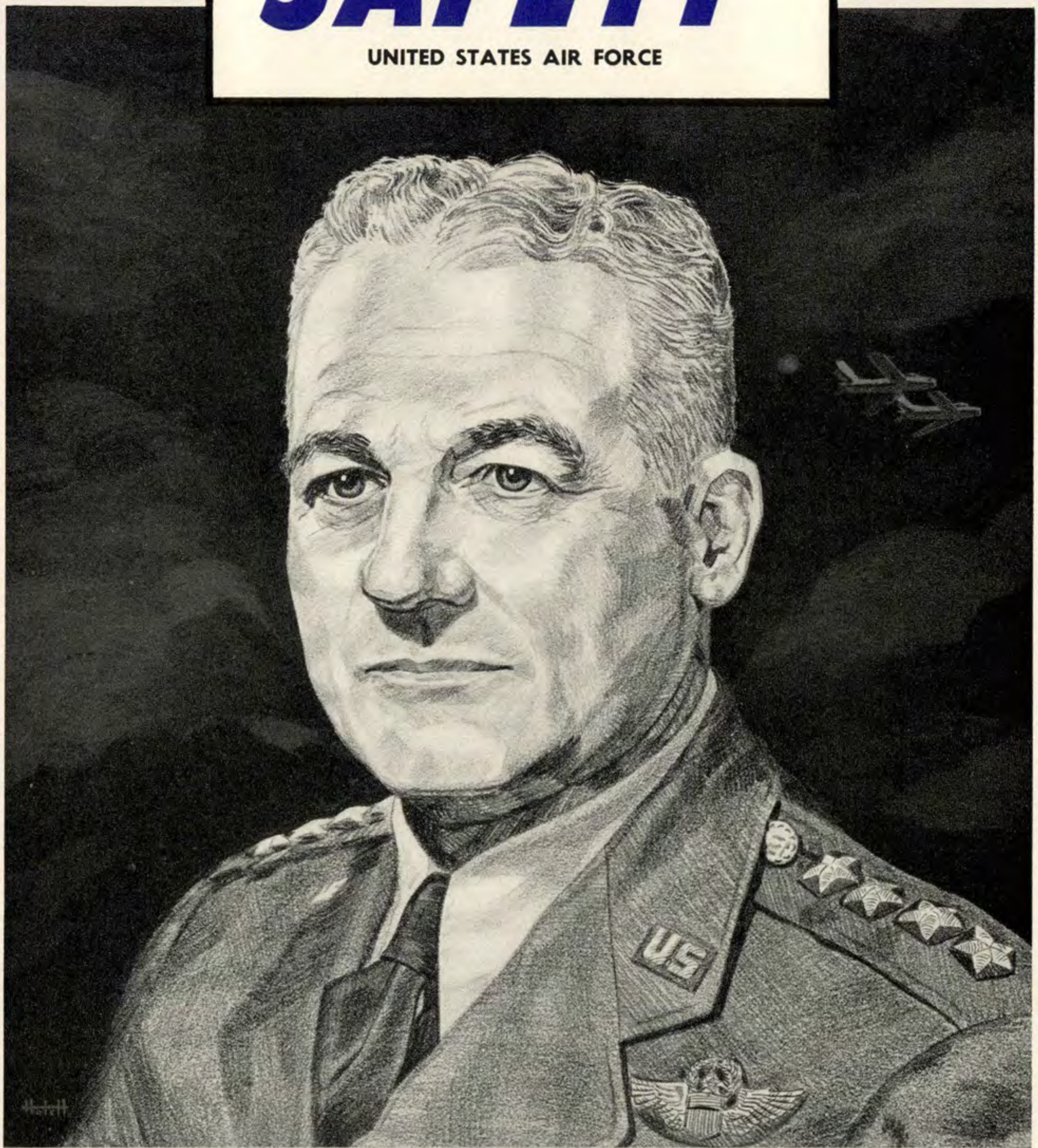
FLYING SAFETY

JULY 1953

UNITED STATES AIR FORCE



GENERAL NATHAN FARRAGUT TWINING
Chief of Staff, United States Air Force
"An Airman's Airman"

LIEUT. GEN. THOMAS D. WHITE
Vice Chief of Staff
United States Air Force

LEADERSHIP

AIR FORCE leaders know the value of adequately planned and executed accident prevention programs. They know that the program, to be effective, must be followed through to the ultimate goal . . . elimination of unnecessary aircraft accidents.

