AUGUST 1953

FLYING SAFETY

UNITED STATES AIR FORCE

FOR SALE: *Air Rescue Service . . .* see page 23

FLYING SAFETY AWARDS

Headquarters USAF and the Directorate of Flight Safety Research announces the six Flight Safety Awards for the period June through December 1952.

The newly designed plaques are extremely impressive, as is the accident prevention program record behind each of the winners.

FLYING SAFETY proudly salutes the six winners with a "Well Done" for outstanding achievement.

Bergstrom Air Force Base (Jet)

Lowry Air Force Base (ATRC Units)

Otis Air Force Base (Jet)

Rhein-Main Air Force Base

Hickam Air Force Base (Pacific Division, MATS)

March Air Force Base (Strategic Air Command Units)

Department of the Air Force
The Inspector General USAF
Major General Victor E. Bertrandias,
Deputy Inspector General

★ ★ ★

Brigadier General Richard J. O'Keefe
Director
Directorate of Flight Safety Research
Norton Air Force Base, California

★ ★ ★

Colonel John R. Dahlstrom
Supervisor of Flight Safety
Publications

★ ★ ★

FLYING SAFETY STAFF

Editor
Maj. Richard A. Harding

Managing Editor
Maj. Ben H. Newby

Associate Editors
Capt. John H. Moore
1st Lt. Bill Johnston

Art Editor
T./Sgt. Steven Hotch

Circulation Manager
S./Sgt. G. J. Deen

★ ★ ★

SUBSCRIPTIONS

FLYING SAFETY magazine is available on subscription for $2.50 per year, or 25c per copy, through the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Changes of subscription mailings should be sent to the above address.

★ ★ ★

The printing of this publication has been approved by the Director of the Bureau of the Budget, June 4, 1951. Facts, testimony and conclusions of aircraft accidents printed herein have been extracted from USAF Form 14, and may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts submitted for publication in FLYING SAFETY magazine. Contributions are welcome as are comments and criticisms. Address all correspondence to the Editor, FLYING SAFETY magazine, Deputy Inspector General, USAF, Norton Air Force Base, San Bernardino, California. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from FLYING SAFETY without further authorization. Non-Air Force organizations must query the Editor before reprinting, indicating how the material will be used. The contents of this magazine are informational and should not be construed as regulations, Technical Orders or directives unless so stated.

VOLUME NINE

NUMBER EIGHT

FLYING SAFETY

CONTENTS

COVER: ARS in Action

Capt. Bill Moranville is surrounded by the equipment and personnel needed to put him through the test pilot school at Edwards AFB. The story is on page 14.

Sand IN YOUR SHOES

Fear . . . Ignorance . . . Stupidity . . .
These are the major obstacles to survival.

By Alonzo W. Pond, M.S., Chief, Desert Section
ADTIC, AU, Maxwell AFB, Ala.

The Arctic, Desert, Tropic Information Center of the Research Studies Institute is charged by the Air Force, "to accumulate, evaluate, and disseminate information about the non-temperate areas of the world." This sounds like an "ivory tower" kind of an organization . . . except for that little word, "evaluate." Many people dream up ideas on survival, some even write books about these dreams. The job of ADTIC is to make sure that information distributed to Air Force personnel comes from reliable sources, and that it fits field conditions.

The people who work in ADTIC are men who have left their "ivory towers" of learning, to spend considerable time in the field of their special areas of knowledge. Our tropic men have canoed and walked the jungles. They have flown over the green hills, and have hiked and camped within them. Men in the desert section have travelled by camel, motor car and airplane over the deserts of Asia, Africa, Arabia, and the Southwest United States. Each man has had from 12 to 28 years of field work plus academic training.

This article was prepared for FLYING SAFETY *because ADTIC believes that ignorance about the desert and ignorance of the body's need for water are the greatest hazards to airmen forced down in desert areas. In the desert, a little learning . . . or a little ignorance . . . is often fatal.*

PAUL H. NESBITT
Chief, Arctic, Desert, Tropic Information Center.

Even among sand dunes there are flat areas suitable for emergency landings. These basins often contain wells.

Department of the Air Force
The Inspector General USAF
Major General Victor E. Bertrandias,
Deputy Inspector General

★ ★ ★

Brigadier General Richard J. O'Keefe
Director
Directorate of Flight Safety Research
Norton Air Force Base, California

★ ★ ★

Colonel John R. Dahlstrom
Supervisor of Flight Safety
Publications

★ ★ ★

FLYING SAFETY STAFF

Editor
Maj. Richard A. Harding

Managing Editor
Maj. Ben H. Newby

Associate Editors
Capt. John H. Moore
1st Lt. Bill Johnston

Art Editor
T./Sgt. Steven Hotch

Circulation Manager
S./Sgt. G. J. Deen

★ ★ ★

SUBSCRIPTIONS

FLYING SAFETY magazine is available on subscription for $2.50 per year, or 25c per copy, through the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Changes of subscription mailings should be sent to the above address.

★ ★ ★

The printing of this publication has been approved by the Director of the Bureau of the Budget, June 4, 1951. Facts, testimony and conclusions of aircraft accidents printed herein have been extracted from USAF Form 14, and may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts submitted for publication in FLYING SAFETY magazine. Contributions are welcome as are comments and criticisms. Address all correspondence to the Editor, FLYING SAFETY magazine, Deputy Inspector General, USAF, Norton Air Force Base, San Bernardino, California. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from FLYING SAFETY without further authorization. Non-Air Force organizations must query the Editor before reprinting, indicating how the material will be used. The contents of this magazine are informational and should not be construed as regulations, Technical Orders or directives unless so stated.

VOLUME NINE

NUMBER EIGHT

FLYING SAFETY

CONTENTS

COVER: ARS in Action

Capt. Bill Moranville is surrounded by the equipment and personnel needed to put him through the test pilot school at Edwards AFB. The story is on page 14.

Sand IN YOUR SHOES

Fear . . . Ignorance . . . Stupidity . . .
These are the major obstacles to survival.

By Alonzo W. Pond, M.S., Chief, Desert Section
ADTIC, AU, Maxwell AFB, Ala.

The Arctic, Desert, Tropic Information Center of the Research Studies Institute is charged by the Air Force, "to accumulate, evaluate, and disseminate information about the non-temperate areas of the world." This sounds like an "ivory tower" kind of an organization . . . except for that little word, "evaluate." Many people dream up ideas on survival, some even write books about these dreams. The job of ADTIC is to make sure that information distributed to Air Force personnel comes from reliable sources, and that it fits field conditions.

The people who work in ADTIC are men who have left their "ivory towers" of learning, to spend considerable time in the field of their special areas of knowledge. Our tropic men have canoed and walked the jungles. They have flown over the green hills, and have hiked and camped within them. Men in the desert section have travelled by camel, motor car and airplane over the deserts of Asia, Africa, Arabia, and the Southwest United States. Each man has had from 12 to 28 years of field work plus academic training.

This article was prepared for FLYING SAFETY *because ADTIC believes that ignorance about the desert and ignorance of the body's need for water are the greatest hazards to airmen forced down in desert areas. In the desert, a little learning . . . or a little ignorance . . . is often fatal.*

PAUL H. NESBITT
Chief, Arctic, Desert, Tropic Information Center.

Even among sand dunes there are flat areas suitable for emergency landings. These basins often contain wells.

only 7 ounces in the same hour. More perfect shade, as in a small cave, will give even better protection.

The Arabs and other desert people don't know anything about calories or the physiology of man in the desert, but they have learned the value of water, the importance of shade, and the wisdom of traveling at night or in the cool of morning. They also wear loose clothing which allows the sweat to evaporate efficiently (not too fast), and protects them from sunburn and from absorbing outside summer heat as well as keeping them warm in cool weather.

During WW II, Dr. E. F. Adolph and associates carried on extensive experiments with troops in North Africa and in our own southwest desert area. They worked out tables of expected survival time for a man with limited water supplies at different desert temperatures.

If you have no water at all, you can expect to survive for two days in summer desert temperature of 120°F—if you stay in the shade all the time and do no walking. Every ten degrees cooler adds a day to your life expectancy. At 70°F., or below, still with no water at all, you can look forward to ten days. This direct relation between your water needs and the temperature of air around you is important. "How long can you survive in the desert?" is answered by two other questions: "How hot is it?" and "How much water have you?"

Be prepared to aid your rescuers with signals. Desert visibility is usually poor.

Walking at night until exhausted and then resting when you have no water reduces your survival time to one day at 120°F., or 7½ to 8 days when the thermometer registers a cool 70°F, or less. The charts also show that there isn't much improvement in your expectancy at temperatures of 110°F, or more until you have at least a gallon of water. In high summer heat, each gallon adds another day. At 90°F, and lower, each quart will mean another day.

During the Adolph studies they did not kill off any of their subjects. However, actual emergency records in WW II and later have given us a few checks on the reliability of Adolph charts. Three U. S. soldiers died in the Persian Gulf area during the war from dehydration. Two Arabs died from the same cause in Saudi Arabia in the summer of 1950. Known conditions in both cases showed the men had lasted two days without water.

In North Africa the experience of four men from the Long Range Desert Group indicates reasonable accuracy for the Charts on survival time at winter desert temperatures. This incident occurred in the winter of 1940-41, so it is probable that daytime temperatures never reached 90°F. The men started with 2.5 quarts (U.S.) of water each. Some water was dropped to them by air, but spilled out. How much they got is not of record. All four men were rescued on the tenth day. One had collapsed and was delirious when rescued and another died after rescue. The third reached shelter the seventh day and stayed there until rescued. Only the fourth man was still going strong on the tenth day of his trek.

One crew with whom I flew 21 hours over all types of Sahara Desert terrain decided "If we ever get in trouble over the desert we'll ride the plane down. We'll need the water, the equipment and the shelter the plane can provide." These men have taken the first step toward a successful desert survival experience if they ever encounter one. They plan on having as much water as possible. They plan on utilizing the shade and the equipment a grounded, even a wrecked airplane can supply. They know the value of shade in extending their survival time and in reducing the body's need for drinking water.

Water is so important that we'll return to it again after discussing some other desert problems. One of these is visibility. The Arabs say "Three things you cannot hide in the desert: smoke, a man on a camel, and a man in love." You will probably not be concerned by the latter under survival conditions. I can't wholly agree with the second, for I've seen camels disappear before my eyes in the Sahara and wondered how they got out of sight so fast. At any rate smoke and dust are visible.

The desert handicaps the visibility of those not specially trained as desert observers. Difference in air density in the cool of early morning and in the heat of midday distort light rays and produce mirages. The more common one is the "lake with islands." The apparent water on the black top highway in the States in summer is the same type. I've seen these mirage lakes so realistic in North Africa that auto passengers refused to believe there was no lake until the car ahead stirred up a cloud of dust where the water seemed to be. Another type of mirage makes mountains appear three times as close as they really are. The third, the rarest and most romantic, is the "inverted city in the clouds."

Seeing mirages does not mean you are going crazy. The apparent objects may not exist in three dimensions where they seem to be, but optically they are real enough to register on camera film, so it is not surprising if you're fooled, also.

These different air densities also distort visibility. A woman on horseback in the Gobi may look to you like a telephone pole but the local Mongols will recognize horse and rider. Other objects may be similarly distorted so badly that you do not see them at all, like the camels that did a disappearing act for me.

Desert glare, short shadows, and the fact that desert buildings are built of the desert soil all tend to hide objects. The summer sun is so nearly overhead in many desert regions that shadows are relatively short for a longer period before and after noon than in regions farther from the equator. The absence or scarcity of vegetation increases reflected light and glare so that your eyes do not recognize the shadows. This is especially true if you do not wear sunglasses. The glare may or may not be painful to you—individuals vary in their tolerance to glare. Whether it hurts your eyes or not, it does cut down your effective desert vision, and the hang-over reduces your ability to see at night.

If you want to be invisible in the open desert during the day, keep a hill or even a very slight elevation between you and possible observers. The mirage will then give you protection. Keep in the shade of anything you can find.

When you want to attract attention, kick up a dust, use a signal mirror or blow a whistle. Your unaided voice is easily lost in the vast space of the desert. White and blue colors are not easy to see at a distance. The most visible color in the desert, as at sea, is luminous red. Tarpaulins so colored really stand out to a rescue plane.

Your most effective daytime visual signal is a signal mirror. Learn to use one now. If you don't see or hear a rescue plane just flash your mirror toward the horizon. Don't blind the pilot while he is trying to land. Give him a break. After he lands, you can again attract his attention with the mirror. He might not be able to hear your voice or your whistle if his engine is still running.

At night (and it can be black in the desert) your signal problem is one of light. Build a fire if fuel is available; use a flashlight, if available, but don't waste batteries. Save the power until you hear a rescuer.

At midday your voice will not carry far, but in early morning voices often carry considerable distances. Then, shepherds on the edge of the desert call out the news from hilltop to hilltop. In the semi-desert high plateau region of Algeria, North Africa, I have often heard two boys a mile apart exchange news of their camps, always early in the morning. I've never heard them waste their breath when heat waves quivered above the earth.

Wind and the accompanying sandstorms are annoying desert phenomena that can reach serious proportions. April, May and June are windy months in the Gobi. It blows from soon after sunup till about sundown. It starts again, often in the opposite direction, soon after sundown and blows till sunup. In grasslands it may not raise dust, but the wind gets to be a personal force you hate.

