aircraft and engine to "further assure that Flight Test received a safe airplane."

OLD PLANES



An acceptance check was run on the entire aircraft by the Little Flight Line. Any discrepancies were taken care of by the unit personnel. Then, since the engine had been in storage status since its arrival at the Depot, it was brought back to life again. The engine was pre-oiled by running hot oil through under pressure. The battery was installed and spark plugs changed.

Ground runs and checks, taxiing and an entire aircraft and engine shakedown took place. A full power check was run with the tail securely anchored. All engine instruments were checked; mags checked and adjusted and the compass swung.

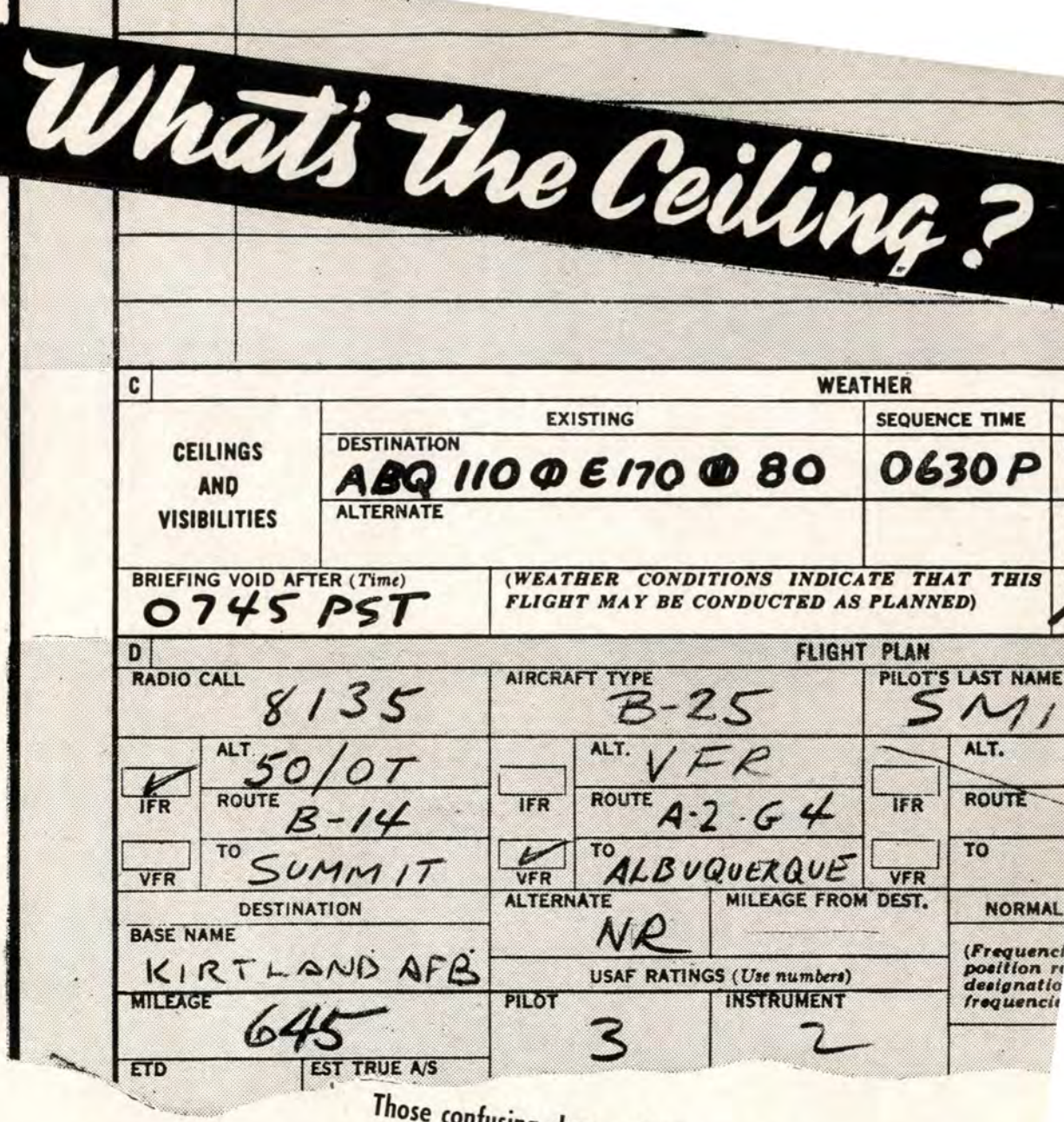
Prior to being turned over to Flight Test, the 51 underwent another "final" inspection. Then the Flight Test Maintenance Inspector ran a complete acceptance check for his section. If everything about the aircraft and engine was up to his rigid requirements, he turned a now new looking airplane over to the test pilots.

The "new" F-51 takes to the air for flight testing. Usually this consists of three separate flights. The test pilots have had no trouble of any kind. "These 51's are in wonderful shape and are the cleanest we have ever flown," said Captain H. W. Thompson, who has been flight testing for five years.

M/Sgt. Bill Gay, line chief for the Flight Test Section, says "When the ferry crews come in, we pull a pre-flight and daily inspection and then stand by for *their* acceptance check and test flight."

The F-51 is then finally through the procedure that consistently turns old airplanes into new, and puts them in the pilots' hands "ready for anything."

What's the Ceiling?



C	WEATHER		
CEILINGS AND VISIBILITIES	EXISTING		SEQUENCE TIME
	DESTINATION ABQ 110 Φ E170 Ⓜ 80		0630 P
	ALTERNATE		
BRIEFING VOID AFTER (Time) 0745 PST	(WEATHER CONDITIONS INDICATE THAT THIS FLIGHT MAY BE CONDUCTED AS PLANNED)		

D	FLIGHT PLAN		
RADIO CALL 8135	AIRCRAFT TYPE B-25		PILOT'S LAST NAME SMI
✓ IFR / VFR	ALT. 50/OT	ALT. VFR	ALT.
	ROUTE B-14	ROUTE A-2 · G 4	ROUTE
	TO SUMMIT	TO ALBUQUERQUE	TO
DESTINATION	ALTERNATE NR	MILEAGE FROM DEST.	NORMAL
BASE NAME KIRTLAND AFB	USAF RATINGS (Use numbers)		(Frequenci position r designatio frequencie
MILEAGE 645	PILOT 3	INSTRUMENT 2	
ETD / EST TRUE A/S			

Those confusing changes in the weather sequence are really very simple

June 1 was "confusion day" to a lot of pilots who attempted to decipher for themselves the teletype weather sequences found in any base weather station. On that date the familiar old sequence got its face lifted and thereby caused an opposite effect on the faces of pilots who did not prepare themselves for the change. Overhauling the sequence was not done purposely to confuse pilots, however. The changes resulted from a comprehensive survey to determine the information most needed in planning flights and the best way of presenting that information.

Incorrect interpretation of the new weather sequence reports can cause pilots and crews a lot of grief. The following explanation of the changes is presented in hopes that some of the grief may be avoided and also so that pilots can regain some of the prestige they lost during the past month when they had to ask the weather forecaster, capable man that he is, "What's the ceiling?"

Here are the changes.

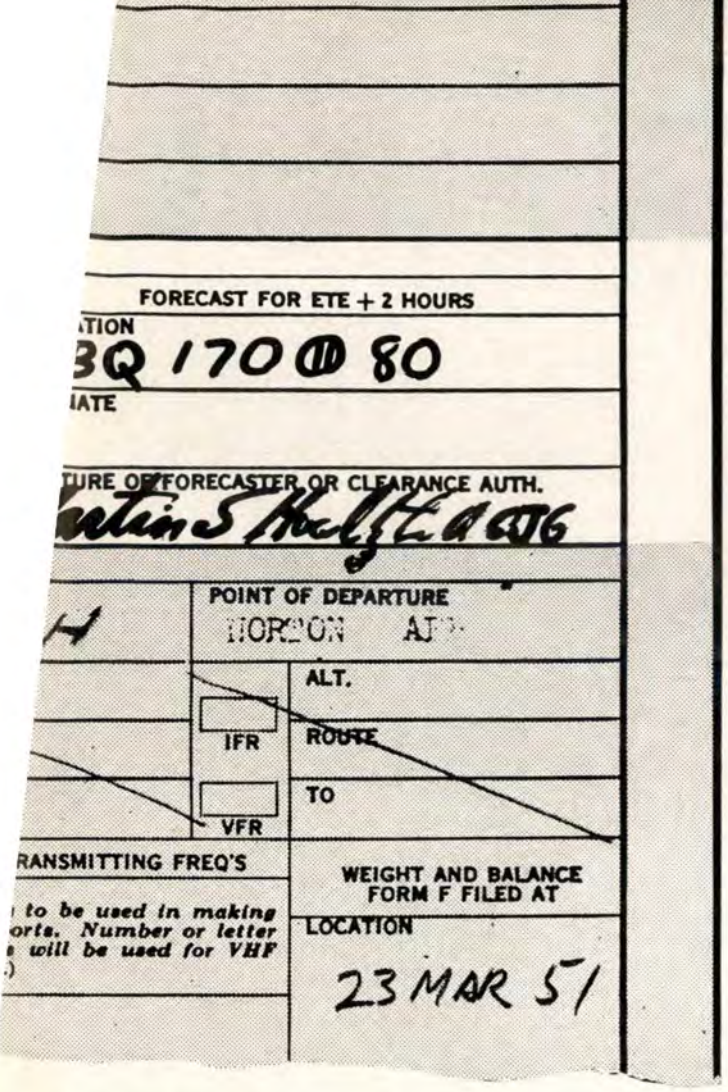
One major innovation is that the ceiling value will always be identified by a letter prefixed to it. These letters ("M," "A," "B," "W," "P," and "E") are old stuff but their use has not previously been restricted to the ceiling layer. If one of these letters is not used, the ceiling is unlimited.