The three most important considerations are:

1. **Air discipline**
2. **Supervision**
3. **Control of the flying operation.**

When unit commanders believe implicitly in the value of concerted accident prevention programs, and where they require the tenets of accident prevention to be enforced throughout the lower echelons, the net result in every instance, has been a reduction of aircraft accidents.

☆

Look Sharp . . . Think Sharp . . . Be Smart with FLYING SAFETY

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VOLUME NINE
NUMBER SEVEN

FLYING SAFETY

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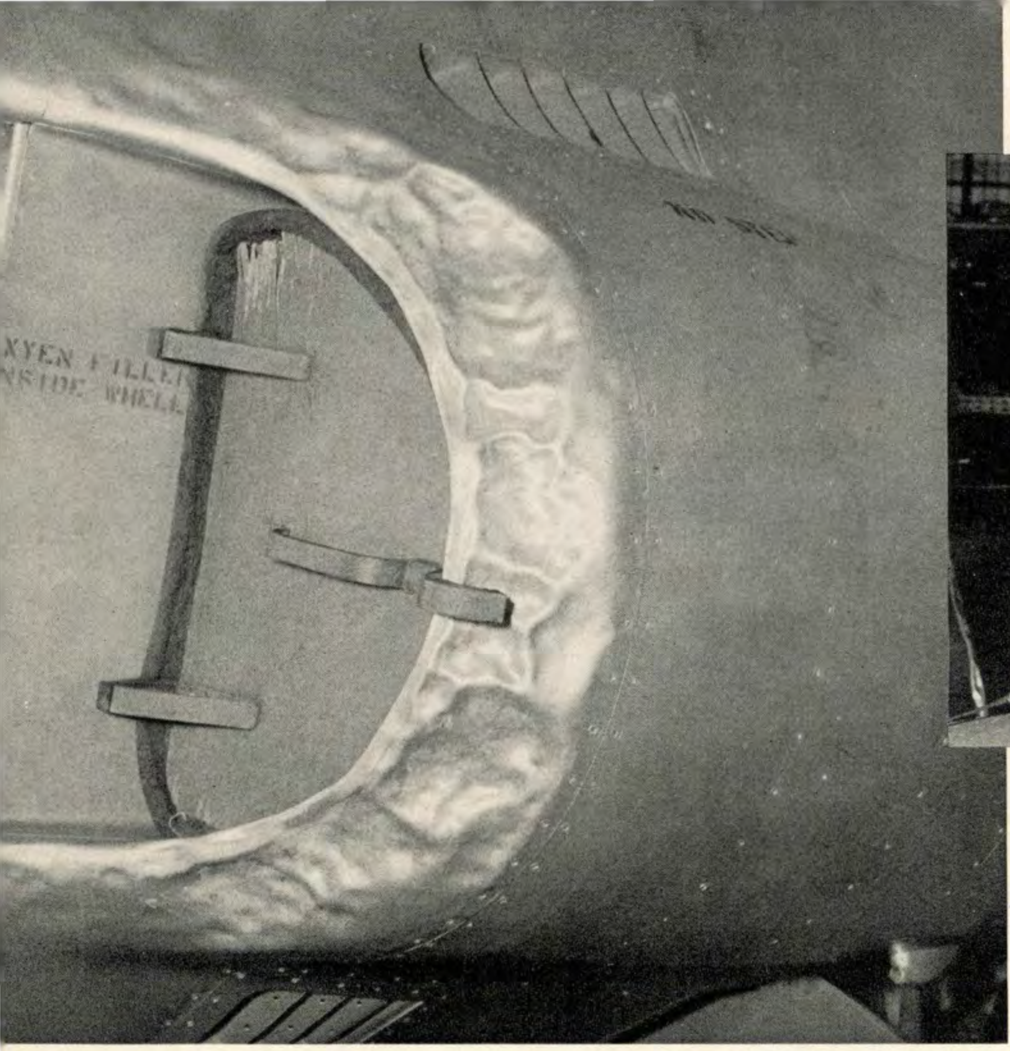
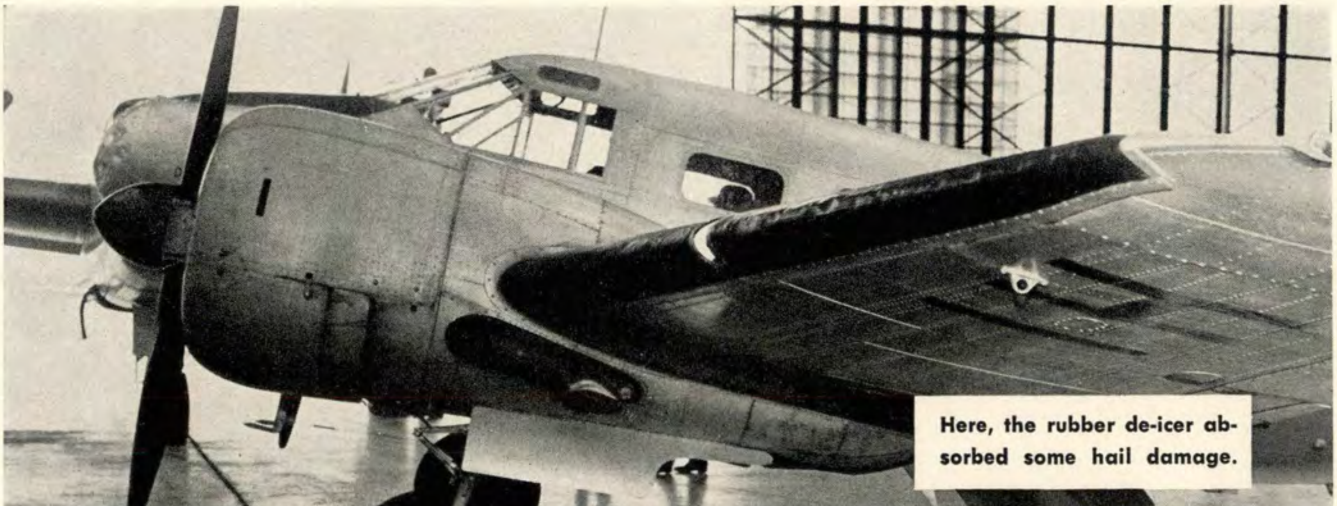
"The American designers favor the thin swept-back wing." (see page 16)