When wind comes from the right direction over loose desert material, the resulting dust storm will fill your pockets, your watch, your eyes, your nose, your throat with dust and grit. Sometimes the sand will pelt you with force enough to sting your legs and arms even through your clothes. Sandstorms sometimes last for days and carry dust up over 10,000 feet altitude. Such storms become navigational hazards to an airborne plane.

If you are on the ground in a sandstorm, remember—no matter how annoying and uncomfortable it may be—it is not a Dakota blizzard. You will not be buried alive. You are more likely to get lost trying to travel in visibility zero. If you are traveling, mark the direction of your route with a large arrow dug in the earth or with a long row of stones—at least 3 feet, better 30 feet. Then get in the lee of any shelter possible. Turbulent air may exist on the edges of your shelter but you should find it fairly comfortable near the center. Any respite is preferable to the blasting force of wind in the open desert.

If no shelter is available, after you have marked your directions, lie down with your back to the wind, roll up in your parachute, and weather the storm as comfortably as you can.

Sleep out a sandstorm, if possible. It is the least unpleasant way. It offers the fewest hazards and the least strain on your body. No search plane will be looking for you until the storm is over, whether it lasts one day or one week, so get all the rest you can and be in good shape when the weather clears.

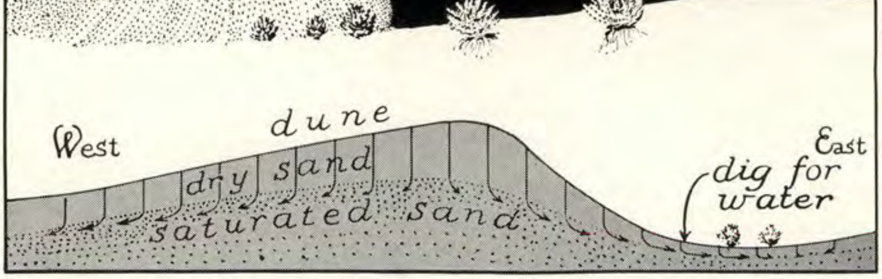
The success or failure of your survival experience will depend a great deal on how well you maintain your physical and mental efficiency. Both depend on adequate rest and water in the desert. Survival accounts analyzed by Dr. Richard A. Howard in the ADTIC publication, *Sun, Sand and Survival*, are full of cases where the men wore themselves out by midday travel. One group was located by the search plane and supplies were dropped. They kept walking and were never heard from again. Were they too stupid to rest and wait for the plane to return? Had dehydration clouded their judgment? We'll never know, but others who walked in the cool of evening or morning and holed up in caves during the heat lived out their story to happy ending.

Several accounts show that the weaker men of a party survived when the strong, husky boys were lost. The weaker men stayed behind and rested. When they moved, they followed the desert law and lived in slow motion like the Arabs and the camel. The stronger ones kept going until they became delirious and collapsed.

This brings us back to your body need of water and the danger of collapse from dehydration. It is true that your body is over 90 per cent water but it is all needed for the efficient operation of that body.

Dehydration is the loss of body water. It begins soon after your last intake of water, tea, coffee, soft drinks, soup, or other non-alcoholic liquid. In fact, most people tend to dehydrate between meals and replace their water loss when they eat. Such voluntary dehydration works without

In sand dunes areas, water may be located by digging at the base of the slope.



A pool of water may last many weeks in a sheltered, natural drainage basin.

Above, trails lead to water in the desert. Know the trail patterns in your area.

Many desert wells have no superstructure, but trails often lead to water.

serious danger in temperate climates. When high temperatures, heavy work, or both push your cooling system into high gear, your sweat glands work at full capacity and your body water gets used up pretty fast.

The blood is first to lose water. That thickens it and throws a heavier load on your heart. Your circulation slows down. All of that tired feeling isn't because you've been working so hard. Part of it is dehydration. Notice how soon you feel rested after a good drink of water! If you had a glass of water about every hour or as often as you got a little thirsty, that tired feeling wouldn't mount up so fast. Keep the unnecessary load off your circulation and you will be more efficient at your work. A loss of only 2½ per cent of your body weight by dehydration will lower your efficiency 25 per cent.

Few people realize that the tired, vague feeling of discomfort signals the beginning of dehydration. They may not even be thirsty, for the sensation of thirst is easily suppressed. Like altitude hypoxia, dehydration sneaks up on you.

Those who have died of dehydration and left accounts of their experience indicate that there is no agony in dying of thirst. Thirst is merely a red light, a warning signal that dehydration is beginning, and you had better do something about it. You can stop thirst in many ways, from will power to pebbles in your mouth. You may put out the red light, but that doesn't put out the fire of thirst.

Thirst is the earliest symptom of dehydration. It disappears or is overshadowed by many stronger sensations as dehydration progresses. The sneaky way dehydration can hit you is well illustrated by the experience of three men who wrecked their jeep in the desert near the Persian Gulf. Search planes found them the fourth day. They had lasted about two days. The radiator of their jeep was still full of water—water which would have kept them alive until the plane found them! It seems reasonable to suppose that if there had been any "agony of thirst" or clear-headed thinking of their problem, the radiator would have been drained. There was nothing about the positions of their bodies to indicate exceptional discomfort. One was still sitting against a front wheel, one was lying under the car. The third had walked out some distance, wandered in a big circle, and collapsed when his tracks crossed his out-going route.

The two Arabs who suffered fatal dehydration in Saudi Arabia in 1950 likewise showed no violent ending. One wrote out his will after his companion had died.

My own experience is that desperate thirst is a very early symptom of rapid dehydration. Climbing out of Rosebud Canyon in southern Utah twenty years ago, I ran out of water but continued to push on at top speed. At that time I didn't know enough to take it easy. By the time I reached the top I was hot, sweaty, and panic-thirsty. My tongue had not started to swell, nor had any other dehydration symptoms except fatigue become apparent. It was still two miles to water but I was so worried that I tried to run. A local shower had left a few tablespoons full of water in rocky depressions. I lapped up those like a thirsty dog. The cool water was not enough to halt my dehydration but it did quench my thirst, quiet my panic, and give me sense enough to walk leisurely the two miles to water. The experience taught me how easy it is to quench thirst, and that thirst is not the killer. If you drink enough only to stop thirst you can still die of dehydration. Men have collapsed with water in their canteens. Don't confuse mere thirst with the serious condition of dehydration.

A good drink of water will do as much as anything you can do to reduce the shock, mental and physical, of finding yourself in a survival situation. Drink normally as often as you feel thirsty. That way you will stay in shape long enough to get well organized, to arrange your rescue signals, to find a shelter or build one from your parachute, and to attend to all the other details your survival manuals teach.

In the desert, where there is water there is life. Your total survival time depends on your water, the temperature of the air around you, and the amount of labor you do. *It makes no difference in your total survival time whether you drink your water first or last.* The real danger lies in your progressive loss of good judgment, loss of mental efficiency, and lowered physical capacity, all of which follow dehydration as surely as night follows each day.

Ration your sweat not your water! That is the best way to get the maximum value from your water supply. To ration your sweat you simply keep the heat load on your body at a minimum. That means resting in the shade during the heat of the day. Keep your shirt on. Keep your body covered so as not to waste your sweat. It may feel nice to let the wind blow on your bare skin but it takes more water from your body. Operate in slow motion. Travel in the cool of early morning or at night if visibility is satisfactory. Keep your water in the shade and don't spill it.

Near the seacoast you can stretch your water supply by dipping your clothes in the sea and wearing them damp. The evaporation of water in your clothes will give you the same cooling service as sweat evaporating on your skin.

Don't drink the sea water! Your body must have water to eliminate waste through your kidneys. Sea water contains a higher percent of waste than urine. Your kidneys will have to draw off additional water from your body to eliminate waste.

Water is life in the desert. Look for vegetation and trees when downed.

If your supply of water is running low and you decide to look for more, remember that in the desert, trails lead to water. Wells, waterholes and oases are reached by trails. Trails are visible from the air. They are marked on maps. Watch for them on your flights. If you have any control of your landing, try to make it on a trail. Wells are located at varying distances along caravan trails. Fifteen or twenty miles between water points is common in most deserts. However, in some bleak areas and on desert motor roads it is sometimes forty miles and even a hundred miles between wells.

You'll need the shroud lines of your parachute to reach water because desert people carry their own ropes. They don't leave them at wells. Desert water tables vary in depth from fifteen to a hundred feet. In some wells the water is more or less alkali and may even have a laxative effect on you. Even that is better than no water at all. Where there are no wells, it is possible to find natural cisterns and even small ponds after a rare heavy rain. I have seen ponds four or five feet deep in locations where there had been no water for twenty years. If there has been one of those rare rains in your area, look for a natural drainage basin. In mountainous regions water collects in caves or basins under tumbled rocks. Water in such deep shade may last many months after the rain.

In dry stream beds which form the desert drainage system when it does rain, the water may sink into the soil within hours after a storm. Standing pools may remain under overhanging banks on the outside curves of the stream. Frequently, natives cover such pools with brush in semi-desert regions.

In dune areas along the seacoast fresh water can sometimes be found by digging in the hollow behind the first dune. Also near the coast there is sometimes enough moisture in the air to form dew in the early morning. It can be collected on the wings of your plane. I have seen it drip from the eaves at Wheelus Air Force Base. Over on the Persian Gulf the moisture extends inland from 50 to 100 miles. The ancient inhabitants of Negev apparently used the dew to aid their agriculture by placing stones around the grape vines to collect condensation. Such condensation in desert regions disappears soon after sunup, so you had better mop the moisture from your plane with a clean rag and squeeze the water into your canteen before dawn.

I have lived and traveled in deserts for days, weeks and months at a time but always on my terms, not on the desert's terms. I have always planned in advance for possible and probable emergencies. I've carried my shelter, sleeping bag, and supply of food and water. I've learned in advance where wells or waterholes could be expected and I have kept my friends posted on the area in which I was working.

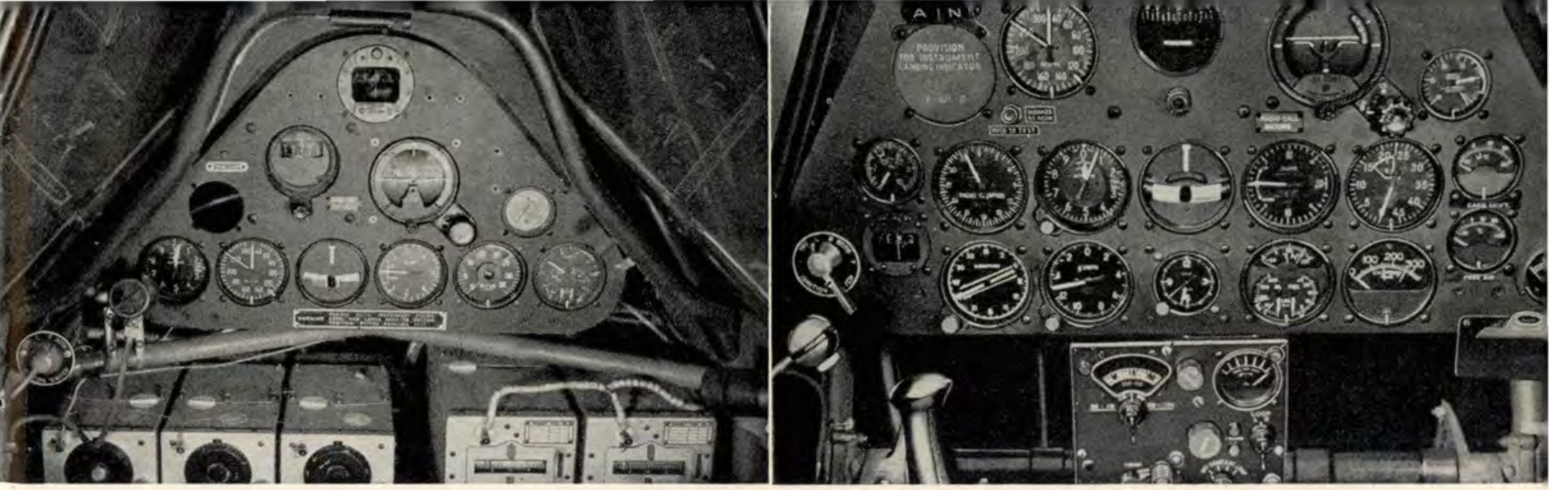
You can do the same. As long as your radio works you can keep the base informed of your location. You can see that your water supply is in the plane in non-leaking containers when you take off. You can check your survival kit, and learn how to use the things it contains. You can learn to operate your survival kit signal mirror and emergency radio equipment. You can study the maps of deserts over which you may fly and learn the few landscape features, find out whether the dry river beds lead to the sea, or lead deeper into the desert (as they do on the north edge of the Sahara in Libya).

You can study AFM 64-5, Survival and ADTIC publication D100, *Afoot In the Desert* to learn details about what to do in the desert IF and WHEN. Intelligent advance planning on your part can turn your desert emergency into a mere forced landing from which Air Rescue Service will pick you up in good health.

Don't sell the desert short. It is a rugged region but a fascinating one if you are prepared. ●

Mr. Alonzo W. Pond is currently head of the Desert Station Section of the Arctic, Desert, Tropic Information Center. He is an authority on desert areas gained through some 20 years experience in the deserts of Africa, Middle East, Mongolia, and Mexico.