Examples:

"15 scattered clouds, 25 thin broken clouds,"—the ceiling is unlimited, but there are scattered clouds at 1,500 feet and thin broken ones at 2,500 feet.

"15 scattered clouds, M25 broken clouds"—the ceiling is measured 2,500 feet (broken clouds) and there are scattered clouds at 1,500 feet.

There is also a new ceiling definition. What it means is that the reported ceiling is the lowest height at which more than half the sky is hidden. The important part of this new definition is that a broken or overcast layer will



NOTE—In the examples on the preceding page and in those below, the symbols for cloud coverage are not used. In the weather sequence report you will see in the weather station, the appropriate symbols for overcast, broken clouds and scattered clouds will appear.

no longer be reported as a ceiling if the layer is predominantly transparent.

A third change in the sequence is that cloud layers are now reported in ascending order of height, and in the same relative position in the report. That all-important information concerning the lowest cloud layer will no longer be merely a part of some casual remark. Also, the height of each layer will always immediately precede the pertinent sky symbol for scattered clouds, broken clouds or overcast.

Example: The old system report of "M10 overcast, thin broken clouds" and, in remarks, "M20 overcast, 5 scattered clouds" become simply "5 scattered clouds 10 thin broken M20 overcast," under the new system. This is much simpler. You don't have to reason it out that the "M10" of the old sequence referred to the broken layer and not the overcast which was somewhere up higher. Don't have to check the remarks section, either.

Probably no items in the aviation weather report have been more controversial than the symbols "X" and "—X," nor have any been more widely misunderstood. At one point in recent planning, these symbols were almost thrown out. However, it was decided they could still be useful, so they have been retained, although in a restricted capacity.

Obscuring phenomena aloft, such as smoke and haze layers, are now reported in the same manner as clouds. For example, scattered clouds, broken clouds, and overcast will be used to report such things instead of "X" and "—X." This means that the use of "X" and "—X" will be less frequent.

Whenever "X" (complete obscuration) is reported under the new system, it means only one thing: that the sky is entirely hidden by precipitation or obstructions to vision (such as fog), whose bases rest on the ground. Ceiling values, which represent the estimated distance that the observer can see upward into the obscuring medium, are prefixed to "X."

Whenever "—X" (partial obscuration) is reported, it also means only one thing—that the sky is partially hidden by precipitation or obstructions to vision, whose bases are on the ground. Ceiling values are never prefixed to "—X." The ceiling is unlimited (unless, of course, there are additional layers aloft that constitute a ceiling).

In the miscellaneous category, but nonetheless important, are two additional improvements in the sequence report. One is the new procedure for reporting gusts and squalls. Peak speed of gusts will be reported following the average wind speed (which will be retained in its usual position), and separated from it by a plus sign, "+." If squalls are occurring, the letter "Q" will be used instead of "+."

Examples:

"↑25+40"—south wind, 25 knots; peak gusts to 40 knots.

"→20Q55"—west wind 20 knots; peak gusts in squalls to 55 knots.

The other is the addition of the new precipitation intensity, "very light" (teletype symbol "--"). This new intensity will be most significant during reports of freezing precipitation, when the distinction between a few scattered drops and steady, continuous precipitation may be operationally significant.

A few months ago, extensive modifications were made in the requirements for "special observations," i.e., those observations not taken at scheduled times—but only when weather conditions occur that are of immediate importance to the safety and efficiency of aircraft operations. These previous changes, as well as those explained here, are all part of a continuing program to provide the essential weather information in a form best suited to the needs of the pilot.

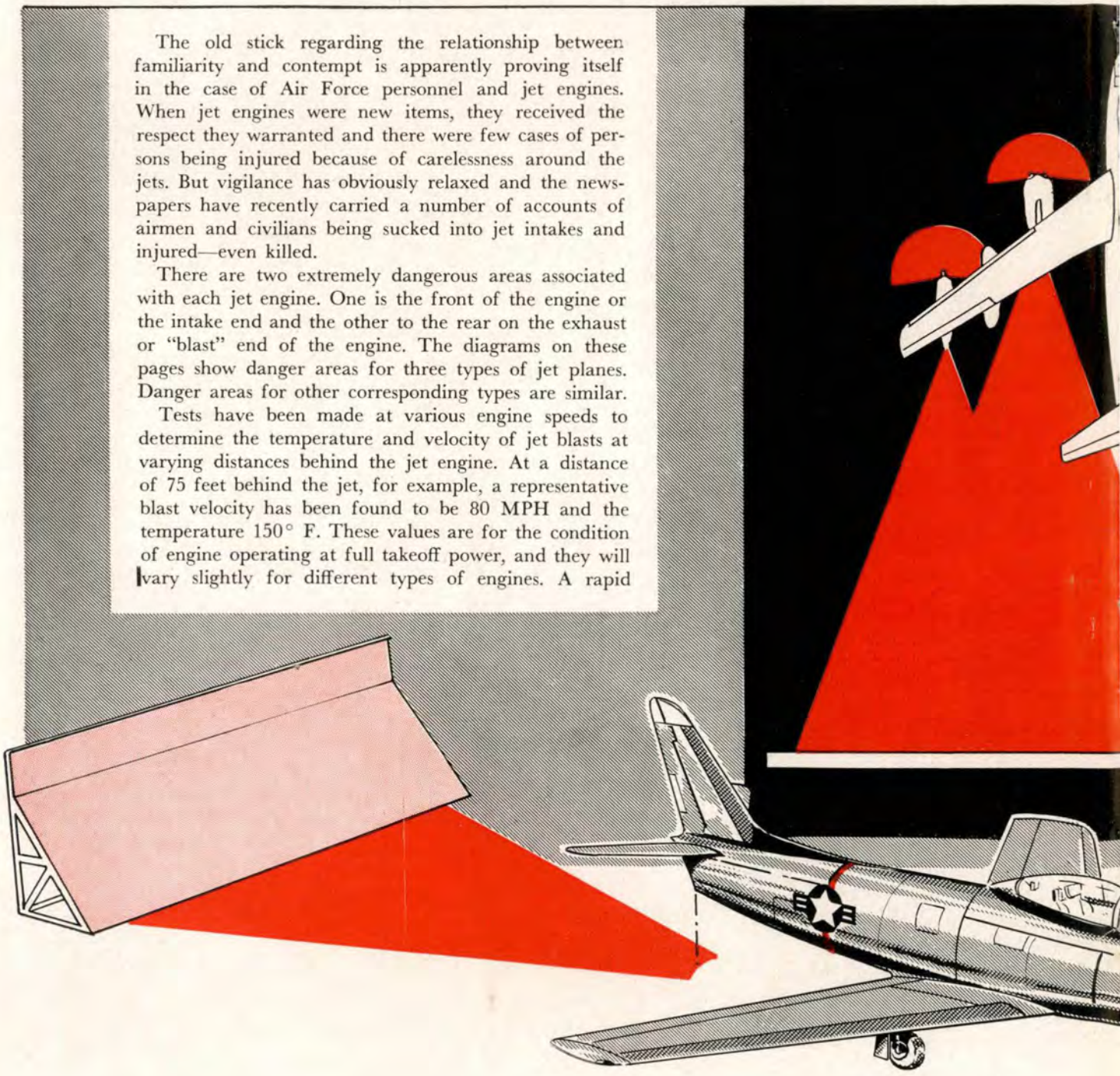
Comments are always welcome on how this program of improvement in the practical usefulness of sequence weather reports can be further developed. Suggestions and comments should be given to your Base Weather Station.

JET HAZARDS

The old stick regarding the relationship between familiarity and contempt is apparently proving itself in the case of Air Force personnel and jet engines. When jet engines were new items, they received the respect they warranted and there were few cases of persons being injured because of carelessness around the jets. But vigilance has obviously relaxed and the newspapers have recently carried a number of accounts of airmen and civilians being sucked into jet intakes and injured—even killed.

There are two extremely dangerous areas associated with each jet engine. One is the front of the engine or the intake end and the other to the rear on the exhaust or "blast" end of the engine. The diagrams on these pages show danger areas for three types of jet planes. Danger areas for other corresponding types are similar.