This antenna housing on a C-45 took quite a beating in a severe hailstorm.

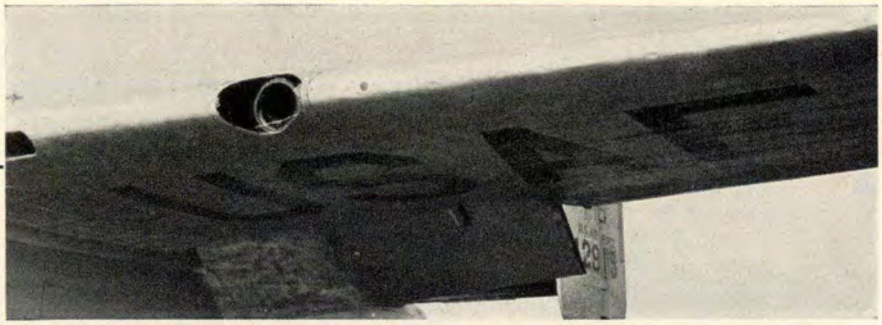
Note how the edge of this jet intake was badly battered by large hailstones.

. . . . hit by HAIL!



Here, the rubber de-icer absorbed some hail damage.

Top right photo shows B-25 landing light completely smashed by hail.



Heavy plexiglas in the nose of this B-25 was shattered in a hailstorm.

Heavy hail damage was incurred to this B-25 on both the leading edges of the wings between the two engine nacelles and the fuselage.

Don't be caught with your flaps down—a good understanding of when and where hail forms will reduce your chances of running into unexpected hailstorms.

ALTHOUGH USAF statistics show no airplanes destroyed or fatalities attributed solely to hail, this weather phenomenon has caused severe damage to aircraft, in some cases running as high as $25,000. Nose sections and wing leading edges take the brunt of hail damage, and windshields have been cracked or broken to a degree that, at normal cruising speeds, could have caused broken glass to be blown into cockpit.