Mr. Pond is the author of numerous books and articles on the Sahara and Gobi deserts.



New equipment affects all aircraft. The rear cockpit of the T-6D, left, lacks the instrumentation of the T-6G, at right.

Complicated Safety

An airplane that is awfully simple may be simply awful for safety factors

By William I. Stieglitz, Republic Aviation Corp.

THE equipment needed for instrument flying and long range navigation is mechanically complex, yet has increased the safety of flying, and has also extended the usefulness of the airplane.

Similarly, the equipment necessary for ILAS approach has added mechanical complexity, yet how many pilots would be willing to remove this equipment and go back to making circling approaches under an overcast? How many would go back to flying a DC-3 over the Rocky Mountains, as compared to flying a pressure-cabin airplane; yet cabin pressurization adds to the complexity of the airplane.

Each such increase in complexity, which in turn has extended the utility and increased the safety and the comfort of the modern airplane, has involved the installation of additional instruments and controls, making the pilot's problem more complex. At the same time, the increase in the speed of aircraft has, in many circumstances, reduced the amount of time available to the pilot to perform any given function.

The airplane is one part of a man-machine combination. Therefore, the important question is not whether the machine is complex in itself, but whether the man-machine combination can function efficiently.

We have not gained in over-all simplicity if, by extreme simplification of the machine, we complicate the situation for the human operator to such a point that we approach or exceed his basic limitations. It is often necessary to complicate the machine to simplify the pilot's task.

When a pilot must go through a complicated sequence of control manipulations to perform a comparatively simple function, it will usually be found that the mechanics of the system are too simple; that had the system itself been made more complicated, its operation by a single control might have been possible.

An illustration can be found in the emergency landing gear extension system of early jet airplanes. The main landing gear, in this case, will drop by gravity, and drag prevents its dropping to locked position. Since a hand pump was needed for ground servicing of the hydraulic system, and for operating other units in an emergency, the simplest way of providing for emergency extension of the nose gear was to use this pump, drawing from the emergency hydraulic supply. In order to reduce the amount of pumping required, a selector valve was added to isolate the nose gear system from the rest of the hydraulic system.

To achieve emergency extension of the landing gear with this system, it was necessary for the pilot to place the landing gear selector handle in down position, and then pull the emergency up-lock release. Following this, the selector valve was placed in "Nose Wheel" position, and the pilot pumped the nose gear down.

After this was accomplished, if the pilot wanted to lower the flaps the selector valve had to be returned to its normal position, the landing gear handle returned to neutral, the flap handle placed down, and the hand pump used to extend the flaps. It might be pointed out that nose gear extension took eight to ten strokes.

One manufacturer further simplified a similar system by eliminating the hydraulic selector valve. The result of this simplification was that ten times as many strokes were required to lock the nose gear down.

It is rather obvious that the procedure described above was time-consuming. As a result, pilots experiencing engine failure at low altitude often did not have time to get the nose gear locked down before touch-down, and the gear collapsed on landing. On the other hand, pilots who had sufficient altitude tended to extend the gear early. With a dead engine, the resulting additional drag of the gear often caused the pilot to undershoot. Besides these two conditions, an error was frequently made in one step or another of the complicated sequence of operations.

This situation was corrected by complicating the airplane. An emergency pneumatic system was installed in such a manner that pulling the emergency gear handle operated the necessary valves and discharged a high-pressure air bottle into the nose gear extension cylinder. In the later aircraft incorporating this system, the pilot need only place the landing gear selector handle in down position and pull the emergency up-lock release. All three elements of the gear extend and lock in a few seconds.

It is true that, in incorporating this pneumatic system, complexity and weight were added to the airplane; the system was made more complex, *yet the over-all result was simplicity.*

The dimming of cockpit warning lights affords a further example of mechanical simplicity which produced control complexity and loss of safety. The need for dimming such lights is obvious, since lights which are bright enough to be seen in the daytime are too bright at night. The standard method of providing control, up to the present time, has been by individual hoods on the lights.

There have been many instances of pilots failing to make sure that all warning lights were full bright, prior to takeoff in the daytime. Accidents have resulted because the pilot subsequently failed to see a dimmed warning light.

Accidents of this kind will be prevented by the added complication of a master dimming switch, such as has recently been adopted as standard by the Armed Forces. With this system, all warning lights are full bright when the cockpit lights are off, and are dimmed automatically to the proper level for night flying when the cockpit lights are turned on. An override switch is provided which permits the pilot to turn the warning lights back to bright, when he is using cockpit lights in the daytime to relieve sky glare. The override switch is automatically reset when the cockpit light switch is turned off. The complexities of such a system are apparent; so also are the increased safety, and the control simplification.

Automatic Controls

Automatic systems represent even greater complexity aimed at simplifying the pilot's task. Many pilots object to automatic controls because of experience with systems which were subject to malfunction, and left them without adequate control, or without sufficient warning to permit them to assume control. Nevertheless, in many cases the answer is not to be found in throwing out automatic control systems, and thus imposing an excessive burden on the human operator. Instead, the automatic system should be made as reliable as possible, and should incorporate adequate warning devices. Further, provision for mechanical override is imperative, if functioning of the system is essential to safety. Such systems must be so designed that their operation is as simple as possible, they are easily maintained, and, insofar as is possible, they "fail safe."

An example of the use of an automatic system to simplify the pilot's task, and to eliminate a recurrent "pilot error," is found in the fuel systems of most modern fighter aircraft. In the conventional fighter of World War II, fuel systems consisted of numerous individual tanks, with manual selection. Errors in the use of this type of system were common. Pilots would switch to an already empty tank instead of a full one, leave the selector in an intermediate position, or, at times, allow a tank to run dry before switching.

To eliminate the possibility of such errors, the fuel systems of present-day fighters are designed so that fuel to the engine is fed from a single main tank, and the fuel from all other tanks transfers automatically to the main. With such a system, the fuel selector is turned to an all-on position, and, barring an emergency or malfunction, the pilot need never touch it again.

This system is obviously more complex than the old type. Transfer pumps, fuel level control valves, and shut-off valves are needed. Provision is also needed to permit transfer of fuel to the engine directly from tanks other than the main, in case of a malfunction. It is true that malfunctions of such systems have occurred. Fuel level control valves, particularly in the early days of their development, were a persistent source of trouble. Accidents have resulted from malfunctions of this system, yet they are fewer in number than those which occurred with the old manual system. Here again, mechanical complexity has simplified the pilot's task, and eliminated a known major cause of accidents.

It has been argued that a duplicate emergency system is a needless complexity; that the primary system should be so reliable that duplication is unnecessary. Obviously, this would be the ideal state, but would imply a state of perfection not yet attained by man. Even though every effort must be made, and is being made, to make primary systems reliable, the possibility of human error in design, fabrication and maintenance is always present. Absolute reliability in systems and components cannot be expected; failures can and will occur, despite our efforts to prevent them.

It is true that through long years of development some items of equipment have reached a point of reliability such that failures between regular overhaul periods are an extremely rare occurrence. Duplication of such items is obviously unnecessary. On the other hand, there are many systems of which this is not true. For example, in a fluid-carrying system, with its fittings and flared tube ends, there is a definite possibility of failure as a result of faulty material, fabrication or maintenance.

Mechanically complex equipment needed for instrument flying and long range navigation has increased the safety factors and utilization of new aircraft.

In such cases, the consequences of failure must be carefully analyzed; if it will adversely affect the safety of the airplane or its occupants, a duplicate system for emergency operation must be provided.

There are many instances where this need is evident. The provision of an alternate power source for gyro instruments falls in this category, as the consequences of a loss of those instruments under adverse weather conditions would be disastrous. Primary flight controls involving hydraulic boost are in the same category. A failure of the primary system would mean loss of the airplane, and there can be no question as to the need for either a duplicate hydraulic system, or other means for the pilot to maintain control. To depend solely on the reliability of the primary system, no matter how carefully it is designed and maintained, would be totally unrealistic.

Most cases, unfortunately, are not as clear-cut as those discussed above, and these are the ones which become controversial. Here, a thorough analysis of all factors involved must be made, to determine whether a duplicate system is necessary, or would be merely needless complexity. For example, whether or not an emergency landing gear extension system is necessary depends on whether the necessity of making a belly landing, every time a failure of the primary system occurs, is acceptable. The consequences are the risk of injury to personnel, and possible total loss of the airplane, or, at best, the cost of major repairs and loss of use of the equipment. For a transport airplane, it is certain that the risk would not be acceptable to the public. For the military airplane, with the increased possibility of primary system failure as a result of combat damage, we cannot afford the cost, either economically or logistically. The increase in performance which would result from the amount of weight saved by omitting the emergency system is not worth the cost. Therefore, installation of an emergency extension system is required.

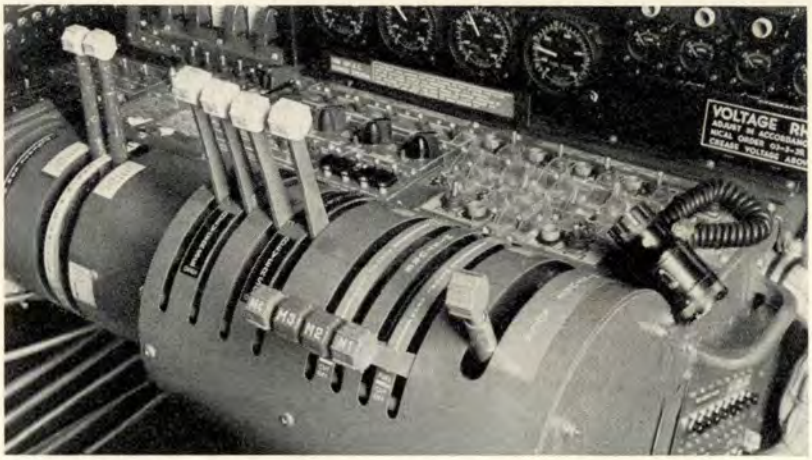
An analysis of all factors, such as outlined above, must be made of the need for any duplicate emergency system. If such an analysis indicates that an emergency system should be installed, every effort should be made to avoid needless complexity in the system itself.

The design of the system must be such that no single failure can make both primary and emergency systems inoperative. One point sometimes overlooked in this regard is the possibility of a failure of the emergency system inducing a failure of the primary system. Compliance with these principles often requires complexity.

An emergency system, installed to safeguard against one type of failure, is of questionable value if a new hazard is introduced through possible malfunction of the emergency system itself. There have been cases where misuse of the emergency system has created such a condition. This does not necessarily dictate removal of the emergency system. Instead, an evaluation should be made of the relative severity of the hazard eliminated and that introduced, and the emergency system should be studied carefully to see whether, possibly by a slight increase in complexity, the secondary hazard cannot be eliminated.

Much of the complexity of the modern airplane is essential to its ability to serve its purpose, and cannot be eliminated without destroying that ability. We must, in fact, be ready to accept an increasing amount of complexity of this type, if aviation is to continue to develop. For example, the problem of mid-air collision is already pressing, and with the increasing speed of airplanes, will become acute in the very near future. With increased closing speeds, the range of human vision is insufficient to give the pilot adequate warning. Since we cannot change this human limitation, we must install additional equipment, such as collision warning radar. This is only one example of the added mechanical complexity which will be inevitable, unless we are ready to say there will be no further improvement in the airplane; that we are satisfied with its present utility, speed and safety. If we are not, we must be willing to accept complexity, and place the emphasis on reliability, rather than on simplicity of design. ●

In big aircraft a reduction of pilot's work load is necessary. Shown below is a B-50 engineer's stand.



THE "D" IS DIFFERENT!

USAF pilots are getting the latest word on the F-86D

Pilots are lectured on the flight characteristics of the F-86D by team member.

A flight demonstration by Test Pilot Joe Lynch and question and answer periods dispelled rumors about the D.

Team members brief Maj. Gen. Victor E. Bertrandias, DIG, USAF, on F-86D flight performance. Left to right: Joe Lynch, Earl Hodder, Chuck Isande, Gen. V. E. Bertrandias, Dave Hoffman and Wes Wright.

If you are one of the pilots who have flown the D model of North American Aviation's F-86 Sabre, it has already earned your respect. If you are in one of the squadrons scheduled to be operationally activated, your introduction to the all-weather interceptor version of the F-86 series is not far off. Additional training that means increased safety for you and your aircraft has been initiated by the manufacturer's instruction teams soon to visit USAF fighter bases.

Maybe you'll be one of the pilots to undergo transition training in this new Sabre and one who has never flown the other F-86 models. Regardless of your experience, you'll find this airplane different from anything you have ever taken off the ground.

The difference can add up to some interesting reactions on your part—reactions that influence your safety as a pilot and your performance of the assigned interception mission. The Air Force realizes this. So does the manufacturer of the airplane. You already know what the Air Defense Command and the Training Command are doing to familiarize you with this fighter. But the manufacturer, too, has assumed some responsibility for your introduction to the F-86D.

Let's say you've logged some twelve or fourteen hours in the D. You're sitting up there at 30,000 feet on top of 18,000 pounds of wires, vacuum tubes, automatic relays, solenoids, servos, and various black boxes you vaguely understand. You're moving along close to 700 miles per hour, conscious that you're flying the Air Force's fastest operational jet fighter.

Sure, you've read the pilot's handbook. You know the J-47-GE-17 engine kicks out with 5200 pounds thrust without its afterburner in operation. You know the general handling characteristics of the airplane. You know your endurance and your emergency procedures in general. And you know your own capabilities.