Tests have been made at various engine speeds to determine the temperature and velocity of jet blasts at varying distances behind the jet engine. At a distance of 75 feet behind the jet, for example, a representative blast velocity has been found to be 80 MPH and the temperature 150° F. These values are for the condition of engine operating at full takeoff power, and they will vary slightly for different types of engines. A rapid



increase in both temperature and air velocity accompanies decreasing the distance from the tailpipe outlet. For example, at 30 feet, the temperature is approximately 300° and air velocity about 180 MPH.

A general rule for jet intake clearance is to keep a minimum of 25 feet in all directions from the intake duct. The "suction" effect is not really powerful enough to be dangerous to personnel at distances slightly closer, but the possibility of losing balance and unintentionally getting within the danger area should be considered. Also, the suction may be sufficiently strong to snatch hats, eye glasses, loose clothing, paper, etc. Damage to the engine itself as well as loss of the articles will result.

THE PAYOFF

It's a Good Idea To Profit By The Mistakes of Others; You May Not Live Long Enough To Make All of Them Yourself

"My introduction to the briny deep came about during an overwater flight in an F-84. About 20 minutes after takeoff I noticed a loud whining noise which I knew I shouldn't be hearing. A check of the instruments revealed a drop from 95 to 85 per cent power and the drop was immediately followed by a terrific explosion which seemed to come from below and behind me. The engine quit, and when I tried to restart it, nothing happened. I started wondering if it was true what they say about salt water toughening the skin, then decided that was the wrong thing to worry about.

"I slowed the plane down to 260 miles per hour and tried to jettison my tiptanks. The right tank came off, but no matter what I tried or how hard I tried it, the left tiptank stayed with me. This did nothing to make things easier.

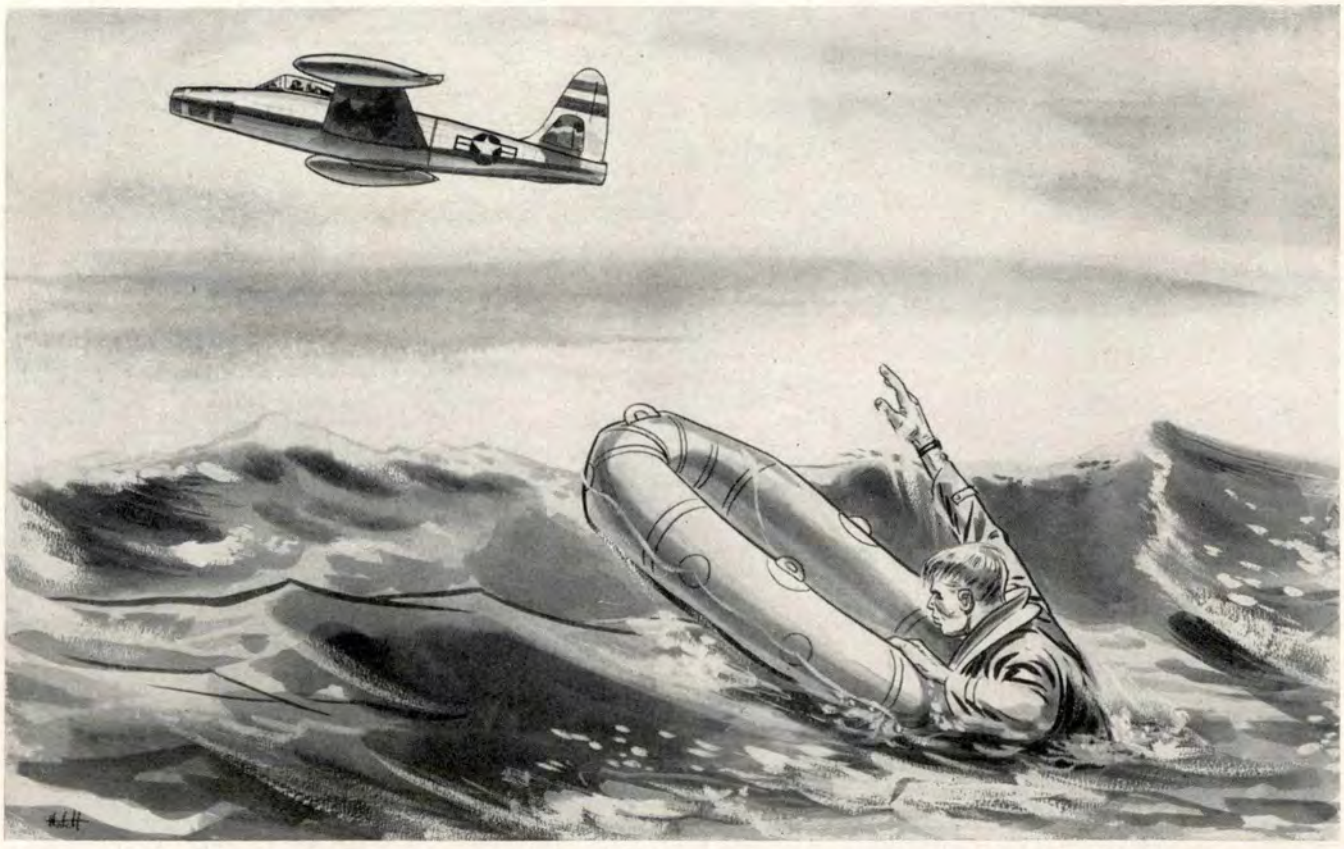
"The trouble first started at 15,000 feet and with plenty of airspeed. After I slowed to 260 MPH, I began a descent to maintain airspeed. It took only about 3,000 feet of this to make me decide there was no future in staying with that F-84 so at 12,000 feet altitude I called my wingman and told him I was going to check the work of the man who packed my parachute.

"I guess all that training on emergency procedures paid off here, because I remember very clearly doing all the things the book says to do before I pulled the seat ejection handle. I must have blacked out momentarily because the next thing I knew, I was tumbling through the air. I got out of the seat all right and found that I was freefalling head-first toward the sea. I went through every gyration imaginable trying to get my head up above my feet where it belongs, but couldn't change my position.

"Finally, rather than set a new high-diving record, I yanked the ripcord and hoped my head was screwed on tight. It was. In fact the jolt from the opening parachute wasn't bad at all. I settled back to enjoy the ride down.

"As I neared the water, I unsnapped my chute and sat back in the harness. I argued myself out of dropping free into the water when I felt that it looked close enough. I had a good argument, too, because I timed it and it took me another 66 seconds before my feet touched the sea. Which just goes to prove something or other about judging distance above water.

"As my feet touched, I straightened out my arms and legs and fell free of the parachute. The dinghy strap, which was secured to my Mae West (incidentally I



inflated the Mae West before I touched the water) opened the dinghy case. I had a little difficulty finding the cord which operates the dinghy inflation mechanism but finally managed to 'make a boat.' It took four tries to get in the dinghy and by then I was completely exhausted.

"At this point, I didn't care much whether school kept or not. It seemed I had swallowed half the ocean, but I began to take interest again after I tossed my cookies.

"All during my bailout and for as long as he could after I climbed into my rubber boat, my wingman was circling me. I knew he'd be screaming over the radio for help and it gave me more confidence and assurance than you can imagine. Finally, he had to leave because of a low fuel supply. During the next hour at least 12 planes passed directly over or within a mile of me. The waves were high, however, and it wasn't till some time later, I don't know just how long, that a flight of four Marine planes flew over and one spotted me. Good old Marines.

"Soon a seagoing airplane, an SA-16, arrived and braved the waves to pick me up. He had a lot of trouble, both in landing and in getting a line to me so that I could board the plane. Those waves looked at least 15 feet high to me.

"I was given warm, dry clothing and hot soup in the plane. When we were airborne, I radioed the Marine pilot who had first spotted me and got his name and address. I want to get in touch with that boy some day. He's my friend.

"The SA-16 picked me up about three hours and 15 minutes after I bailed out of the F-84. It seemed much longer of course. I was in good shape though—no bruises or sore muscles and not a scratch on me.

"I learned from this experience that knowing emergency procedures is most important to a pilot. But there's even more to it. He should also be familiar with his emergency equipment such as survival kits—know what's in the kit and just how it's meant to be used. Another thing I learned is the feeling of assurance that comes to a downed pilot when he has a buddy circling above him and knows that that buddy is doing all possible to get help on the way. Without wishing anyone bad luck, I hope I'm able someday to give someone else that feeling.

"I had a lot of difficulties which I won't go into now. Some of them were because I wasn't familiar with the use of the emergency equipment Uncle Sam furnishes. Others I think were caused by inadequate equipment. I made some recommendations about improving the emergency kit and I know they're getting a lot of attention.

"I don't want to go through this sort of thing again. But I know that if I have to, the experience I got on this 'boat trip' plus the intensive training course *I'm going to give myself* will make me much better able to cope with the situation."