Research shows that the extent of hail damage to an airplane varies in direct proportion to the size of the hailstone, the impact velocity and the type of material struck by the hailstone. It has been found that hailstones less than 0.75 inch in diameter cause little or no damage, but there are cases on record of airplanes running into hailstones as large as two inches in diameter, and these can and do cause heavy damage.

Although the USAF is making significant strides in the detection and interpretation of weather phenomena, including hailstorm masses by radar equipment, the successful avoidance of hailstorms is still dependent upon pilot judgment. In order to exercise good judgment, the pilot should:

☆ Be familiar with the occurrence of hail and the effect of hail on his aircraft.

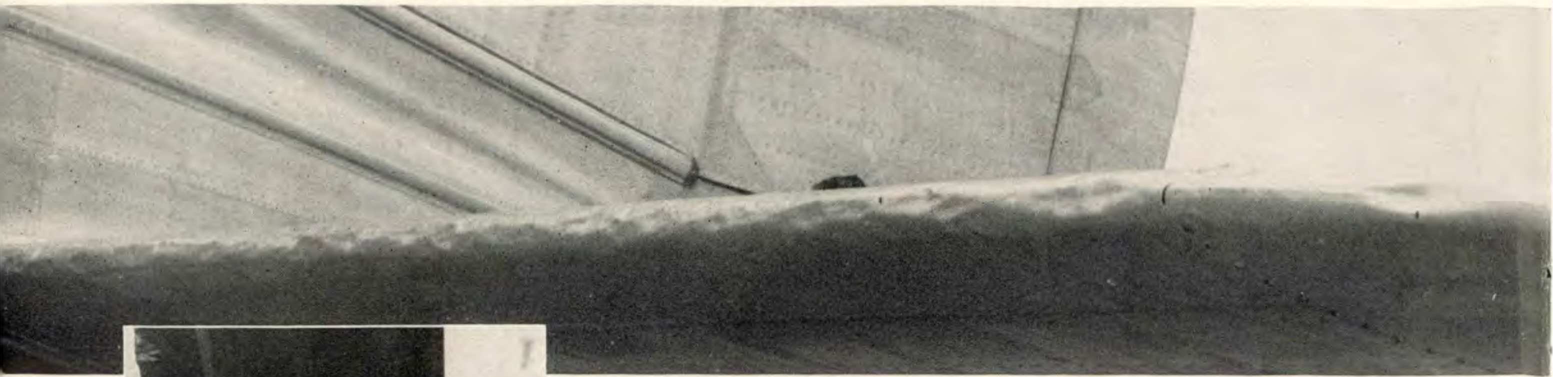
☆ Know the overall weather conditions before he leaves the ground on a flight.

☆ Be aware of the developments that can arise, and be able to evaluate them when he meets the emergency.

Watch for Thunderstorms

You don't have to be a professional weatherman to have a good understanding of when and where hail forms, and the weather conditions associated with hailstorms. You should know enough about hailstorms, however, to discuss them intelligently with your forecaster, and to know what extra in-flight weather information you should have available. If you have this "gen" at your fingertips, the chances of running into hailstorms will be reduced.

If, in planning your flight, you



Above is a close-up of a hail-battered leading edge of a horizontal stabilizer showing what can happen to a plane flown through a thunderstorm area.

Prop blades take their share of hail damage. Below, a large type hailstone punched through this wing edge.

have a feeling that you may possibly encounter hail, you should keep a weather eye out for all thunderstorm clouds that are in line with, or directly adjacent to your course. Since you should know that the severity of a thunderstorm is associated with the stage of its life cycle (FLYING SAFETY, March, 1953, "Flying the Thunderstorm"), and since hail usually occurs in the mature stage of the storm, great caution should be taken when you are flying near or through this stage of the thunderstorm. You can recognize this mature stage because the storm will have a sharp-edged cauliflower appearance, with cloud-to-ground lightning. You can tell a storm in the dissipating stage by its wispy-edged appearance, and cloud-to-cloud, flickering lightning.

The chances of running into a hailstorm at night when visibility is low, is lessened by the fact that only 24 per cent of the hailstorms occur after the hours of darkness. Hail is usually a daylight phenomenon.