But what you don't know completely is this airplane. You know you've got to put it on what rumor calls a "collision course" and hold it there by interpretation of your radarscope signals. Without reference to anything *but* your 'scope you continue to within a few hundred yards of your target, taking your signal to breakaway not from your own judgment or experience but from what appears on your scope.

Brother, this is the time you need all the skill, confidence and assurance you can get!

The chances are that when you learned to fly, the term "electronics" was applied to radio only. Now, instead of the mechanical linkage you are familiar with, the only connection between your engine controls and the engine itself, (except for the emergency regulator) on the D, is an electronic control. And instead of relying on all that judgment you've built up as a fighter pilot you depend on your fire control system without a chance to even take a good look at your target.

The weakest link in this pilot-airplane-mission chain is you yourself. The airplane has been proven to the Air Force and it now has to be proven to *you*. To help with this introduction and to establish an attitude of safety and confidence the manufacturer is sending out trained teams to demonstrate the airplane. The teams talk with the pilots who are to fly the aircraft and answer any questions that arise at the bases to which the airplanes are assigned.

The manufacturer knows more about these F-86D's than anyone else so it's only natural he should pass

The indoctrination course convinced pilots of the D's mission capability.

this information on to you pilots, who will be flying them.

This instruction is distinct from field service representative's activities which are concerned mainly with maintenance. The entire program is designed to give the information the pilot wants . . . and needs.

As the first models of the F-86D began undergoing accelerated service tests in 1952 at Wright-Patterson, Eglin, Edwards and Ladd, data on tactics, suitability, performance, stability, and cold-weather operations began to accumulate. Engineers were vitally interested in these tests and were in a good position to evaluate their over-all considerations.

A company team composed of project aerodynamicist Earl Hodder, engineering test pilot Joe Lynch, and Field Service project supervisor W. W. Wright sent up a trial balloon in the projected induction program at Tyndall AFB back in December, 1952. Reaction of the pilots who were conducting the test was immediate and emphatic: "Come back, stay a week . . . and tell us more!"

Subsequently, ADC made an official request in February, 1953, through AMC that the manufacturer's lectures become a part of transition training in the F-86D. In March the instruction team gave several of these indoctrination lectures at ADC headquarters in Colorado Springs for staff personnel and Maj. Gen. Frederic H. Smith, Jr., vice-commander of ADC. These lectures were repeated subsequently for the staffs of Maj. Gen. Morris Nelson, commander EADF, Stewart AFB, Maj. Gen. Delmar Spivey, commander CADF, Kansas City, and Maj. Gen. Walter E. Todd, commander WADF, Hamilton AFB.

Thus, complete agreement on the project was reached and approved by both the Air Force and the manufacturer's engineering department.

Typical of all these indoctrination lecture-demonstrations to come was the first one held at George AFB on 21 April 1953, for the 94th Fighter-Interceptor Squadron.

Pilots' experience in this squadron ranged from Lt. Robert Goodrich's 140 hours in other F-86 models to Capt. James Harvey's 550 hours A and E time plus 15 hours in the D. There was skeptical enthusiasim about the airplane, but a universal dislike for its all-weather purpose.

At a briefing preliminary to the flight demonstration, Earl Hodder presented slides on performance data, flight characteristics, and the use of the fire control system. Then engineering test pilot Joe Lynch took over, and using the same type of slides, discussed engine and flight controls and a few pilot inspection procedures, especially the seat pin and canopy lock.

Lynch also went into detail on best climb speeds, then talked about aerobatics and structural limits of the F-86D. Pilots were particularly interested in his statement of maximum attainable Mach in a full-power dive from over 45,000 feet, using afterburner. From his over 200 hours experience in the D, Lynch discussed the wing-roll characteristics at high speed, spin and stall characteristics, air starts, ejection seat details, and forced landing procedures.

Talk is all right, but the payoff came when Lynch took to the air for a demonstration of the F-86D's versatility. He used a maximum performance takeoff and followed it by a series of vertical rolls. He then went into vertical 8's, Cuban 8's, and immelmans to demonstrate control sensitivity . . . all below 10,000 feet. Most impressive to the pilots was the demonstration of slow flight just above stalling speed, followed by a go-around right on the deck. and his maximum performance landing. During this maneuver he showed the airplane can roll to a stop in less than 2,000 feet.

Pilots and crewmembers swarmed around the airplane immediately afterward. They inspected the landing gear and tires. They were amazed that such a short landing-run would not be damaging to the brakes or destroy the tread.

"Just routine," Lynch commented.

After the demonstration, Lynch remained with the pilots, answering questions and doing a little hangar flying. This, too, had a calculated effect on those who were scheduled to take off for their first flight in the D within an hour.

Comments of Major L. L. Arasmith, squadron operations officer, were typical of the pilots' reaction:

"A thing like this," he said, "really dispels rumors. We had been told unofficially a lot of things Lynch disproved. He showed us he's got confidence in the airplane and we should have, too."

Maj. Carrol R. Northcutt, with eleven hours D time, stated:

"An indoctrination program such as this really cleans it up. It would take the boys hours in the air to gain the confidence they seem to have after this demonstration."

The manufacturer is now preparing a second indoctrination team to expedite this program. As rapidly as squadrons are activated for all-weather interception, one of these groups will conduct the same type of demonstration at each base to which the F-86D's are assigned.

So, when you're up there just a few seconds away from your target, eyes fixed on your radar scope, relax with the words of Captain Harvey after he witnessed North American Aviation's demonstration:

"In the F-86D, after what I've seen, I don't mind an all-weather mission. In this airplane, who would?" ●

The test pilot school at Edwards AFB is the only Air Force school of its type and one of five in the world.

Four hours each afternoon are spent in classrooms, "boning-up" on the aeronautical whys and wherefores of experimental test flying. Engineering is a principal subject.

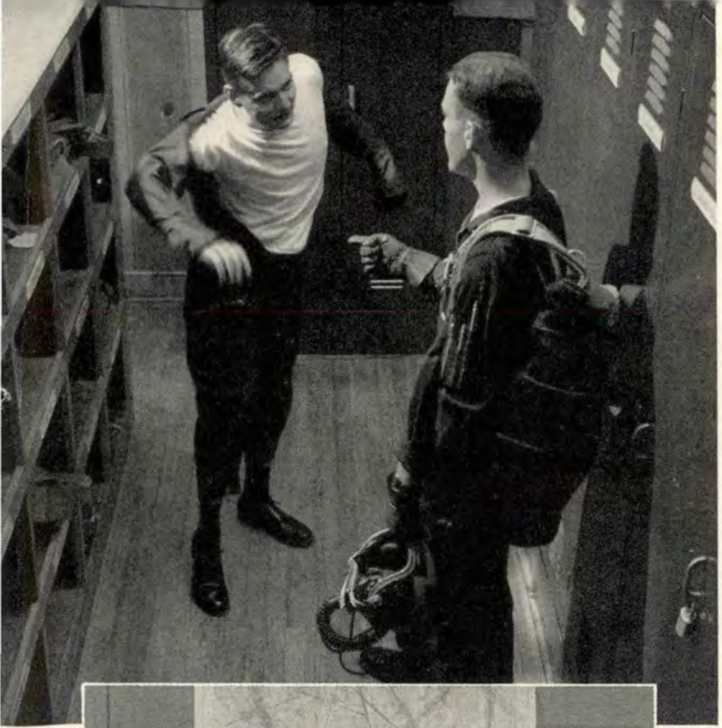
DURING the early morning hours high over the California desert, a pilot pulls back on the controls of a World War II B-25, putting the light bomber into a steep turn. A motion picture camera located behind the pilot records the aircraft's instrument readings while he brings the plane to accelerated stall. This is not the first time he or other pilots have performed this maneuver. It has been a required operation of a select group of pilots for the past ten years. These pilots are the students attending the U. S. Air Force's Experimental Flight Test Pilot School at Edwards AFB, California.

Approximately four hundred pilots have attended this school since 1943. There are four classes a year, one beginning each calendar quarter and continuing for six months. Each class is limited to 15 student pilots.

Entrance requirements for the school are high. An applicant is normally required to have the equivalent of two years of college engineering. A degree in engineering is highly desirable. He must have a minimum of 1500 hours of diversified flying time, and can be any rank from second lieutenant to major.

If a pilot has an exceptional record, it is possible that the other requirements may be waived by a board of officers. Air Force Regulation No. 53-19 authorizes any eligible officer to apply for training.

The old reliable "slip-stick" and a handy comptometer are necessities as the student absorbs flight test information.



From locker room to operations, instructors follow through with briefings before student makes test flight takeoff.

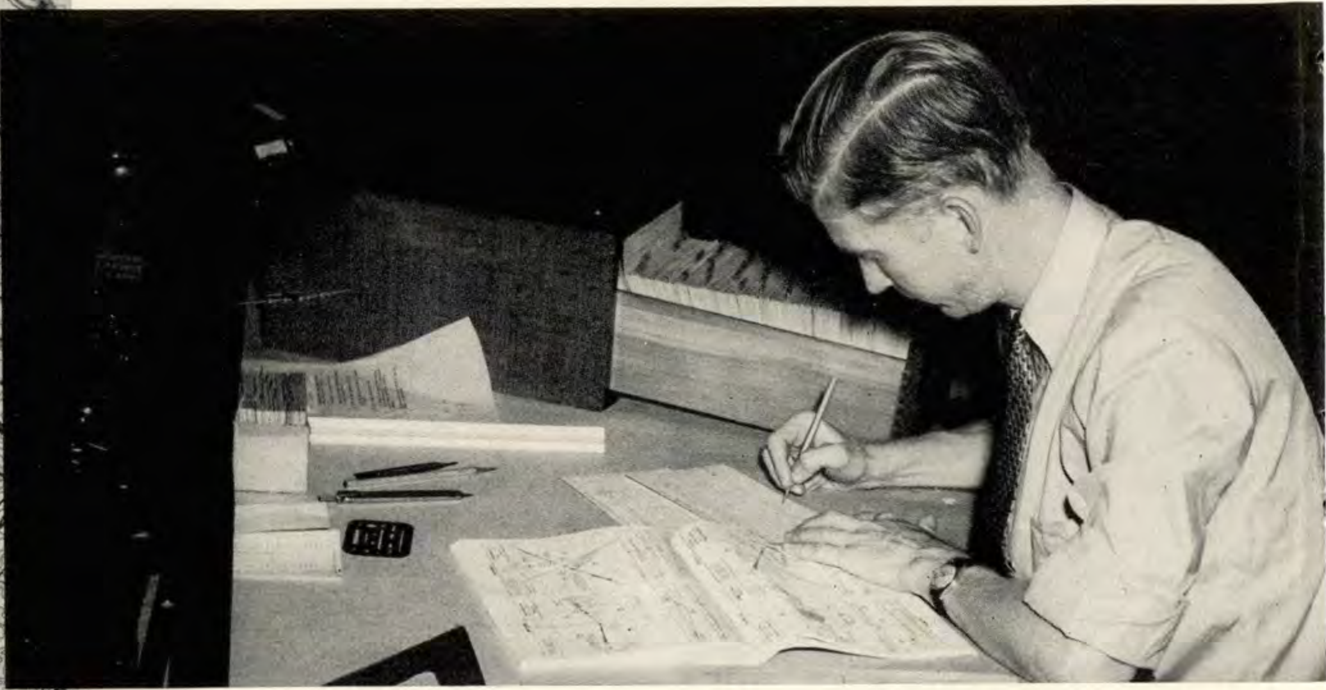
Experimental test flying is done on every type of airplane from the XB-52 to helicopters and liaison type planes.

Students are taken on many tours of aircraft factories and research laboratories. Here, a test pilot class is visiting the NACA's Ames Aeronautical Laboratory, at Moffet Field, Calif.

Students learn how to read and interpret film strips taken of instrument panel during a series of aircraft test stalls.

Pilots who have been graduated from the school fly all types of experimental planes. Below, the XB-51 on a test flight.

THE CHARTS YOU CHOOSE



Radio Facility Charts are kept up to date by expert technicians and fully edited each month.

OLD P. T. Barnum always claimed that a sucker is born every minute, and sometimes in the flying business it looks as if the old boy rather understated the facts. There are considerable strange and wondrous tales which bear out this theory, involving pilots who would reach a high state of dudgeon if they were accused of being suckers.

None of these lads would think of purchasing shares in the Brooklyn Bridge or of buying some real estate located in the center of Lake Okeechobee. But when it comes to playing fast and loose with their lives, these boys don't give it a second thought.

When a pilot has an up-to-date source of information vital to the safety of his flight and chooses to ignore it, he can only qualify as a bonafide, grade A sucker.

Illustrating this premise is the case of the two fly boys who got lost on an instrument flight, at night, while milling around almost directly over destination. Reason? They didn't check available sources of information.

They had filed VFR and did all the navigating with a WAC chart. Finally, they got over an overcast a hundred miles or so from destination. Radio range frequencies and call letters were taken off the WAC instead of out of the Radio Facility Chart.

Unfortunately, the chart was over a year old and the call letters at the destination had been changed. The pilots were unable to get a proper identification but assumed that they were too far out to pick up the right range. Consequently, when they arrived in the vicinity of the station they were unable to orient themselves. Finally, an emergency was declared and they got a steer into the station. It was found that so much time had been spent in milling around trying to relocate themselves that they had insufficient fuel to proceed to an alternate. If the weather had socked in they would have had to abandon the aircraft.