KNOW YOUR EMERGENCY PROCEDURE

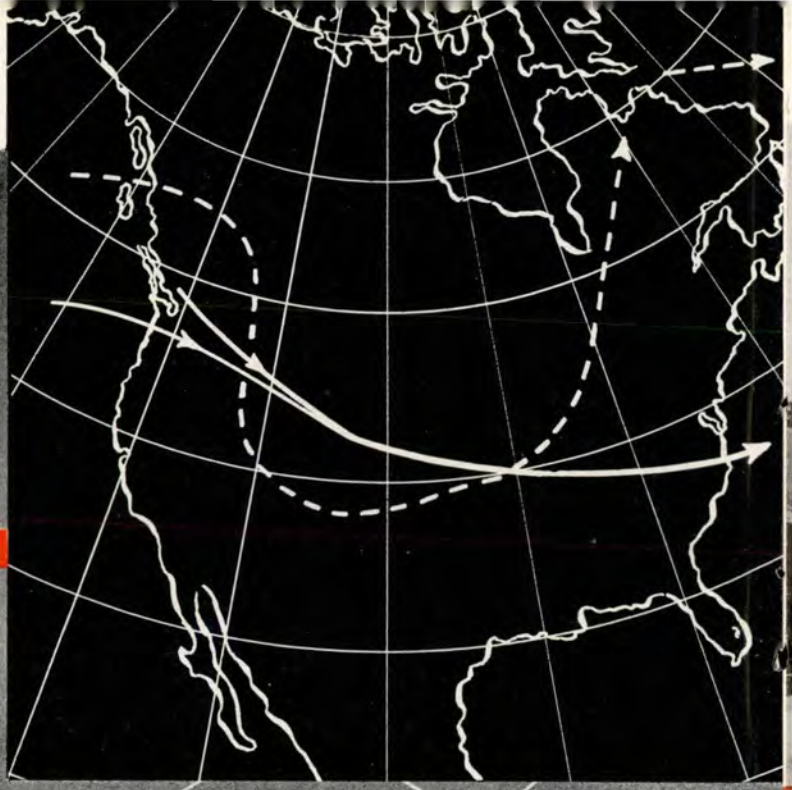
When no bail-out is made and the pilot prepares to ditch the F-84E, the following ditching technique should be followed:

- Engine off and landing gear up. The flaps should be in the one-half to three-quarters down position.
- Dive brakes should be full up. Release tiptanks unless they are empty and the sea is nearly calm. Jettison the canopy.
- If a regular wave or swell pattern exists, make the approach to touchdown parallel to the waves and attempt to land on the crest or on the falling side of a wave. If the water surface is irregular with two or more wave patterns, it is best to land into the wind and disregard the waves.
- The touchdown should be made in the same attitude as a normal landing and the airplane should not be stalled at time of contact.

WATER SURVIVAL

- After a bailout, don't inflate the Mae West until you unfasten the chest strap of the parachute. After you are in the water try to save your parachute; it will be helpful later.
- After working free from your parachute and inflating your raft, get out of the water at once. Board a one-man raft from the narrow end. Pull yourself partly onto the raft, face down, kick your feet as in swimming, and then with an upward and forward lunge pull the raft under you before it is fully inflated. It then rises as inflation is completed.
- To right a capsized raft, crawl up one side, grab the righting rope, life line and fall backwards into the water pulling the raft on top of you.
- If you have no anti-exposure suit, wring out your clothes and get as dry as possible. Keep the floor of the raft dry. Insulate the bottom of the raft where you sit with any available material. Wrap up in a parachute. Flex your muscles.
- Your big problem on a raft is protection from exposure. If the raft is not provided with a canopy, improvise one from a paulin, yellow side up. For poles, use oars with one section of the handle removed. To prevent ripping of the paulin, use elastic cord from the parachute pack for ties at points of greatest stress.
- In rough weather, put out a sea anchor on a line long enough to permit the anchor to be in the trough of a wave when the raft is on the crest. Improvise a shock absorber on the sea anchor line to keep it from tearing off the raft.
- Tie yourself to the raft with at least a 10-foot line so that the raft won't drift away if it capsizes.
- If rescue by an amphibious plane is in prospect, maneuver into the calmest water available, and drift down to plane or boat from the windward side unless directed otherwise.
- Some relief from sea sickness may be obtained by lying down. Do not eat or drink while sick. To prevent immersion foot, keep your feet as dry and warm as possible. Massage and exercise.

THE JET *Stream*



THIS PHENOMENON OF THE ATMOSPHERE CAN SPEED YOU ON YOUR WAY—OR KEEP YOU FROM COMPLETING YOUR JOURNEY

By Lt. Colonel Don Williams
Air Weather Service

The Jet Stream began to challenge meteorologists during the latter stages of World War II. Pilots had reported at various times encountering narrow bands of extremely strong winds. These reports were climaxed by an experience over the Asiatic mainland late in the war. On this occasion, a pilot found himself in a sudden and entirely unexpected headwind—so strong that the aircraft practically stood still with full throttle. The severity and turbulence experienced, so closely paralleling earlier reports, gave credence to

the theory that there existed an important and recurring atmospheric condition to be reckoned with in military aircraft operations. Interested civil and military agencies began a series of studies to pin down the phenomenon.

Today, the Jet Stream and its behavior are fairly well defined. It has been described as a meandering ribbon of extremely strong winds. It varies in altitude between 15,000 and 50,000 feet with maximum intensity between 30,000 and 40,000 feet. The Jet Stream flows in a wandering course between 30 and 65 degrees north latitude, and up and down vertically through several thousand feet. From day to day, the Jet Stream can move in a direction at right angles to its axis with a speed of about 10 knots. The Jet may completely encircle the earth, but is normally broken into segments. The wave length of the Jet Stream is generally 50 to 120 degrees of longitude in length. It normally comes from a westerly direction, but may in unusual situations appear locally from an easterly direction.

The Jet Stream is associated with the tropopause, a level of the upper atmosphere between the troposphere and the stratosphere. The height of the tropopause varies according to latitude, season and daily weather patterns, and ranges from 25,000 to 50,000 feet. At the Jet location there is usually a broken tropopause with the tropopause in the polar air being substantially lower than that on the warm side.

Most graphical representations of the Jet Stream show the structure as a circular current. In such cases the vertical scale has been stretched out of proportion since the Jet is actually a flat ribbon about 100 times as wide as it is thick.

The Jet Stream in most cases is associated with a Polar Front, with the Jet in the warm air. In this case the axis of the Jet is often over the intersection of the Polar Front and the 500 mb (approximately 18,000 feet) level.

As a rule, the Jet Stream is composed of winds between 100 and 150 knots. In extreme cases the wind speed may exceed 200 knots. There is an intense horizontal and vertical wind shear away from the center of the Jet. The extreme horizontal shear may be on the order of 5-10 knots decrease in 10 miles, to the left of the Jet axis, and about half this shear to the right of the Jet axis. The vertical shear may reach 10 knots decrease per thousand feet in extreme cases. In other words, the vertical shear is about 50 to 100 times the horizontal shear.

Light to moderate high level turbulence may be expected along the boundaries of the Jet Stream. Severe turbulence has been encountered upon occasion. However the turbulence appears irregularly and may be temporary and local in nature.

As a forecasting aid, it appears that successive waves of the Jet Stream are linked dynamically. Intensification of one wave has a downstream effect on the next wave. Therefore analytical charts must show several long waves in the upper Westerlies for forecasting future locations and intensities of the Jet Stream.

The forecaster can, by various methods, help the pilot locate and utilize (or avoid) the Jet Stream. Of course, the greatest aid would be a forecast of the exact location of the Jet Stream for the time and altitude of the flight. However, this is not always possible, so a method has been developed for using the D-value which is the "difference" between the absolute altitude as measured by radar and the pressure altitude as measured by a pressure altimeter set at 29.92. The D-value at the center of the Jet Stream on a particular day stays within relatively narrow limits. Forecasting these limits for a particular flight altitude would be of definite assistance to the pilot in finding or avoiding the Jet. In flight, determination of the D-value of course depends upon equipment which is not installed in all airplanes.

Another method for determining the center of the Jet Stream which could be more universally used depends upon forecasting the free-air temperature at the center, which appears to remain fairly constant.

As an additional aid, the pilot can, by watching for the sharpest change of D-values perpendicular to the desired flight course, determine the location of the greatest wind speed. The strongest winds in the Jet Stream occur in the strongest D-value gradient perpendicular to the Jet axis. In the above cases the pilot would be instructed to deviate to one side of the course or the other to get within and stay within the forecast D-value or temperature limits,, as long as the Jet Stream is going his way.

Pilots planning flights in the vicinity of a Jet Stream would do well to consider the location and boundaries of the Stream. Large deviations in course may well save considerable time when the Jet Stream may be utilized as a tailwind or must be confronted as a headwind. The Jet Stream is no longer the fantasy of the research scientist. Its maximum utilization in aerial flights demands at least a working knowledge of its basic characteristics.