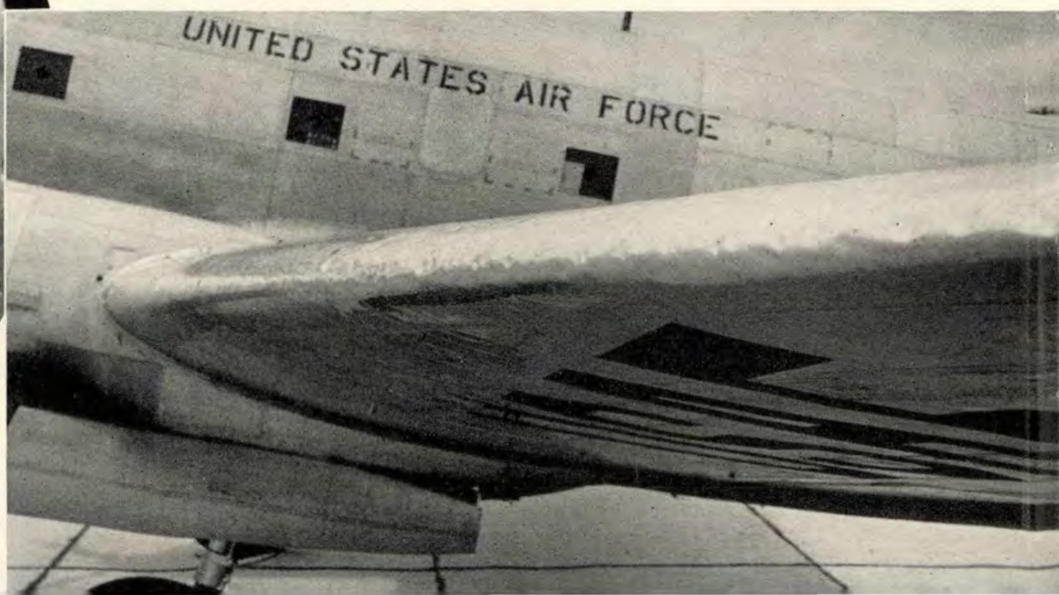
Many USAF pilots make use of visual soft spots when on IFR in cumulonimbus clouds. However, this method is not always reliable because hail has been reported in the clear air outside the storm clouds. It is advisable to stay away from cumulonimbus clouds when the temperatures at flight altitude are below freezing.

Remember this too, that although you may not encounter hail in one particular storm, you may run into a passel of it in another storm within the same general area, or at a different altitude in the same storm.

Should you enter a thunderstorm and encounter hail, you must decide whether you should turn to get out of the hail area, or continue through the hail on your original heading. Here again, pilot judgment comes into play, and your decision must be based on all the known factors regarding the position of the airplane with respect to the storm.

If your course is parallel to the edge of the storm, a turn is obviously

Cold front hail severely pock-marked the leading edge of this C-47 wing.



the best solution. If the relative position of the storm is unknown, the best course is to continue through the storm. This course is especially advisable under IFR conditions, poor radio reception, or where other adverse factors are involved. Remember also that the speed of your airplane has a definite effect on the hail damage you will sustain. You should reduce speed as soon as possible after entering a hail area.

Forecast Judgment

In forecasting hail, a certain amount of judgment must be used on the part of the weather man. Probably the most important factor in the accuracy of hail forecasts is the amount of time the forecaster has been stationed in the vicinity. In general, the forecaster is able to detect potentially dangerous situations when he makes an area or route forecast.

During the preflight weather briefing he should always warn the pilot of the possibility of hail, when the signs are right for it. After the pilot has taken off, every effort should be made to transmit hail information to the pilot when inflight reports and surface observations indicate that hail exists, but was not forecast for the area. In other words, hail is extremely hard to forecast accurately, and the phenomenon occurs so rapidly that the pilot cannot always be forewarned. To summarize the general requirements for forecasting hailstorms, and attendant thunderstorms, these points should be checked:

• *Amount of moisture aloft.* Although a sounding may show a great degree of instability, no clouds develop if the atmosphere is exceedingly dry. A moist layer shows 70 per cent or more relative humidity.

• *Height and Thickness of unstable layer.* Cumulus clouds form with instability below the freezing level. However, for cumulus to reach severe thunderstorm proportions, and to cause hail, the unstable layer should extend at least 15,000 feet above the cloud base.

• *Height Above Freezing Level.* Hail is more likely to form with a low freezing level in springtime conditions, since more of the unstable region is in temperatures below zero.