In describing the incident both pilots emphasized that the flight chart contained erroneous information, but admitted they failed to check the facility chart containing the current information they needed.

An incident of this kind points up a lack of knowledge of the functions of the organization charged with getting this information to the field.

The Aeronautical Chart and Information Center (ACIC) is charged with providing the Air Force with aeronautical charts, air target materials, aeronautical information publications and documents, evaluated intelligence on air facilities, maps, terrain models and related cartographic services. ACIC is part of the

Air Photographic and Charting Service (APCS) under MATS command.

APCS has the dual function of supplying photographic coverage and charting service for the Air Force. It provides the Air Force with all special mission photography beyond the capabilities of standard reconnaissance units.

The Lookout Mountain laboratory is responsible for all photographic documentation of the Atomic Energy Commission testing program. APCS produces or procures all documentary films, training films and film strips required by the Air Force. APCS trains and provides combat camera teams and provides processing and editorial services for these units. It maintains film storage and film libraries for millions of feet of Air Force film.

The Air Force's first television unit, the 1354th Video Production Squadron, is also a part of APCS. This medium is proving of immense value already in the fields of training and documentation.

APCS photographic units include two squadrons based in the United States, and flights based in Japan, Alaska, Newfoundland, Panama, Germany, England and France.

The tremendous task of the charting service, handled by ACIC, can best be shown by a few statistics.

There are 7600 different kinds of charts and publications produced by ACIC. During the last fiscal year over 75,000,000 copies of these charts were produced, with over 67,000,000 being distributed to the field. The printing plant in St. Louis, where these charts are produced and printed, employs 200 military and 2300 civilian technicians.

To get back to the two pilots who tried to use a standard flight chart to obtain current air information. ACIC people are constantly amazed that so many pilots do depend on overprint information from a flight chart that may be completely obsolete.

Brig. Gen. Edwin M. Day, Commanding General, APCS, emphasized, "Pilots must remember that when they use flight charts and maps some of the overprint information contained thereon may be obsolete. (Air overprint information is printed in red or blue on flight charts and lists range legs, frequencies, call letters, etc.) The Radio Facility Charts and the NOTAMS are accurate and contain current, up-to-date information which should be used for navigation.

"A flight chart, such as one of the WAC series," Gen. Day continued, "may be over a year old and still be the current chart in use. It is impossible for the ACIC to keep these flight charts current in view of the tremendous day-to-day changes made in the material that constitutes the air overprint on these charts."

In this connection, the ACIC has recommended to the Air Force and HQ, USAF has concurred that all air overprint material that is subject to frequent change and short range obsolescence be omitted from flight charts. Then a pilot must check Radio Facility Charts and NOTAMS for this information.

ACIC personnel point out that the Air Information Division, which is responsible for Radio Facility Charts and Pilots Handbooks, receives an average of 1500 corrections, additions and deletions every week. Thirty to forty per cent of these changes are directly connected with safe flight as they concern routing and rerouting of airways, range frequencies and identifications, danger areas and instrument landing facilities. The other changes affect such things as airport facilities, lighting, servicing and condition of runways.

The ACIC maintains a world-wide network to obtain this vital information. In Washington, extensive staff and liaison offices coordinate a wealth of information obtained from cooperating Federal agencies.

To produce a new chart requires 600 different operations. Here, mountain ranges are surveyed in matter of minutes with photo alidade.

A committee composed of USAF, Navy, RAF and RCAF personnel assigns the responsibility for production of Pilot's Handbooks and Radio Facility Charts on a world-wide basis. This brings about standardization of procedures, graphic symbols and contents and enables the pilots of all three nations to use mutually the facility charts and handbooks without specialized training or briefing.

Both the U. S. VOR and LF facility charts are produced and distributed every two weeks, while the overseas editions are distributed once a month. Also, four RAF charts are used on a reciprocal basis. Domestic publications average 56,000 per issue, foreign editions total 7000 per month.

Specialists in the St. Louis plant estimate that 80 per cent of all the pages in the domestic facilities charts have at least one change every two weeks, while 98 per cent of all the pages in the domestic facility charts corrected every month.

Information is obtained from many varied sources and channeled into the chart information center. Results of both governmental and private surveying are received. Contact is maintained with local, state and national agencies controlling topographical changes and foreign survey organizations. Terrain sketches are obtained from missionaries and explorers and information is exchanged with domestic and foreign airline pilots. Navigation and information data are gathered from foreign aeronautical agencies.

All this information is channeled to research people who painstakingly check for accuracy and then use it to revise and correct current data appearing in the various charts in use.

Aeronautical Chart Information Offices (ACIO) also supply much of the information used by the ACIC in producing charts. These offices, located all over the world, act as gathering agencies for the ACIC and handle chart distribution for overseas bases. They are also responsible for contacting units for suggestions and recommended changes to current charts and publications.

Another function of the ACIO is to field test new charts and publications that affect their respective theatres. For example, each jet pilot in FEAF will receive one of the new jet handbooks for Japan and Korea.

These information offices are responsible for printing the Radio Facility Charts for their respective areas. In addition, NOTAMS are sent out to indicate special or hazardous conditions until the charts can be changed, using the same methods as the domestic NOTAM system.

They collect and verify much of this information from foreign military sources, air attaches, air liaison officers, foreign civil aviation authorities, airline pilots, private individuals and from the International Civil Aviation Organization (ICAO).

A better understanding of some of the problems of the entire ACIC operation could be obtained if all aircrew members could tour the gigantic St. Louis plant. There, hundreds of skilled technicians work at producing the most accurate charts and flight publications in the world.

ACIC figures that on a requirement for a new flight chart, as requested by a major command, it will take 18 months to produce and get to the field, unless it has top priority.

First, all possible sources of information are probed. When the information has been compiled, it is researched for accuracy and edited. It then goes through such varied phases as drafting, re-editing, art work, camera reproduction, printing, overprinting, final editing and distribution. There are approximately 600 separate steps from the original request to final distribution to the field.

The ACIC people have several pet peeves which they feel can be alleviated by a better understanding of their work.

One angle not considered by some supervisory personnel is that a tremendous amount of time, energy and money goes into producing Radio Facility Charts, NOTAMS and special NOTAMS, and in rushing this information to the base operations offices. If this information is not disseminated promptly and so efficiently that all pilots, both base and transient, are aware of it, the entire purpose is defeated.

Three-D enters chart production when photo is checked with stereoscope.

An example of this is the base where Radio Facility Charts are allowed to sit in a warehouse from several days to over a week before distribution—in the meantime pilots go on using old charts which may have obsolete or incorrect information in them. Other bases are guilty of not stressing the fact that pilots should *always* check NOTAMS, not only for destination but for route and bases along the course. This situation is particularly true of special NOTAMS that show new danger areas or temporarily unsafe conditions that might exist for a short time only.

To relieve this situation, General Day has personally recommended that a standard NOTAM set-up be established in the USAF on a worldwide basis. This would include a standard NOTAM board in each base operations as well as NOTAM files. At the present, some operations display special NOTAMS prominently and have operations people and AOs call attention to them, while others maintain a system that allows pilots to depart without being informed of pertinent information.

Another peeve concerns the extremely wasteful usage of charts and handbooks. Every pilot has, at one time or another, drawn a set of charts for a trip and after landing left them in the aircraft or stuffed them in a navigation kit till crowded conditions demand that they be thrown away to make room for more of the same.

As a fix for this situation an interesting experiment is being conducted by the ACIC. They are now preparing plastic covered charts that can be written on, erased, and used again. A pilot can draw course lines with a grease pencil, rub them out at the end of the flight and have the equivalent of a brand new chart when it is needed again. These charts, which are being tested now by selected units, have the advantage of wearing much better than the old charts, even though used over and over again.

Even worse is the treatment of Pilot's Handbooks. Often they are not kept up to date, are thrown around the aircraft and generally torn up and mishandled. Pages are removed and not returned, so that the next pilot who needs some specific page finds himself out of luck. Some bases have a surplus and allow them to be stored, with no attempt to keep up the amendments. At the same time another base may have a critical shortage, but fails to order more until forced to do without.

However, the greatest criticism was directed toward the failure of most aircrewmen to report pertinent information to the ACIC through the proper authorities. All information is grist for the mill; whether it concerns a topographical change, a mistake in a chart or publication, or merely an added facility at an airport.

All the processes of the ACIC are contingent upon accurate, timely information. It is the responsibility of each aircrewman to send in this information. The ACIC believes that the best single source of the information they use should come from USAF crewmen since, compared with other sources, they cover such a tremendous amount of territory in a short time and are in a position to note all changes, both of the topographical and air information type, from a professional viewpoint.

Brig. Gen. Edwin M. Day, CG, APCS, stated, "It is the responsibility of each crewmember to send the ACIC information needed to keep charts current."

This information can be reported rapidly in a number of ways. Military communications channels are available; base operations personnel can be informed or a phone call can be made. (See your Radio Facility Chart.)

To make it easier for crewmen to report any changes, the ACIC will soon print franked, addressed, perforated postcards, attached to the Radio Facility Charts. Any information can be printed on the cards and dropped in the nearest mailbox. With this quick information system in effect, changes can be put out to the field more quickly than in the past. It is suggested that once the cards are in the charts, all base operations offices put a special mailbox in a prominent place to facilitate mailing.

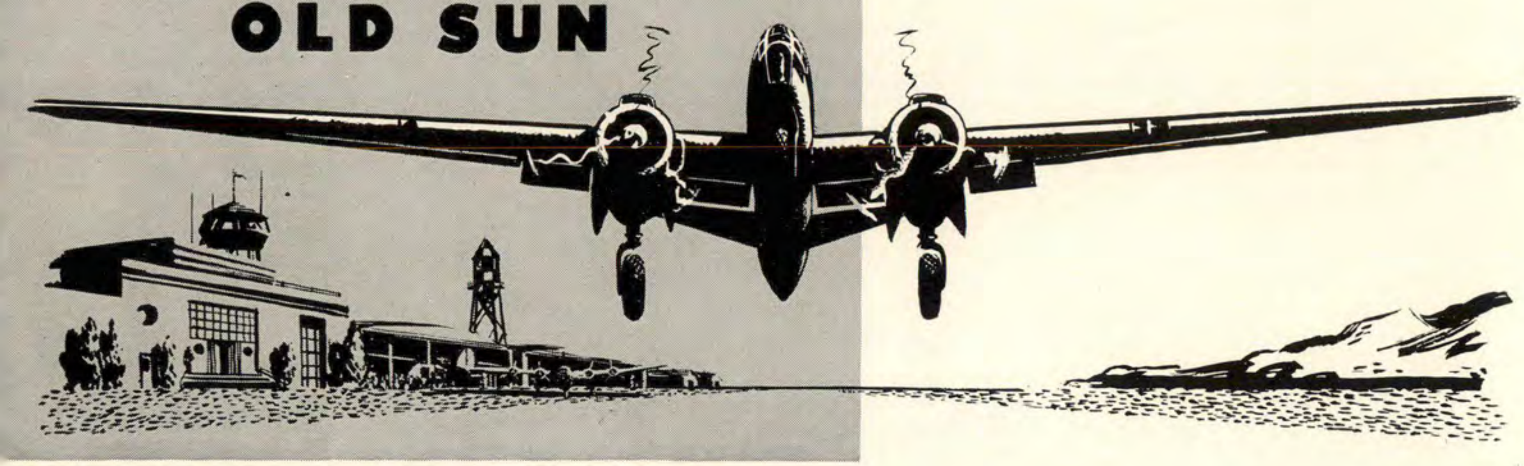
Overseas a pilot can report this information to the nearest ACIO. Information offices are located at the following places: Westover AFB, Mass., Wiesbaden, Germany, Elmendorf AFB, Alaska, Tokyo, Japan, Hickam AFB, Hawaii, Albrook AFB, Canal Zone, Sealand AFB, Wales. If unable to contact one of these offices, be sure to give this information to the first base operations office possible.

Pilots can also give valuable information to the ACIOs on the Foreign Clearance Information Guide. All errors and changes in this book should be reported at once. The publication contains information on clearance requirements for landing or overflying any foreign country. It also lists specific theatre and country requirements for passports and visas, diplomatic clearance, immunization, aerodromes and routes to be used and availability of fuel service.

In emphasizing the importance attached to the information received from aircrews, General Day stated: "Hundreds of thousands of highly skilled man hours go into the detailed work of producing and maintaining our charts and publications. Each individual in the Air Photographic and Chart Service is personally aware of the responsibility placed on him by the Air Force. An aircraft without up to date navigational charts and aids is of little use in the defense of our nation. It is also the responsibility of each member of the United States Air Force to insure that we receive the latest, most up-to-date information with which to work." ●

THAT UNLUCKY OLD SUN

When its watermelon weather . . . the runways shrink together and those long, fast landings can easily stretch into an accident!



HOT weather is here, and it's hard on man and beast, to say nothing of flying machines. With the advent of dog days, runways and tempers get shorter, airplanes and clothing get heavier, and the term "no sweat" becomes a mere figure of speech.

One of the problems of military flying today which continues to haunt the accident prevention program is the simple takeoff. This maneuver is one of the most basic concepts of flying, yet it imposes one of the heaviest factors in planning.