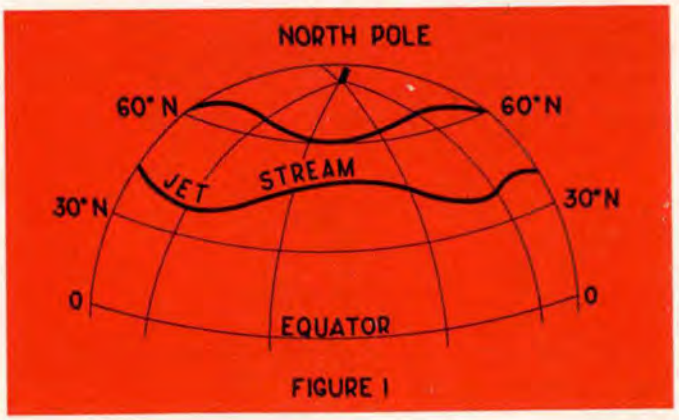


FIGURE 1

REESE REMOVES THE RUST

POLISHING UP RUSTY PILOTS IS A TASK REQUIRING HARD WORK, INITIATIVE AND A LOT OF PLANNING

By Capt. Glen T. Noyes

Providing refresher flying training for a Reserve pilot who has been ordered back to active duty is something like trying to rehabilitate an airplane which has been in mothballs for several years. In the case of the airplane, however, the problem is one of accomplishing clearly defined mechanical tasks. The pilot who has been in "mothballs" for five years presents a more complex problem.

It was this problem which faced Reese Air Force Base during the early part of February this year. The following directive from Lieut. General Robert E. Harper, Air Training Command, was received by Reese's commanding officer, Col. Thomas J. Barrett:

SUBJECT: *Refresher Training* *25 January 1951*
TO: *Commanding Officer*
Reese Air Force Base, Texas

1. This is to advise your Headquarters that one hundred sixty (160) recalled reserve officers, a majority of which are former multi-engine pilots, will be assigned your station for the purpose of undergoing refresher training.
2. It is estimated that recalled personnel will report for training within 30 to 60 days.

Immediately, Colonel Barrett and his staff planned a course of action based on prior experience in training recalled pilots during the Fall of 1950 when approximately 40 reservists reported to Reese.

Four men were selected from the most experienced instructors in the 3501st Training Squadron to set up a flying program and a corresponding ground school course. These men included two flight commanders: Maj. Ralph Bradley, with eight years active duty; Capt. Lowell G. Reed, a multi-engine instructor with a background of five years and 3,300 hours in the ATRC; and two assistants: Capt. Joseph B. Bennett, a pilot since 1929 with 4,500 hours in single-engine aircraft; and Capt. Charles C. Hodges, Jr., who has 4,000 hours, 2,300 of which were spent in the ATRC.

This nucleus of Refresher Section went to work in early February to shape up a program which would bring the rusty pilot's flying proficiency up to date, introduce him to the new Air Force and orient him in new procedures, regulations and practices. With these objectives accomplished, the refreshed pilot would be ready to take his place as a useful cog in the national defense machine.

From their jobs in factories, offices and on farms, from homes over the nation, recallees started arriving in Lubbock, Texas, in early March. Included in the line-up were ranks from Second Lieutenant to Lieutenant Colonel; some who wanted to come back, some who didn't; airmen reinstated in their commissioned reserve ranks; pilots with B-17 time, pilots with BT-13 time; some eager to fly, some reluctant. Each, with his own urgent problems and desires, arrived in Refresher Section. There was a well planned program awaiting them.

Flying training, set at 40 hours by higher headquarters, was conducted in the old, but faithful, "Terrible Texan," the T-6, because of its availability and the theory, "If he can fly a 'Six' he can fly anything."

This time limit was broken down into 12 hours of transition, two hours formation and the balance, instruments. The student received more or less time than allotted, depending on his proficiency in each phase.

Transition included general familiarization with the T-6, takeoff and landing practice, spins and stalls and emergency procedures. After six hours of dual, the pilot was soloed. Captain Bennett, one of the original recallees last fall, said that in this phase many of the reservists can be soloed in much less than the six hours

allotted. When this was possible, the student received additional solo hours. Two hours dual and two hours solo night flying completed the transition phase.

Formation consisted of two hours in which the student reviewed all phases of basic two- and three-plane formation.

Instrument flying was the tough phase and the one of which nearly two-thirds of the refresher program consisted. Twenty hours of dual instruction and practice "team" rides made up the course. New procedures, attitude instrument flying, radio range work and use of the radio compass were stressed. Those students who had been away for any length of time found the course plenty "rough." At its conclusion, however, the average student was able to pass his 60-4 instrument check and renew his instrument card without difficulty.

The flying program was a full and busy one for the students but imagine the woes of the instructors. Take that of Lt. M. R. Salcido, another of the original Reese recallees. He had one student with only 350 hours and another with over 1,000 hours of B-17 time. Both had been out since 1945. Capt. A. R. Davis, still another recallee who was instructing at Reese, had two C-47 pilots, neither had been near an airplane for four years and neither had any single-engine time.

Aside from this variety of experience and lack of single-engine time, one of the instructor's biggest problems was restoring the pilot's faith in himself and in his airplane. This was especially true, Captain Reed said, in officers returned to active duty involuntarily. These individuals often exhibited a lack of confidence which slowed down the retention of new material and thereby increased the load on the instructor. Generally, however, the student grasped instruction rapidly and his self-confidence returned as his time in the air increased.

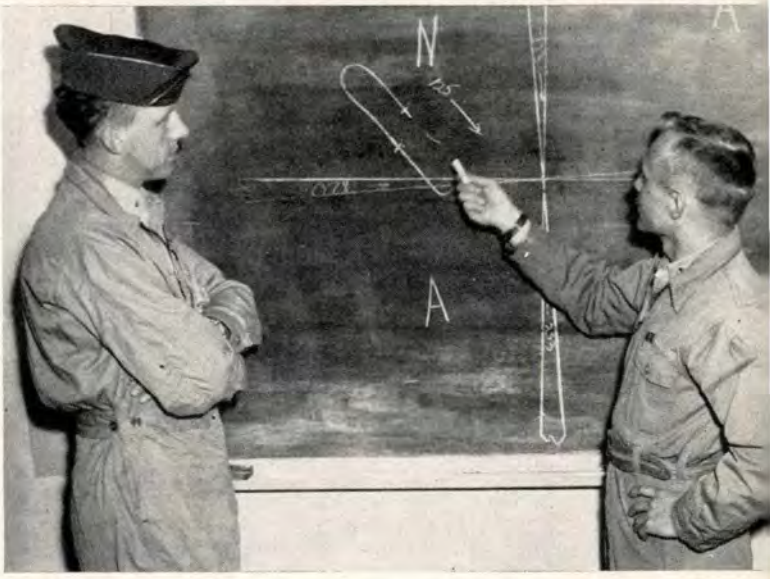
Conducted by the flight instructors and the 3500th Pilot Training Wing Instrument School, ground training included classes in Analysis of Maneuvers, Engineering, Navigation and Cruise Control and the regular instrument school subjects: weather, instrument construction and theory.

Analysis of Maneuvers included familiarization with the T-6, ground operation and standardization. Engineering concentrated on the T-6 engine, systems and construction. Reservists became intimately familiar with the E6B computer, cruise control procedures for the T-6 and B-26 and flight planning in the Navigation and Cruise Control course.

The Refresher Section program lasted 26 flying days. Two flights alternated by weeks on morning and afternoon flight schedules.

What assignment could the pilot look forward to after completing his refresher training at Reese? Flight Commanders Bradley and Reed evaluated each student on his attitude, ability in the air and ground school. When possible the officer's personal desires were honored. Three recommendations were possible: He could be retained in the Air Training Command as an instructor. If recommended as a potential instructor, he could go to Pilot Instructors School, Craig Air Force Base, Alabama, for further training before reporting to an ATRC flying school. He might be assigned as a mission pilot, flying transports or other aircraft on regular duty assignments. A third possibility was a behind-the-line job corresponding with the officer's civilian experience or previous service specialties.

Lt. W. G. Podoll, one of the refresher instructors, gives a cockpit check to Lt. Frankfield who recently came back to active duty.



Instrument procedures make up a major part of the refresher course.

The thoroughness and efficiency of the Reese Refresher Section program was complimented by the reserve officers themselves. In the last class to finish, two-thirds of the men chose the Air Training Command as their preference for further assignment.

Experiences of these reservists in B-17's over Berlin, B-24's in the South Pacific, transports from the Arctic Circle to the tropics, and in fighter planes around the world, will be put to work in training of Aviation Cadets and student officers who will fly B-36's, B-47's and the aircraft of wars to come.

Through theses veterans of WW II the great Air Force of 1941-45 is wedded with the Air Force of 1951 and the future.