• *Amount of Thermal Heating.* In order for convective currents to begin, a certain amount of surface heating is required. This amount can be determined by estimating the dry adiabatic temperature at the convective condensation level, and the maximum surface temperature.

• *Local Forecasting Experience.* By studying the local records, valuable information can be obtained on the synoptic patterns and on the critical values of the upper-air elements that prevail during days when hailstorms occur.

We generally think of hail as going hand-in-hand with thunderstorms, but the geographical distribution of the two are not always the same. Scientists have discovered that the worldwide occurrence of hail seems to be most frequent in "continental interiors of middle latitudes." This occurrence diminishes seaward, toward the equator, and toward the poles.

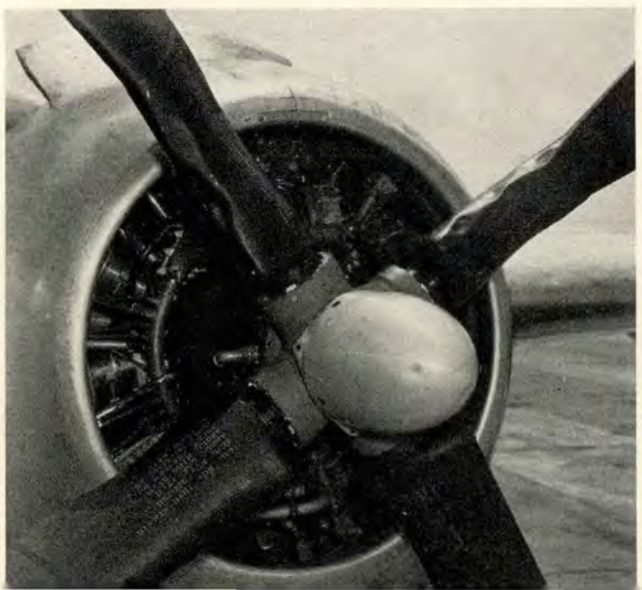
Meteorologists also agree that 50 per cent of all hailstorms occur between 1400 and 1600, Local Standard Time, and that less than 10 per cent of the hailstorms occur between midnight and noon. A study made some years ago by a large scheduled airline showed that in the Central and Eastern United States, hail usually falls in showers of dangerous size between 1200 and 2100 hours, Local Standard Time, and is especially frequent between 1500 and 1800 hours, Local Standard Time. A study recently completed in the Denver (Colo.) area, showed that in the month of May, the average time of occurrence was around 1300 hours, but that this time had shifted to 1430 hours by September.

In the United States, hail is generally a warm-season phenomenon. The country can be divided into three regions of hail-occurrence . . . East and South . . . Ohio Valley, Great Plains and Rocky Mountains . . . and the Pacific Coast area.

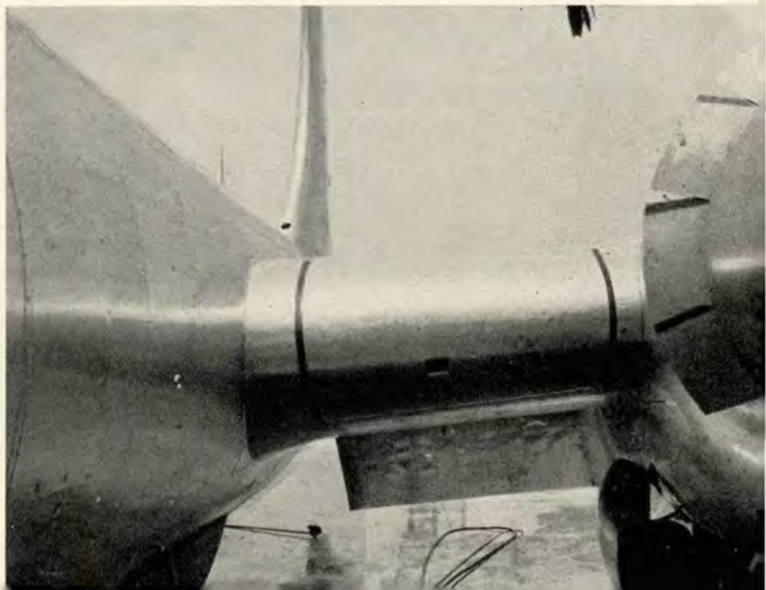
The general pattern of hail areas follows this trend. Early in January the light hail area starts in the South, and gradually spreads northward. Most of the East and South have some hail from mid-March to mid-June. A gradual waning of activity, especially in the coastal areas is then evident. In the interior, there is a warm-season northward development, with a noticeable spread of hail activity, beginning in February. By June this area has reached the plains and the Rocky Mountain country, and by late September, has started to recede southward with lessening intensity.