Runways have been continually lengthened until some of our modern airdromes resemble the Pennsylvania Turnpike, yet contrary to popular opinion, the extension of a runway does not provide the panacea for takeoff accidents. Particularly during periods of hot weather.

The prime reason for the trend toward longer runways is the need for higher speeds, longer range and heavier payloads.

In order to get range and payload, gross weights have gone up. This, also, requires longer takeoff runs.

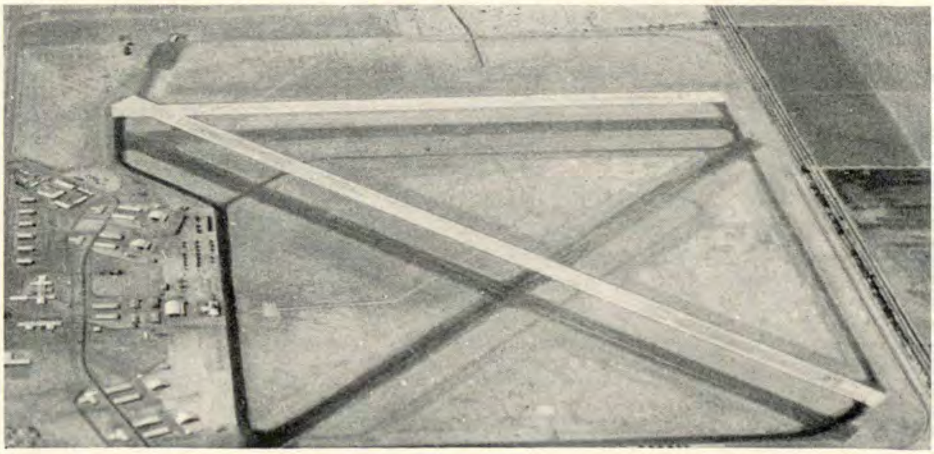
The problem is further complicated by the varying characteristics of individual airplanes, types of missions, variations in seasonal temperatures, and field elevations. The advent of the jet airplane did not simplify the problem . . . in fact, it added to installation headaches.

Because the thrust of a jet engine is directly related to air density, it is essential that both temperatures and field elevation be considered when planning for takeoff runs and aircraft loadings.

In checking a directory of military airfields, both in the ZI and abroad, it has been noted that the great majority of runways are at elevations of 1500 feet or less, MSL. So it is obvious that temperature would be the most common factor that would affect the air density at most airfields.

The one thing that no pilot can afford to become is a "creature of habit." "Habit" and mechanical procedures rate high among "killer" items. So, keep in mind that even though the gross weight, the pilot, and the aircraft remain the same, takeoff runs vary in direct proportion to the runway temperature and the heat of the air.

In addition to the many obvious problems encountered while flying in the summertime, the pilot has to watch out for heat-wave optical illusions.



A pilot who is used to becoming airborne after a certain length of time or distance, may become inclined to abort his takeoff from a field that is high above sea level after he gives his machine the needle, and then rolls and rolls and rolls. His basic problem is that the air is hot and thin, and he just needs more time and distance to become unstuck.

A basic rule to remember is that in hot air, the indicated airspeed will be the same as at lower temperatures, but the ground speed will be faster because the air is thinner.

Here is a typical example of how altitude and temperature can gang up on a pilot, with grievous results:

A pilot in a T-33 was taking off from a field 4000 feet higher than the one at his home station. The temperature out on the field was 94°F., and there was a headwind of less than two knots. (Headwind is a *very* important factor.)

After using all of the 8000 feet of the runway, he finally pulled the airplane off and staggered into the air, only to settle again to the overrun a hundred feet off the end of the pavement. "Wham!" he hit, and "Woosh" into the air again, staggering aloft at 140 knots. Inasmuch as the terrain rose gradually from the end of the runway, the airplane skimmed the top of a hill, taking with it a handful of power-line wire.

This birdman was lucky. He walked with the angels, and managed to get back to the field without damage to himself, but with major damage to the airplane.

For a general rule-of-thumb estimate, you can figure that temperature rise figuratively lifts your field elevation. For instance, 100°F. at sea level is equivalent to 80°F. at 1000 feet; and to 60°F. at 2000 feet above sea level. This, in general terms, means that for a twenty-degree rise in runway temperature, you will need about 20 per cent longer takeoff roll.

Let's look at some actual figures just to give you an idea of how the runway contracts under a beating sun.

Our first example is the T-33. We'll take off with 230-gallon tiptanks and 15,500 pounds gross, at a field level of 1000 feet MSL. At 23°F. (—5°C.) you'll need only 2750 feet; at 59°F. (+15°C.) you'll need 3500 feet; at 95°F. (+35°C.) you'll need 4500 feet, and at 131°F. (+55°C.) you will have to roll for 5700 feet before you break ground.

With the F-84-C, with tips and 16,500 pounds gross, at 1000 feet MSL, you'll need 4200 feet at 40°F; at 60°F., you take 4800 feet roll; at 80°F., the roll increases to 5400 feet; at 100°F., you need 6000 feet, and at 120°F., not an uncommon runway temperature in the desert, your airplane will roll for 7100 feet before becoming airborne.

The F-86-E has takeoff roll characteristics similar to the T-33. With tiptanks and 16,400 pounds gross, at 23°F., you need only 2350 feet at 1000 feet elevation, but when the temperature rises to 95°F., the aircraft takes 3900 feet to get off.

From these figures it is clear that the runway length shrinks nearly to one-half the normal measurement with the advent of hot weather.

SAC pilots will tell you that a B-29, grossing 110,000 pounds (sea level, no wind) needs only 2800 feet of ground run on a standard day (59°F.). But at 75°F., an increase in temperature of only 16 degrees, this airplane needs 3100 feet to get off the ground with 25-degree wing flaps. Three hundred feet more doesn't seem like a great distance, but it can be the measure of disaster to the pilot who isn't savvy to the tricks that heat plays on airplanes.

This phenomenon is also the reason for closely checking takeoff weights. A slight error can result in very serious consequences.

We all know that higher ground temperatures are more critical in jet aircraft than they are with conventional airplanes. Jet pilots know that there are certain bases where no takeoff should be attempted when the thermometer is boiling, especially when the field altitude is higher than 2500 feet MSL with a no wind condition as an added hazard.

Not long ago two jet pilots tried to make a takeoff when the sun was beating down on a mountain air base. They consulted the Dash-One, all right, but for the wrong airplane type. One boy got off okay but the other crashed at the far end of the runway. If the second pilot had known the current takeoff distance, chances are he would not have tried to take off.

So much for pilots and takeoffs.

Another hot weather danger, and this danger is to the well being of

Summertime brings shortened tempers, more important, "shortened" runways.

the airplane itself, is careless ground operation, resulting in high oil and cylinder head temperatures. We all know that proper engine cooling means longer engine life, more efficiency, greater dependability, and of course a higher flight safety factor. This is the responsibility of the aircraft commander. Where engines are closely cowled so as to cool with minimum drag for speed and range, heat control is all important.

Start Engines Quickly

Engines should be started as rapidly as possible . . . in four-engine airplanes, all four engines should be running three minutes after the starting procedure has been initiated on No. 1 engine. Cowl flaps should be full open for all ground operations.

Another hot weather tip is to get off that dime and start rolling as soon as possible. Don't delay your taxiing operations, and remember that you'll generate less heat at low idling RPM's than you will with high idling speeds.

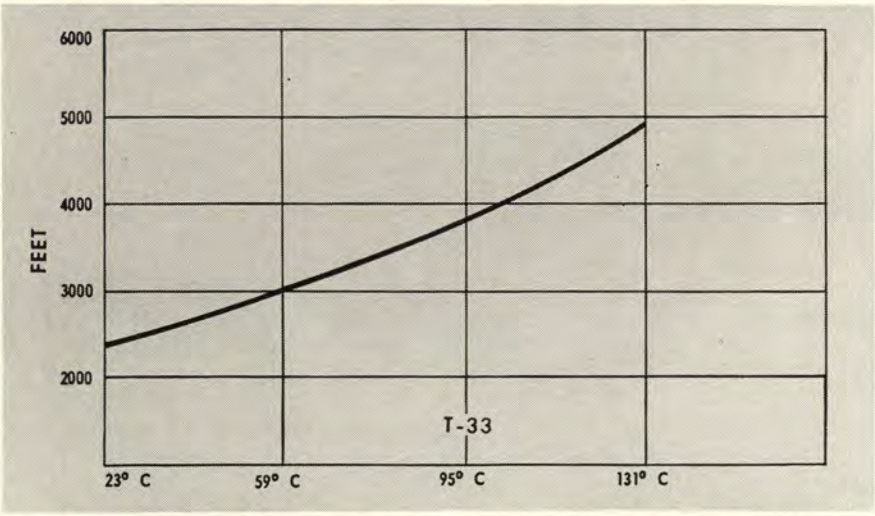
When you run your power check, be sure to head into the wind. Difference between "upwind" and "downwind" engine cooling is tremendous.

Reduced power takeoffs are not recommended in hot weather. Manufacturers have proved that engine temperatures upon becoming airborne will be the same with full takeoff power as with reduced power. Reduced power increases the takeoff time and the takeoff run, and engines will operate at high temperatures for a longer period. Also, reduced power takeoffs narrow the safety margin in the event of engine failure.

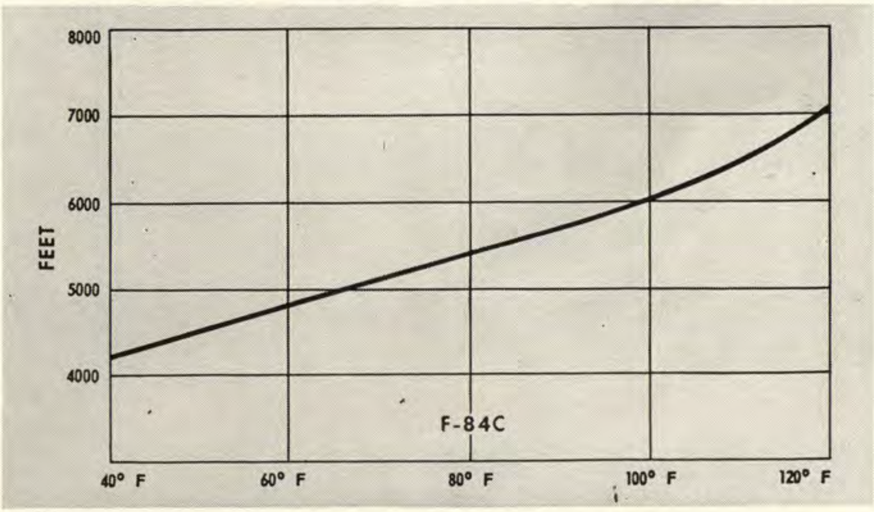
When you know that the runway surfaces are hot, and that the sun is popping the corn in the fields, plan your landing approaches accordingly. Don't come dragging it in over the wheat fields, low and slow. High power settings are required to maintain that slow drag, with gear and flaps down, which means that your engines are going to overheat.

Remember, that excessive cylinder head temperatures, in addition to shortening engine life, are one of the causes of detonation. Temperatures above the limits set forth for various power conditions tend to cause detonation. When serious detonation starts, internal cylinder temperatures immediately rise to a point where heads and pistons overheat and the valves burn and warp.

If your airplane has been closed up in the morning, when the air has been cool and damp, or during a shower, it should be unbuttoned as soon as possible to permit free air circulation. This prevents sweating, and lessens the chances of moisture or condensation damage. This is particularly true in parts of the world where humidity is high. One of the most damaging periods occurs when the sun comes out after a mid-day shower. A hot summer sun plays hob with plastics, such as the coverings used for electrical wires.



Increased temperatures mean it'll take more distance to get off the ground. In general, a twenty-degree rise in runway temperature means you will need about twenty per cent longer takeoff roll. The chart above shows the temperature-length ratio for a T-33. F-84C, below.



Check Control Cables

Also, remember that control cables are usually rigged to tension under ideal temperature conditions. At *high* temperatures these cables may become slack, and your controls may become loose to a danger point. In summer, as in any other season, crew efficiency is directly tied to crew comfort. We can't always change the weather to please the flying people, but flying personnel can, in many ways, make it easier on themselves when temperatures soar.

Hot weather is rough on men and machines, and the operating efficiency of both means the difference between a low accident rate and a high one. Knowledge of hot weather operations is an important phase of the accident prevention program. ●

AIR RESCUE SERVICE

ARS Personnel Often View the End Product of Pilot Error . . . They Believe That "It Just Ain't Necessary"

By Major W. F. Rubertus and Captain D. A. Bolls

PERHAPS more than others, members of the Air Rescue Service often have the unpleasant duty of viewing the end product of pilot and maintenance error — human misery and death. The memory of these incidents is not conducive to sound sleep and pleasant dreams—especially when we feel that "It just ain't necessary!"

After seeing a number of these tragedies, it becomes apparent that a re-education campaign is in order. While Air Rescue Service can hardly be expected to prevent in-flight emergencies, *it can frequently preclude their fatal termination.*

Many instances can be cited where pilots have failed to report their emergencies promptly, thus unnecessarily jeopardizing the lives of their crews. Since Air Rescue Service maintains a 24-hour vigil, the question becomes one of "WHY?"

After due consideration we conclude that many pilots are either unaware of the rescue facilities available or consider their use as an admission of error. This is nothing but foolish pride and, we hope, can be overcome by appealing to their common sense and by informing them of what we have and how to use it.