HIGH FLYING TEACHERS

USAF Pilots Are Taught Their Own "Design Limits"

By

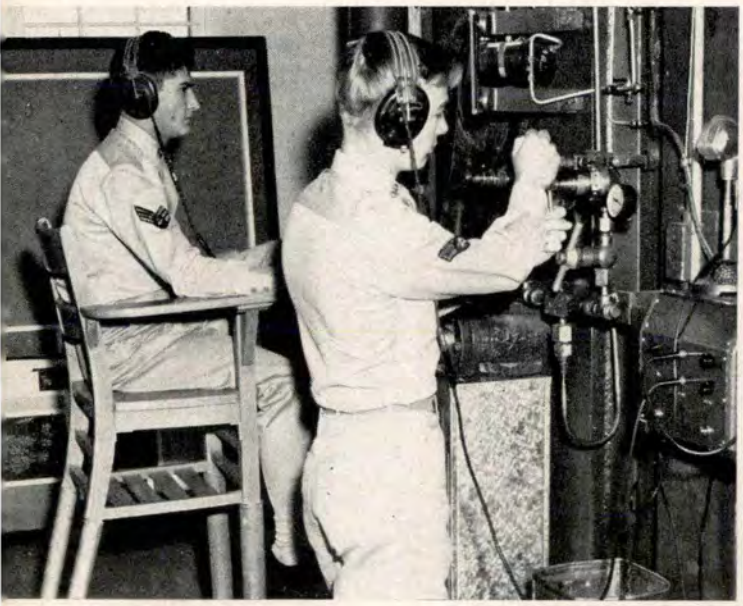
Capt. George E. Schafer, USAF (MC)
Headquarters, Air Training Command

Man was designed to be a land creature; consequently when he gets up into "the wild blue yonder," he is not adapted for some of the things that happen to him. Or, in the words of the Flight Surgeon: The human body, designed primarily for terrestrial life, encounters dangerous, untoward effects as it ascends above the earth's surface.

Most of these effects are a result of a strange environment in which the atmospheric pressure is reduced. Reduced barometric pressure has two effects. They are the lowering of oxygen pressure and lowering of total pressure on the body. When the oxygen pressure is reduced to such an extent that the oxygen supply to the body becomes inadequate, we experience a condition known as hypoxia.

As the total pressure on the body is reduced during ascent, the expansion of free gas in the body cavities may lead to abdominal pain, dysbarism (sinus pain and ear pain) or aerodontalgia (toothache). At altitudes above 30,000 feet gases dissolved in the body fluids may escape rapidly enough to cause the joint pain known as "bends" or the burning sensation in the lungs known as "chokes." This action can be compared to the reaction obtained by opening a bottle of soda. In the soda, gas bubbles do not form as long as pressure is high. When the bottle cap is removed, pressure decreases and gas bubbles escape.

Other effects are caused by the maneuverability of the machine in which man makes his ascent. Changes in the direction and the attitude of flight may bring great forces to bear upon the body of the flyer (G forces) or may impair his perception as to the position of the plane relative to the earth (sensory illusions). During the past few years with newer high-speed aircraft, jet and rocket propelled planes, flights are at higher altitudes and at greater speeds. These conditions have increased the number and severity of physiological stresses on the human body to the extent that it has become absolutely necessary for the flyer to understand these stresses, know his own "design limits" as well as those of the airplane and to know his tolerance to them and be able to use the proper protective devices. This knowledge is as important as knowing the existing fuel supply and the range of the aircraft, for the flyer's body is becoming



Trained operators at the controls of the Low Pressure Chamber which provides realistic sensations of flights at higher altitudes.

Lt. John W. Wray, Aviation Physiologist, gives instructions prior to a "flight" in the chamber at Williams Air Force Base, Arizona.

more and more an integral part of the equipment. The problem is trying to match the man with the machine.

The flyer is given training courses which demonstrate these effects and enable him to use the equipment necessary for his own protection. During World War II, trained personnel assigned to units provided with low-pressure chambers and allied equipment conducted this training. These units, then known as Altitude Training Units, have been re-established under the name of Aviation Physiological Training Units, which simply means that these units teach the effects of flying on the human body.

There are two important differences between the old Altitude Training program and the relatively new Aviation Physiological Training program. These differences are to be found in the scheduling of the course and the qualifications of instructor personnel.

During the last war, the course was divided so that portions were presented to the flyer in certain phases of training within the Air Training Command and other portions were given after the flyer had graduated from training. Now, the entire course is conducted within the Air Training Command. All cadets complete their training prior to graduation from Advanced Flying Training courses, and all other aircrew trainees complete it in advanced phases of training. Other commands conduct refresher and specialized training as the need requires.

Formerly, most of the instructors were officers with Doctor of Philosophy degrees in physiology, but following the last war, a shortage existed of men with these specialized qualifications and there was no foreseeable means of obtaining enough instructors. Consequently, in 1949, it was decided to utilize pilots for this job—pilots capable of conducting aviation physiological training under the technical supervision and guidance of a Flight Surgeon. True, the idea was born out of necessity, but consideration was given to the possible advantages these pilots would have over non-rated instructors. They could talk the same language as the men they taught and could also continue to fly the aircraft used for training or tactical aircraft, whichever was used locally, and thus could adapt their flight experience to their teaching.

In the summer of 1949, selected volunteer pilots were sent to the School of Aviation Medicine at Randolph Air Force Base. Here they learned about the basic sciences which underlie an intelligent understanding of Aviation Physiology; also, they learned detailed and applied principles of the subject they would teach. Following this course, the successful graduates were sent to various bases where they set up courses of instruction. After establishing the units and assembling the necessary equipment used in conjunction with training, the pilots instructed students in the problems encountered by the body during flight.

The objectives of the course are to give the student a basic understanding of the physiological stresses placed on the body during flight, an appreciation of the physiological limits of the human body and a clear understanding of the means for counteracting the various effects. To accomplish these objectives in 24 hours of instruction, some basic physics and physiology must be presented. Following instruction in the fundamentals, the effects of hypoxia (or oxygen lack) are presented in detail. It is intended that the students thoroughly understand the dangers of hypoxia, know its signs and symptoms, know the times of useful consciousness at various altitudes without oxygen and appreciate fully the proper use of oxygen.

The instruction on decompression sickness is intended to teach the student the causes and dangers due to the expansion of gases trapped within the body's cavities, which produce gas pains in the stomach and intestines and sinus pains, and also those dangers resulting from evolved gases within the body which bring on the bends

Students receive instruction on the human physiological makeup as well as on problems encountered by the body during flight.

Lieutenant Wray lectures to Altitude Training Unit Technicians at Williams AFB. Technicians must answer many student questions.

Capt. G. M. Brockway, Aviation Physiologist at Nellis AFB, Nevada, with training aids used for classroom instruction of students.

or chokes. It must also enable the student to be familiar with the methods of preventing or minimizing these conditions. Emphasis is also placed on the understanding of acceleration (G forces), the objective being to teach the student his physiological limits, how to attain maximum tolerance and how to use protective devices properly. The above are only a few of the subjects that must be taught. Others include night vision, sensory illusions, effects of speed and oxygen equipment.

In addition, an opportunity is given for actual practical application of the knowledge gained by means of a low-pressure chamber where reductions in pressure simulating high altitudes are accomplished. During such "flights," the flyer-to-be actually sees and experiences hypoxia and decompression sickness and gains practical knowledge of the equipment he must use.

The pilot-instructors have attacked their problem with intense interest and vigor. Cadets receiving this course are enthusiastic and their many favorable comments are a tribute to the manner of presentation and the course material itself.

The real proof of the value of any physiological training is safely accomplished flights at the higher altitudes and faster speeds.

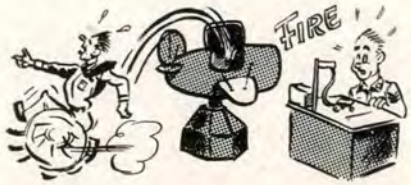
KEEPING CURRENT

ALTIMETER MAGNIFIER—A lighted magnifying device to be installed on the Kollsman window of altimeters will aid in reading altimeter settings, especially when landing at night or under adverse weather conditions. The inventor of this important safety device, S/Sgt. William E. Groom, Jr., of March AFB, was awarded the 12th Air Division Monthly Flying Safety Award, for May, 1951.

GUST ALLEVIATOR—A gust-alleviator developed by AMC and Douglas Aircraft engineers is designed to give planes higher speed, more comfortable flying, and may increase range or payload of bombers and cargo planes. The device, a simple mechanical linkage hooked up to the planes' ailerons, has been satisfactorily tested on a C-47. It is completely automatic in operation and in no way affects the pilots' control of the ailerons. It is estimated that gust-alleviators will permit lighter plane structure and will increase level flight speed as much as 75 MPH.

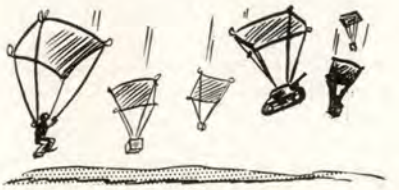
• • •

RESCUE RECORD—As of May 31, 1951, a special helicopter detachment of the 3rd Air Rescue Squadron, operating at or near front lines in Korea, was credited with the rescue or evacuation of more than 1,609 UN military personnel, 450 of whom were picked up from behind enemy lines.



SIMULATORS — Flight simulators now being purchased by the Air Force will simulate in-flight training in many types of planes. Simulator models of the B-47, B-36 and B-50 bombers, C-124 and C-97 cargo planes and the F-86D interceptor will soon be available. Each will include a "hell box" with which instructors can plague crews with such troubles as icing, engine fires, loss of fuel pressure and instrument landings, but with the advantage of being able to switch back to neutral after the "crash". . . if one occurs . . . with no damage to either aircraft or crew.

ICAO RECOMMENDS — The International Civil Aviation Organization has come up with safety recommendations for airlines and other aircraft operators which will protect passengers in the event of a crash. Backward facing seats; spacing of forward-facing seats farther apart so passengers do not hit the seat in front; shoulder harness installation; "swing-seat" design, whereby on impact the seat tips back putting the passenger in a prone position so his head does not fly forward and his body does not tend to come out of the belt, and a strengthening of the seats to withstand a crash impact of at least 9G's, are some of the safety improvements which this group would like to see adopted.



SQUARE CHUTES — A square parachute, formed of cotton strips with air spaces between, will replace the present 24-foot cargo drop 'chute, and in clusters of three or four will probably replace the 64-foot heavy cargo 'chute. Space between the strips allows for a fast escape of uprushing air to reduce the opening shock and permits heavier loads to be delivered. This parachute will be far less expensive than the present type and will also permit the aerial delivery of 500 pounds of equipment from a plane traveling at 175 MPH as against the present 300 pounds dropped at 150 MPH.

• • •

RESPIRATOR STARTS — Starting jet engines by "artificial respiration" has been tested successfully in Korea. The method, in which exhaust blast from one jet is used to start another just behind it, is described as an "apparently practical means of starting jet aircraft at advance bases where external power units are unavailable, or in extremely cold weather where effectiveness of such starting sources is reduced."

• • •

GLIDER SUBSTITUTE — The C-123 assault transport, designed to operate from small, unprepared fields in forward combat areas will soon be used in substantial numbers to replace gliders formerly used to support airborne units. It is expected that many of the problems encountered when airborne units and their equipment are flown in gliders or when heavy equipment is delivered by air drop, will be eliminated by use of this aircraft.

"FLIGHT PLAN FOR FREEDOM"— Here is a general release movie which should go on every airman's personal "must see" list. A combination of technical accuracy, excellent camera work and imagination make it one of the best that March of Time has released. "Flight Plan" takes you along on a 9,000-mile, 39-hour "maximum effort" atomic bombing mission.

• • •

CIVIL AVIATION'S PROGRESS — Based on a 25-year period, civil aviation's progress in all fields has been greatest in the past five years. If the present rate of advance is maintained, in five more years our 1951 state of development will look as outmoded as 1926 conditions look today. Tremendous increases in volume have been accompanied by and, to a great extent, stimulated by equally remarkable advances in safety.

NIGHT VISION TRAINER — The School of Aviation Medicine has come up with a new device, still in the early development stages, to indoctrinate student flight surgeons in the science of night vision. Practically every gradation of illumination can be simulated and by use of a model which is magnetically controlled in its capers over the screen, a realistic night scene is presented.

Although the original design purpose of this night vision trainer was to aid the flying medicine men in their research, the trainer has another possibility as an operational aid to all-weather, or night flying specialists. The trainer could be set up and operated similarly to a link trainer and with the knowledge and technique gained in this darkened room, nocturnal flights could be made much safer.

CROSS FEED ★

FLYING SAFETY IDEA EXCHANGE

JUMPIN' JENNY — Just about everyone in the Training Aids Shop of the Training Aids Wing at Chanute AFB, Illinois, was eager to see it, but oddly enough no one wanted to try it. Said one grease monkey to another, "Ya, sure, I know. Only 200 pounds of pressure . . . ," then looking up at the ceiling a few feet overhead, "and if the frame busted you'd go through that roof faster than an F-94!"

They were talking about the Pilot Ejection Seat which was recently modified into a training aid in the Training Aids Shops.

Under normal conditions, the kick of the chair pulls from 12 to 16 G's pressure on a pilot weighing 150 pounds, and accelerates him 60 feet per second. The pilot moves upwards through four of the fastest feet ever and is jerked to a stop by six strong cables.

While the ride is abrupt to simulate an actual ejection, no one after experiencing it would hesitate to trigger the real thing in a flight emergency.

Recently, the pilot ejection trainer was on display for pilots and maintenance crews at George AFB, California. In addition to teaching these personnel all the systems of the F-94 Interceptor, instructors of the F-94-1(A) Mobile Training Detachment demonstrated to them just how the "Jenny" works, the procedure for bailout, the kick to expect and the mechanism of the seat itself.

BAIL-OUT BOTTLE — The accompanying photograph shows a new method of attaching the bail-out bottle to seat-pack parachutes. It minimizes the possibility of rupturing the oxygen hose, and eliminates the possibility of bodily injury from the bail-out bottle during bail outs. The bottle is safely mounted and readily accessible for preflight check and service. This method was established by T/Sgt. Dean E. Ormsby of the 116th Fighter Interceptor Squadron.

—Lt. Col. Frank W. Frost
CO, 116th Fighter-Interceptor Squadron.

POLICE COOPERATION — Procedure in case of off-base airplane crashes was the subject of a recent Cape Cod Police School meeting which was held at Otis Air Force Base. One hundred and three police officers from the area surrounding the base accepted the invitation to visit Otis.

Capt. J. R. McMahon, Otis Provost Marshal, described the crash procedure and acquainted members of the school with the ways in which they could be of greatest assistance. He emphasized that primary consideration should be given to saving crew-members and secondary efforts should go to protecting surrounding property.

The visitors made a hangar inspection of a static F-86 display and were given a briefing on the plane by members of the F-86 Mobile Training Unit from Chanute Air Force Base.

The results of this cooperative attitude should pay off for pilots who are trapped in plane crashes in the Otis area.

DOWN AT SEA — What would you do if you were flying over the ocean and suddenly noticed an aircraft that had ditched or was preparing to ditch? With a ship in the near vicinity would you know how to direct that surface craft to the downed aircraft? You may save a life, or many lives, by knowing the proper procedure.

The latest instructions are contained in notice to Mariners No. 1, dated 6 January 1951, prepared jointly by the U. S. Coast Guard and the U. S. Navy Hydrographic Office. This emergency procedure has been reprinted in both official and unofficial publications reaching seafaring people. Briefly stated, this is what you should do:

- Circle the vessel at least once.
- Fly across the bow of the vessel at low altitude, opening and closing the throttle, or changing propeller pitch, when possible.
- Head in the direction of the distress scene. Repeat until the vessel acknowledges by following your aircraft.

Use the Aldis Lamp, radio, or message drop to explain the situation if possible. The surface craft will follow the aircraft or indicate

that it is unable to comply by hoisting the international flag "NEG-AT." This flag is a checkerboard pattern consisting of 16 blue and white squares.

All pilots flying over extensive areas of water should have this information. Pass it along to your fellow birdmen. You might be the fellow in the drink.

—Flight Safety Officer
MATS, PACD—

CRASH CREW PRACTICE — In crash-fire fighting as in everything else, practice makes perfect. To make certain that its crash crews keep alert, the 3rd Bomb Wing in southern Japan, pulls unscheduled practice crash alarms at times when they are least expected by the crews. Hulks of abandoned planes are actually set ablaze and the resulting fire is as realistic as could be asked.

Recently, for example, the alarm sounded while the crash crew was playing softball near their alert shack. Gloves, balls and bats were dropped in haste as the players rushed for the crash trucks and their gear. In a matter of seconds, the trucks, fully manned, were speeding down the runway in the direction of the burning aircraft.

Flames licked from the wings to the tail section of the wrecked C-46, and a thick, oily black smoke rose skyward. High octane fuel supposedly from the plane's gas tanks spread flames outward from 20 to 30 feet.

The crash crews were told that three persons, actually dummies, were trapped in the plane.

The crew members drove their trucks in from the upwind end of the plane and in less than 15 seconds after their arrival they were spraying a dense fog of compressed water on the flames. In 12 more seconds a footpath was cut through the fire area and two men started forward with axe and ladder to rescue the "crew" of the plane.

To shorten the story, the combined efforts of all the crash crewmen saved the three trapped "men" who were then given emergency first aid. The blaze was extinguished, and the fire was not allowed to spread or endanger other persons or equipment.

When the crash alarm first sounded, the crash crew did not know that it was merely a simulated emergency. They realized the fact, of course, when they arrived at the burning plane. That they waded into the flames just as though it was the real thing is a tribute to the seriousness with which these men take their jobs.

Actually, this crew has not had to show its stuff in a real emergency. It has been alerted numerous times and followed landing airplanes down the runway "just in case." They, as well as the flying crews, know that their practice has made them ready, and they draw strength from the fact.

The crash fire fighters' first concern is rescuing the plane's crew-members before an explosion occurs. A spray of water is played on the engines and fuel tanks to keep them cool until the rescue is completed. Then the fire is extinguished.

Flying Safety

RESTRICTED

DEPARTMENT OF THE AIR FORCE
THE INSPECTOR GENERAL, USAF

Major General Victor E. Bertrandias
Deputy Inspector General
For Technical Inspection and
Flight Safety Research

DIRECTORATE OF
FLIGHT SAFETY RESEARCH
Norton Air Force Base, California

Brigadier General Richard J. O'Keefe, Director

Vol. 7 No. 7 JULY 1951

COVER PHOTO:

Paul Mantz rips wings from a Stearman biplane trainer during filming of a movie. Note running Air Force advisers in the foreground.