Therefore, we become "Salesmen." We offer a product which we believe no well-equipped aircrew should be without. Devoid of fine print and war clauses, it consists of the material resources, ingenuity and willingness of our people, dedicated to the interest of *your* in-flight safety, and may be appropriately considered "Airways Insurance."

Sales Resistance

But we of Air Rescue Service are often surprised at the sales resistance we encounter. The fly-boy with a few hours of emergency-free flight is a difficult prospect, and, although appearing to listen carefully, his mind seems to be far away. He agrees that rescue is OK for the other fellow, but nothing could happen to him. "Don't I check the crate? Don't I get the weather? Don't I read the NOTAM's?" and on and on. Of course, he does! But one day here he is—belly up in the boon docks without enough gas to heat a can of emergency rations. Again, we ask "WHY?"

Over most of the airways that men fly, Air Rescue Service is as close as the mike button. Our crews are trouble shooters of the wild blue yonder and they are dedicated to the preservation of life and the prevention of human suffering. Yet, they receive the least cooperation from the very man who keeps them in business—the *indifferent* flyer.

Time is a factor in favor of a pilot if he uses it wisely. Precious minutes spent in sweating out a recalcitrant engine are sorely needed by ARS in getting an aircraft airborne and in position to help. There have been times (too many) when emergencies tend to grow—and some of us have seen the results—when we could find them! A distressed aircraft that can be located by radio and radar while airborne is much more preferable to a lot of little pieces that require an extended visual search to find.

Let's look at another type of "throttle jockey"—he knows all about Air Rescue Service and never fails to call them when some sort of emergency develops while in flight. But after the interception is accomplished and he is safely tucked under the wing of an SA-16 or SB-29, he becomes quite confident and decides that maybe he wasn't so bad off as he thought. This courageous fellow then blithely continues with his original mission, believing it is unnecessary to head for the nearest dry land or the closest airfield. He quickly forgets his feathered engine, and bad oil leak, or the rescue crew who must tag along after him and miss the rare roast beef the wife had fixed for dinner. He also forgets (or doesn't even think about) the Alert that's still on, back at Rescue's home base. The para-rescue team is ready, other search aircraft are standing by—*just in case*—and until he finally makes up his mind

The position of a distressed aircraft is plotted accurately by a specialist on a master grid chart in the ARS Operations Center.

Minutes after a position report has been received crewmembers of a "dumbo" scramble for a take off.

to set it down somewhere, they'll remain that way. In short, he's not very considerate of his airplane, the lives of his crew, or of anyone else.

We know that most USAF Commands have policies in this regard, but one statement is usually included in all of them, "The final decision rests with the aircraft commander." All too often, "I can make it" has become a crew's epitaph.

There is still another type of pilot with whom we come in contact. This is the reticent, quiet type, who, when an emergency develops, believes the Rescue aircraft can locate and intercept him by clairvoyance or some sort of divining rod. He usually has too much important business at hand to answer radio calls, and when he finally does decide to speak, he will give only the barest details.

It is in these cases that we have a definite requirement for a crystal ball. While we are equipped with the finest electronic DF equipment available and our crews know how to use it, we need the cooperation of the distressed aircraft in every case. If we get it, we can find 'em, escort 'em, and even talk 'em into a landing—but we *can't* do it alone.

We repeat, it's *you*, the pilot, who can do the most to help us find you quicker. On long flights over water, for instance, when the pilot of an approaching or departing aircraft fails to send in his hourly position report, ARS control alerts a rescue coordination center. Until the pilot of such an aircraft is contacted and conditions are *proved* to be normal, an ARS unit will remain on the alert.

If the non-reporting aircraft cannot be contacted within a reasonable length of time, an alert ARS plane is dispatched to intercept and escort the distressed plane to its destination or alternate. Again, pilots may ask for this aid before their emergency becomes critical.

At a Rescue Operations Center a master grid chart is kept up to the minute. The complete rescue operation is followed constantly on this grid chart and the exact locations of the rescue and distressed aircraft are kept pinpointed.

Now, if the aircraft having trouble is not located, the Rescue Coordina-

Follow the Rules for Safety!

While the Air Rescue Service provides relief for all types of emergencies, whether it be an aircraft in trouble, or any other type of rescue action, it is primarily concerned with the most common emergency—that of the aircraft and its crew in distress. These emergencies take the form of feathered engines, lost aircraft, bailout, and any other indications that may lead to trouble.

Each squadron has an area of responsibility and each is responsible for initiating the action on all aircraft emergencies within this area. If additional assistance is needed, it can be readily obtained from other Air Rescue squadrons, or its assisting agencies, such as the Civil Air Patrol, the Highway Patrol, and many other valuable sources. Each squadron has the necessary equipment and highly trained personnel to fulfill its mission. These people are available twenty-four hours a day, seven days a week, to lend a helping hand to anyone who may need it.

Listed here are some of the things which should determine just how good an insurance risk you are:

☆ Follow your proposed flight plan as closely as possible. Then, if you do get in trouble, you'll be easier to locate. Speed is of the essence in rescue work.

☆ At the first indication that serious trouble may be in the offing, don't be proud. Let someone know about it . . . anyone! Your family would rather have you around than a paid up insurance policy. So would the Air Force!

☆ Close that flight plan. Failure to do this has caused Air Rescue and its assisting agencies a lot of headaches and expense in locating an aircraft's whereabouts, not to mention the embarrassment to the individual concerned. Be especially cautious at installations where your flight plan has to be closed by means other than your presence.

☆ Make all required position reports. Let someone know your position, or where you have been, and where you are headed for. This will prove an invaluable aid if trouble should develop. Who wants to buy an airplane if you won't be around to fly it?

Just following a few simple rules will help insure your being able to fly another day and will aid the Air Rescue man to fulfill his code—"That Others May Live."

—1st Lt. H. R. Ogden

Keep Current

NEWS AND VIEWS

• **The NADAR**—A compact fire and crash proof airborne tape recorder designed to log everything that happens during an airplane or missile flight has been developed by North American Aviation, Inc.

Using tiny miniature electronic parts, the small recorder called NADAR, from North American Data Airborne Recorder, originally was designed to "go along for the ride" on USAF guided missiles to report on altitude, speed, and general conduct of the vehicle in flight.

Carried by commercial military or private airplanes, the airborne tape can record important information during a flight as long as 10 hours. The tape can be run for another 10 hours non-stop with the previous information being "wiped off" as the new information is recorded. Over 500 hours running time can be racked up on the recorder before it needs a service check.

Locked in a sealed, crash-proof case, a 1200-foot magnetic tape carries the log of a complete trip, including conversation in the cockpit, communications from the ground, data on pressure, altitude, time elapse, vertical acceleration, airspeed, and direction. A quick check of the tape following an unexpected incident during flight would give engineers a full report of everything that happened in the airplane from takeoff to the time of termination.

An 18-pound unit that fits snugly into wing roots or luggage compartments, the recorder is composed of many Tom Thumb size parts designed and developed in the company's Electro-Mechanical department for guidance mechanisms of missiles. Much smaller than recording instruments with comparable capabilities, the airborne recorder is about the size of a portable typewriter.

• **Unlucky Strike!**—Ever hear of an oxygen mask fire? One occurred recently that resulted in first and second degree burns on the hands and legs of an F-86 pilot.

The incident happened after the fourth puff of a cigarette at 10,000 feet cabin pressure during a normal letdown from an altitude interception mission. The oxygen mask ignited, and the flow of oxygen from the system—regulator in SAFETY position—forced a solid flame from the mask about 12 inches long. To avoid face burns, the pilot blocked the flames with his left hand while forcing the helmet off his head with his right.

When the flame was clear of his face, he switched the oxygen regulator from SAFETY to NORMAL, which stopped the pressure flow and consequently the flames. He then extinguished the smoldering fire that remained in the mask by smothering it on his leg. An uneventful landing at the home base followed.

No excessive oxygen pressure with the A-14 regulator in SAFETY position was discovered by investigators, and it was *their* opinion that the pilot's use of the SAFETY position was the primary cause of his injury. He also was criticized for not wearing gloves to protect the hands during a fire from any cause.

This incident is worth mentioning because it can serve as a "caution sign" to all pilots operating this type oxygen system.

Craig AFB, "Plane Talk".

• **AF Information Films**—The Air Photographic and Charting Service has announced that Air Force Digest No. 1, first in a new series of Air Force information on films, has been completed and forwarded to the field for immediate use.

Initiated as a project with a twofold purpose—to place unclassified pertinent information on Air Force activities before interested audiences by utilizing footage shot for documentation purposes—the Air Force Digest will contain only information of an unclassified nature and will offer excellent material for the information and education program. Each film will be approximately 14 minutes in length. A new issue of the Digest will be forwarded to Air Force units all over the world every three weeks by automatic distribution through the AF Area Film Libraries.

Air Force Digest No. 1 covers four activities:

☆ Research on foreign objects entering airscoops for jet engines.

☆ Air Force mobile communications units in operation in Europe.

☆ The training of Greek Aviation Cadets by USAF and England.

☆ And a final regular feature of Digest No. 1, the "Did You Know?" picture shows the ME-163 rocket powered interceptor captured from the Germans at the end of World War II. The pilot who made the flight shown in AF Digest No. 1 is now in the United States, assisting the Air Force and rocket powered research and development.

An official of the Air Photographic and Charting Service says, "We believe that this series, produced entirely from footage supplied by APCS camera units and processed by our regular in-service facilities, will bring current, interesting information to the attention of AF personnel throughout the world."

Distribution of the Digest will be made automatically by the area film libraries at bases and units within their areas. In order to gauge reaction to the new series and gain constructive criticism, area libraries have requested using units to complete preview questionnaires on issues as they appear, and return the completed forms to them for evaluation by the Air Photographic and Charting Service.

Actual F-86 dogfights against Communist MIGS in Korea, including gun camera footage of Sabre kills, are included in the second edition.

Base Information Service officers have been advised to make the Air Force Digest available to the AF Reserve units, other activities affiliated with the Air Force, and interested organizations in the area. The Digests are also cleared for non-profit TV and theater use.

Cross Feed

Gardella's Pix

Six of the twelve pictures used in June FLYING SAFETY's "Survival in the Tropics" were taken by Capt. Paul Gardella, Chief, Survival Training Unit, 19th Air Div., Carswell AFB.

The survival unit at Carswell is excellent, and the personnel all well qualified and competent. Their interest in survival activities is unusually high, and I have never seen a more accommodating group.

Maj. Bernard Garfinkel
Chief, Survival Training
Hq., Eighth AF.

* * * * *

Oversight unintentional. Pictures used had no photographer's identification, so kudos to Captain Gardella, belatedly—Editor.

Form 1 and Form 1-A

In your May, 1953, issue I was a bit astounded to see reference to the Form 1 and Form 1A. I know it has taken much time and work to acquaint pilots with the *new* Form 1 and its parts I, II, III, IV, V. Would you correct this so my students will again have faith in the A/C Maintenance Instructor? Thank you.

M/Sgt. James G. Smith
Det 550, AFROTC
Rensselaer Polytechnic Inst.
Troy, New York

You're in good form, M/Sgt. Smith, and we stand corrected for our oversight. The students may now have even more faith in their A/C maintenance instructor—Editor.

Flying the Right Side

I read your FLYING SAFETY issue with a great deal of interest and look forward to each publication. It is most informative and enthusiastically presents each article and subject.

Lead time in publication does have its problems so the question I am about to ask is not a criticism of your method but something I would like clear in my own mind. The question concerns the fourth paragraph, page 13, of an article titled "The Pilots Good Book" in the June, 1953, FLYING SAFETY magazine; and AFR 60-16A dated 27 May 1953, wherein the paragraph 11-a instructions state that aircraft will be flown to the right, etc.

Yes, I would like to know which is the most correct but most of all could you tell me the reasons behind the change of flying to the right rather than on the center. From my own experience I find flying the center of a leg to be easier and use the procedure of comparing volume transmissions of the "A" and "N" identification signals.

Lt. Col. Harold D. Schmoldt
AFCAG-60, Hq. USAF

CAA has always prescribed the right-hand side of the course. So did the old 60-16 (1950). Believe Par. 11 of 60-16 (Feb. 1953) was a mistake, probably due to confusion with omni-range. AFR 60-16A (27 May '53) brings it back to the old rule again. No particular reason for it as far as we know, except that the old idea was that orientation was more certain, and collisions less likely when flying the "feathered edge"—Editor.

USAF Version of CAA's Ills

I have just read your latest issue and would like to say that ILS should not be considered as difficult for a pilot as you give the impression it is.

I run the Hq instrument school and find many of the pilots completely unfamiliar with it. After about two rides, they are invariably sold on ILS and prefer it to GCA. This is no doubt due to the generally low quality of our GCA units.

One point the Major is wrong on is that using an ID-249 for an ILS approach, you cut out the course line selector and have only localizer and glidepath sensing. You also lose the use of the No. 2 needle, which normally homes on the omni-station. The TO and FROM indicator is also out when using an ILS or VAR station.

Capt. R. R. Lawrence
Hq. TAC, Langley AFB, Va.

This is all spelled out in T.O. AN-16-30-ARN 14-3—Editor.