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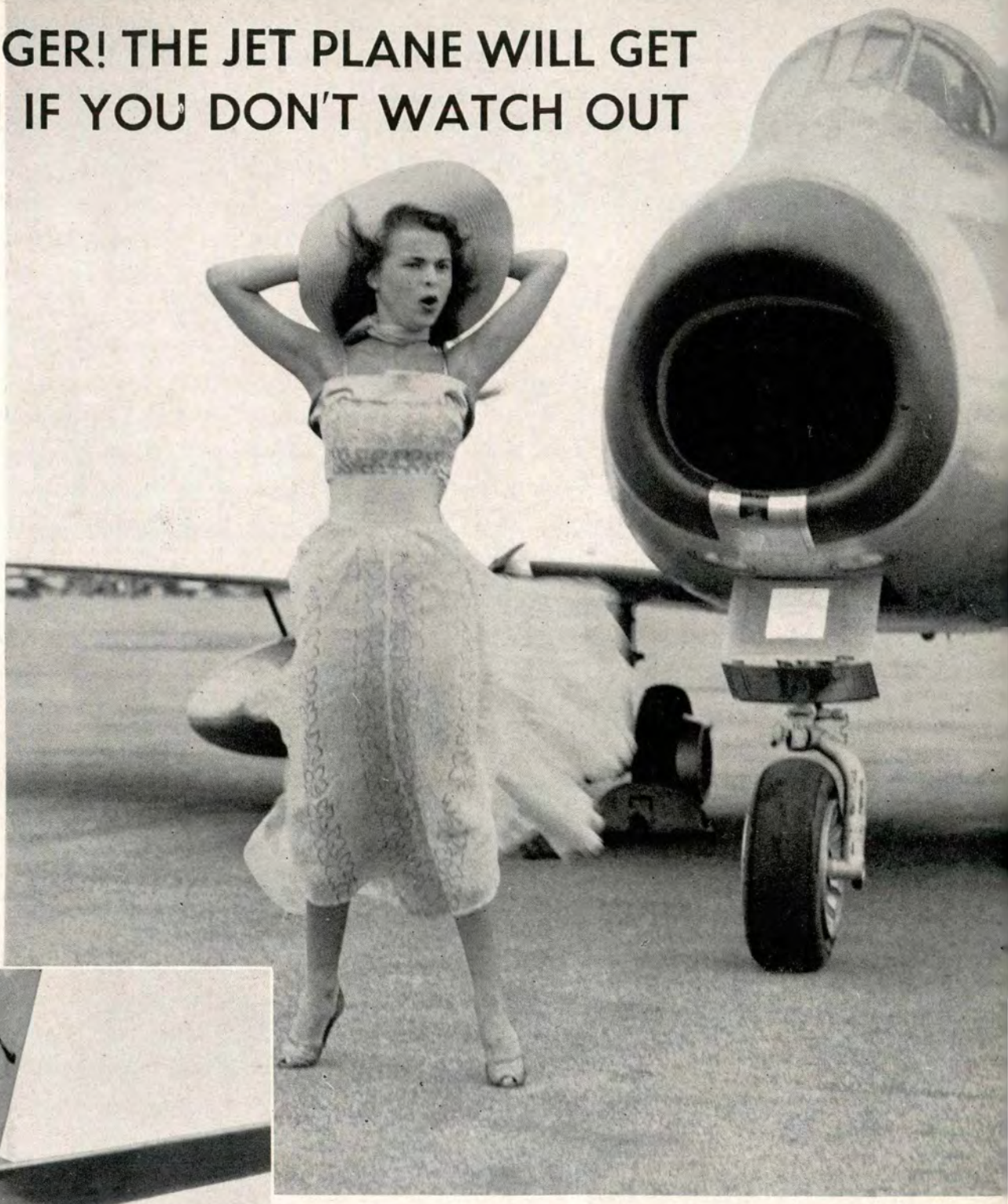
RESTRICTED

DANGER! THE JET PLANE WILL GET YOU IF YOU DON'T WATCH OUT



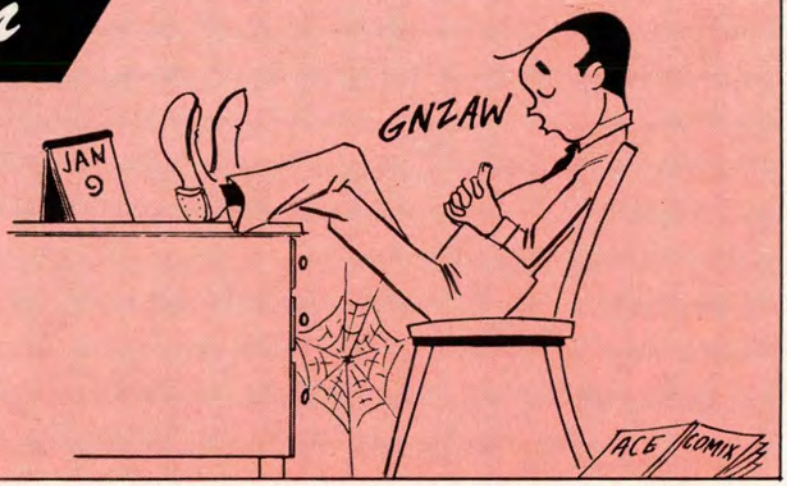
Janet Leigh, Starring in "Jet Pilot"

STAY ALERT

The Two Danger Areas Are Near the Air Intake and the Engine Exhaust Blast

WHEN working or walking in the vicinity of jet planes during ground operations remember that if you get too near the nose or tail of a jet you can be swallowed alive or toasted to a crisp. Carelessness causes casualties.

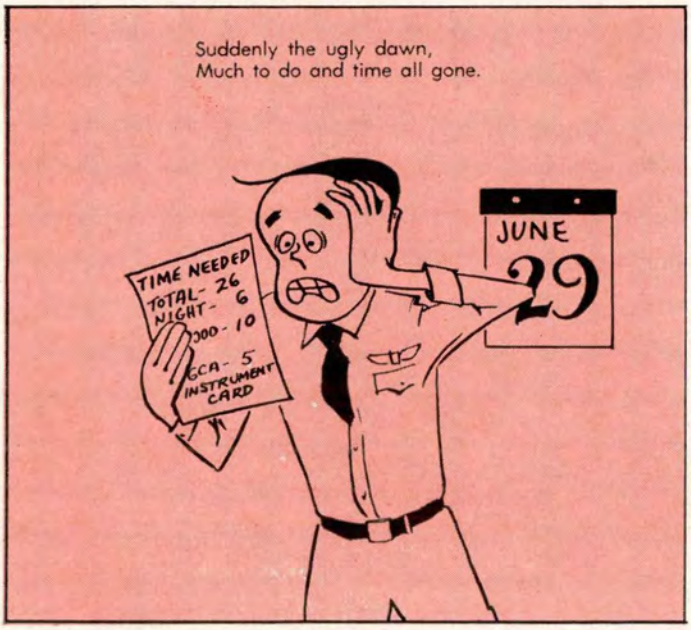
Mal Function



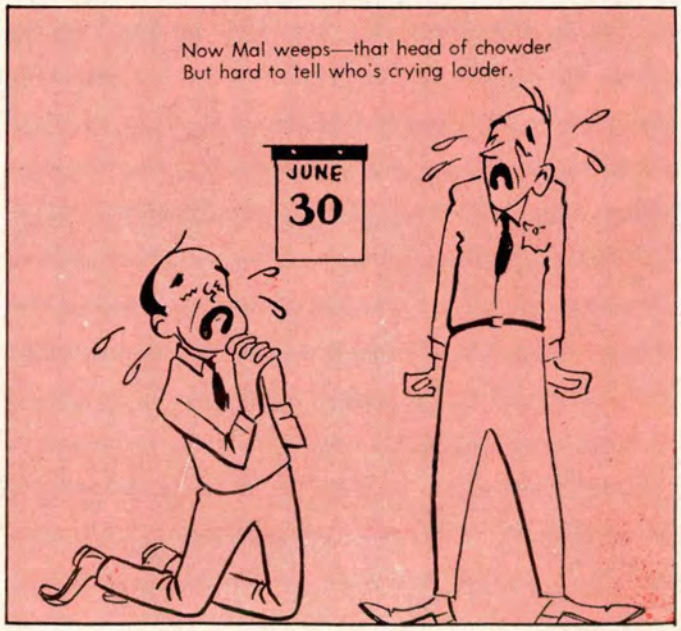
First of year Mal rests but good,
Burning time and sawing wood.

Two months later, Ops on horn:
60-2 stuff, they warn.

Later still they beg, they plead;
Mal too busy, will not heed.



Suddenly the ugly dawn,
Much to do and time all gone.



Now Mal weeps—that head of chowder
But hard to tell who's crying louder.

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