Exchange of Publications

For the past two years the Flying Safety and Training Section at Tinker has been publishing a "Flying Safety Information Letter," and until recently distribution was limited to pilots assigned to this base. In February, 1953, however, Captain Robert A. Alger, Flying Safety Officer at Hill AFB, in Utah, wrote us, expressing a desire to establish a regular exchange of flying safety information between our activities. We recognized the value in such an exchange and put the idea to work immediately. To date, we have included all the bases of the Air Materiel Command in the distribution of our publication and would be pleased to include any other base requesting copies.

In April we received a letter from Headquarters, AMC, stating that our suggestion on the exchange of flying safety information was being sent to other AMA's and APD's.

We, in turn, would like to give credit to Captain Robert A. Alger, the FSO up at Hill, for the original idea and would be pleased to see such recognition publicized in FLYING SAFETY magazine.

Major Yorke J. Gunn
Chief, Flight Operations Br
Tinker AFB

Nice Goin', Tinker and Hill!
—Editor.

Used as Training Aid

Here at Palm Beach International Airport, the FLYING SAFETY magazine is read and discussed with unusual interest. In addition to certain subjects being discussed at accident prevention meetings and through the usual exchange of ideas whenever aircrew personnel get together, items are cut out from the magazine and presented in the various classrooms of either the C-124, C-97, C-54 or SA-16 Transport Training Groups.

James S. Keel, Maj USAF
Flying Safety Officer
1707th AB Wg
West Palm Beach, Fla.

Keep Current

NEWS AND VIEWS

• **The NADAR**—A compact fire and crash proof airborne tape recorder designed to log everything that happens during an airplane or missile flight has been developed by North American Aviation, Inc.

Using tiny miniature electronic parts, the small recorder called NADAR, from North American Data Airborne Recorder, originally was designed to "go along for the ride" on USAF guided missiles to report on altitude, speed, and general conduct of the vehicle in flight.

Carried by commercial military or private airplanes, the airborne tape can record important information during a flight as long as 10 hours. The tape can be run for another 10 hours non-stop with the previous information being "wiped off" as the new information is recorded. Over 500 hours running time can be racked up on the recorder before it needs a service check.

Locked in a sealed, crash-proof case, a 1200-foot magnetic tape carries the log of a complete trip, including conversation in the cockpit, communications from the ground, data on pressure, altitude, time elapse, vertical acceleration, airspeed, and direction. A quick check of the tape following an unexpected incident during flight would give engineers a full report of everything that happened in the airplane from takeoff to the time of termination.

An 18-pound unit that fits snugly into wing roots or luggage compartments, the recorder is composed of many Tom Thumb size parts designed and developed in the company's Electro-Mechanical department for guidance mechanisms of missiles. Much smaller than recording instruments with comparable capabilities, the airborne recorder is about the size of a portable typewriter.

• **Unlucky Strike!**—Ever hear of an oxygen mask fire? One occurred recently that resulted in first and second degree burns on the hands and legs of an F-86 pilot.

The incident happened after the fourth puff of a cigarette at 10,000 feet cabin pressure during a normal letdown from an altitude interception mission. The oxygen mask ignited, and the flow of oxygen from the system—regulator in SAFETY position—forced a solid flame from the mask about 12 inches long. To avoid face burns, the pilot blocked the flames with his left hand while forcing the helmet off his head with his right.

When the flame was clear of his face, he switched the oxygen regulator from SAFETY to NORMAL, which stopped the pressure flow and consequently the flames. He then extinguished the smoldering fire that remained in the mask by smothering it on his leg. An uneventful landing at the home base followed.

No excessive oxygen pressure with the A-14 regulator in SAFETY position was discovered by investigators, and it was *their* opinion that the pilot's use of the SAFETY position was the primary cause of his injury. He also was criticized for not wearing gloves to protect the hands during a fire from any cause.

This incident is worth mentioning because it can serve as a "caution sign" to all pilots operating this type oxygen system.

Craig AFB, "Plane Talk".

• **AF Information Films**—The Air Photographic and Charting Service has announced that Air Force Digest No. 1, first in a new series of Air Force information on films, has been completed and forwarded to the field for immediate use.

Initiated as a project with a twofold purpose—to place unclassified pertinent information on Air Force activities before interested audiences by utilizing footage shot for documentation purposes—the Air Force Digest will contain only information of an unclassified nature and will offer excellent material for the information and education program. Each film will be approximately 14 minutes in length. A new issue of the Digest will be forwarded to Air Force units all over the world every three weeks by automatic distribution through the AF Area Film Libraries.

Air Force Digest No. 1 covers four activities:

☆ Research on foreign objects entering airscoops for jet engines.

☆ Air Force mobile communications units in operation in Europe.

☆ The training of Greek Aviation Cadets by USAF and England.

☆ And a final regular feature of Digest No. 1, the "Did You Know?" picture shows the ME-163 rocket powered interceptor captured from the Germans at the end of World War II. The pilot who made the flight shown in AF Digest No. 1 is now in the United States, assisting the Air Force and rocket powered research and development.

An official of the Air Photographic and Charting Service says, "We believe that this series, produced entirely from footage supplied by APCS camera units and processed by our regular in-service facilities, will bring current, interesting information to the attention of AF personnel throughout the world."

Distribution of the Digest will be made automatically by the area film libraries at bases and units within their areas. In order to gauge reaction to the new series and gain constructive criticism, area libraries have requested using units to complete preview questionnaires on issues as they appear, and return the completed forms to them for evaluation by the Air Photographic and Charting Service.

Actual F-86 dogfights against Communist MIGS in Korea, including gun camera footage of Sabre kills, are included in the second edition.

Base Information Service officers have been advised to make the Air Force Digest available to the AF Reserve units, other activities affiliated with the Air Force, and interested organizations in the area. The Digests are also cleared for non-profit TV and theater use.

Cross Feed

Gardella's Pix

Six of the twelve pictures used in June FLYING SAFETY's "Survival in the Tropics" were taken by Capt. Paul Gardella, Chief, Survival Training Unit, 19th Air Div., Carswell AFB.

The survival unit at Carswell is excellent, and the personnel all well qualified and competent. Their interest in survival activities is unusually high, and I have never seen a more accommodating group.

Maj. Bernard Garfinkel
Chief, Survival Training
Hq., Eighth AF.

* * * * *

Oversight unintentional. Pictures used had no photographer's identification, so kudos to Captain Gardella, belatedly—Editor.

Form 1 and Form 1-A

In your May, 1953, issue I was a bit astounded to see reference to the Form 1 and Form 1A. I know it has taken much time and work to acquaint pilots with the *new* Form 1 and its parts I, II, III, IV, V. Would you correct this so my students will again have faith in the A/C Maintenance Instructor? Thank you.

M/Sgt. James G. Smith
Det 550, AFROTC
Rensselaer Polytechnic Inst.
Troy, New York

You're in good form, M/Sgt. Smith, and we stand corrected for our oversight. The students may now have even more faith in their A/C maintenance instructor—Editor.

Flying the Right Side

I read your FLYING SAFETY issue with a great deal of interest and look forward to each publication. It is most informative and enthusiastically presents each article and subject.

Lead time in publication does have its problems so the question I am about to ask is not a criticism of your method but something I would like clear in my own mind. The question concerns the fourth paragraph, page 13, of an article titled "The Pilots Good Book" in the June, 1953, FLYING SAFETY magazine; and AFR 60-16A dated 27 May 1953, wherein the paragraph 11-a instructions state that aircraft will be flown to the right, etc.

Yes, I would like to know which is the most correct but most of all could you tell me the reasons behind the change of flying to the right rather than on the center. From my own experience I find flying the center of a leg to be easier and use the procedure of comparing volume transmissions of the "A" and "N" identification signals.

Lt. Col. Harold D. Schmoldt
AFCAG-60, Hq. USAF

CAA has always prescribed the right-hand side of the course. So did the old 60-16 (1950). Believe Par. 11 of 60-16 (Feb. 1953) was a mistake, probably due to confusion with omni-range. AFR 60-16A (27 May '53) brings it back to the old rule again. No particular reason for it as far as we know, except that the old idea was that orientation was more certain, and collisions less likely when flying the "feathered edge"—Editor.

USAF Version of CAA's Ills

I have just read your latest issue and would like to say that ILS should not be considered as difficult for a pilot as you give the impression it is.

I run the Hq instrument school and find many of the pilots completely unfamiliar with it. After about two rides, they are invariably sold on ILS and prefer it to GCA. This is no doubt due to the generally low quality of our GCA units.

One point the Major is wrong on is that using an ID-249 for an ILS approach, you cut out the course line selector and have only localizer and glidepath sensing. You also lose the use of the No. 2 needle, which normally homes on the omni-station. The TO and FROM indicator is also out when using an ILS or VAR station.

Capt. R. R. Lawrence
Hq. TAC, Langley AFB, Va.

This is all spelled out in T.O. AN-16-30-ARN 14-3—Editor.

Exchange of Publications

For the past two years the Flying Safety and Training Section at Tinker has been publishing a "Flying Safety Information Letter," and until recently distribution was limited to pilots assigned to this base. In February, 1953, however, Captain Robert A. Alger, Flying Safety Officer at Hill AFB, in Utah, wrote us, expressing a desire to establish a regular exchange of flying safety information between our activities. We recognized the value in such an exchange and put the idea to work immediately. To date, we have included all the bases of the Air Materiel Command in the distribution of our publication and would be pleased to include any other base requesting copies.

In April we received a letter from Headquarters, AMC, stating that our suggestion on the exchange of flying safety information was being sent to other AMA's and APD's.

We, in turn, would like to give credit to Captain Robert A. Alger, the FSO up at Hill, for the original idea and would be pleased to see such recognition publicized in FLYING SAFETY magazine.

Major Yorke J. Gunn
Chief, Flight Operations Br
Tinker AFB

Nice Goin', Tinker and Hill!
—Editor.

Used as Training Aid

Here at Palm Beach International Airport, the FLYING SAFETY magazine is read and discussed with unusual interest. In addition to certain subjects being discussed at accident prevention meetings and through the usual exchange of ideas whenever aircrew personnel get together, items are cut out from the magazine and presented in the various classrooms of either the C-124, C-97, C-54 or SA-16 Transport Training Groups.

James S. Keel, Maj USAF
Flying Safety Officer
1707th AB Wg
West Palm Beach, Fla.

STRIKE THE RIGHT NOTE!

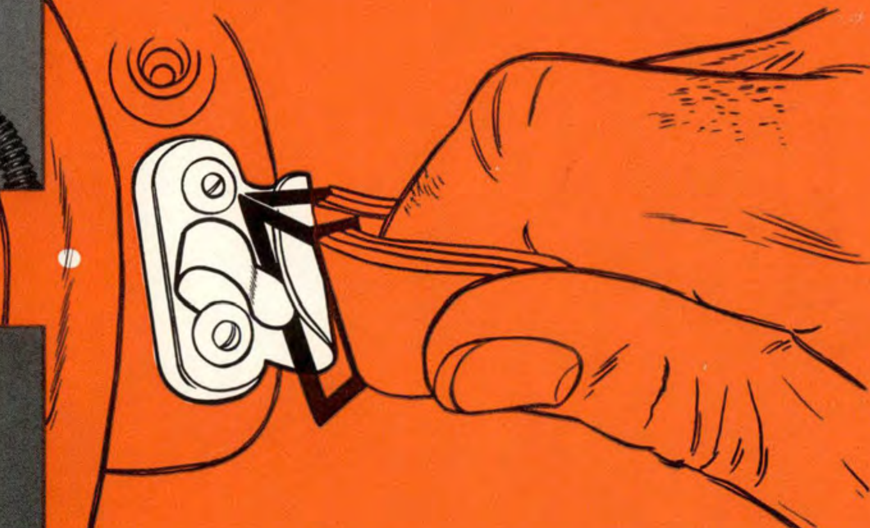
When flying, if trouble looms, strike the right note at the right time. Call it in or tap it out, but be sure you give the straight poop when you ask for help. The Air Rescue Service is designed to serve you in time of need but without the correct pitch, help may arrive too late.

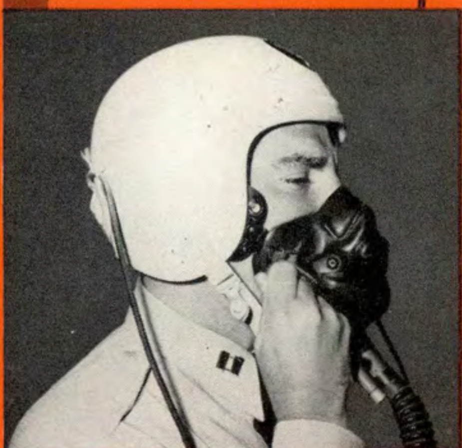
If in trouble . . . stay tuned to Safety!

GET IT OFF . . . *QUICK!*

There might come a time when you're going to have to get your oxygen mask off — real quicklike. There have been reported instances where pilots have gone into the drink and couldn't get the mask off — result — they almost drowned!

Here, in pictures and writing, is the procedure for shedding the mask — quick:





1. Grasp the mask strap in your right hand, using thumb and forefinger.

2. Move metal loop backward and downward against spring.

3. Continue downward motion, forcing spring out of clip with metal loop — and the mask is off.

Caution — While practice makes perfect, be careful the spring retains tension. Do not practice too many times, or it will be necessary to replace clip and spring.

Know your personal Equipment for Safety!

☆ U. S. GOVERNMENT PRINTING OFFICE 1953—271133