Reports by pilots indicate that hail is encountered most often over the Florida area at 16,000 feet MSL, and over Ohio at 10,000 feet MSL. However, seldom was hail found at more than one or two levels in the thunder-

Prop blades on this B-29 took a beating from hail.



Light hail scored this B-50 wing edge, dented the flaps.



storm. From this, it appears that hail occurs in very narrow bands within thunderstorm clouds, and occurs less frequently above 20,000 feet MSL. The average duration of a hailstorm is generally accepted to be fifteen minutes, although reports have been verified where hailstones have formed on the ground to a depth of two feet, denoting a longer period of fall.

From Convective Clouds

Hailstones fall almost exclusively from convective clouds, although hail does not fall from all thunderstorms. The mechanics of the thunderstorm have been well established, and we will not go into these details in this article. Although we know how a thunderstorm is made up, the production of hail in a thunderstorm is still somewhat of a mystery to the metro man. We do know that in general, the more violent storms produce hail.

Studies have been conducted by various airline companies, meteorological agencies, and USAF Air Weather Service to determine the weather factors associated with hail. The thunderstorms associated with airplane hail encounters have been classified as (1) Cold front, (2) Warm front, and (3) Air mass.

Of 78 cases of hail encounter reported, 59 were attributed to cold-front action; 13 were caused by air mass activity alone, and six were caused by warm-front action. Therefore, it is obvious that cold front action will be the most likely to produce hail damage to your airplane.

East of Indiana the percentage of cold-front hail encounters was the most pronounced. Here, eight out of ten cases of hail encounters were from cold-front activity.

It was also found that the cold-front storms occurred most frequently between 1400 and 2200 LST, and reached a maximum at 1530 LST. Most of the air mass storms occurred between 1400 and 1500 hours LST.

Radar Detection

A great many of our large USAF airplanes are now equipped with radar that can be used to detect areas of precipitation. By using this equipment, and by knowing how to interpret what is seen on the scope, the pilot can avoid danger areas. If it is impossible to circumnavigate these areas, the pilot can pick the safest route. During test flights using radar equipment, 32 hail encounters were analyzed. It was found that 31 of these cases occurred in heavy rain areas, and only one in light rain areas. Interpretation on the PPI scope showed that of the 31 hail encounters during heavy rain, 28 cases occurred during the first 15 seconds of heavy rain, following the light rain.

Here are the areas where hail-producing storms are found. These figures coincide with ground weather reports and with crop-hail damage insurance rates . . . and you can't beat the insurance companies along this line of knowledge.

You are most likely to encounter damaging hail between the Mississippi River and the Continental Divide. This area accounts for 74 per cent of all hail damage to aircraft. Sixty-four per cent of hail damage occurred during the months of April, May and June.

Of all hail damage analyzed, 56 per cent was encountered aloft between 1400 and 1600 hours LST, and 85 per cent occurred between 1400 and 2200 hours LST.

Pilot reports show that the average distance flown through hail was about five miles, although reports ranged from one to thirty miles. The common width of hailstorms, however, is one to two miles, although hailstorms 75 miles in width have been reported.

The best advice to pilots is not to fly through thunderstorms, *period.* However, there are times when this can't be avoided. That's why it's a good thing to know all about the mechanics of thunderstorms, and be prepared to carry on safely through wind, and storm, and sleet and hail—if you can't do it any other way! ●

Large hailstones knocked deep dents in this spinner and battered the paint from the leading edges of the wings and cowlings in a violent thunderstorm.

Acknowledgment is given to Mr. Robert K. Souter and to Mr. Joseph B. Emerson, of the National Advisory Committee for Aeronautics, for the technical information derived from their study, "Summary of Hail Literature and the Effect of Hail on Aircraft in Flight."

the BREATH of life

Breathing at altitude comes real easy with the new D-1 type oxygen regulator—

THE NOMENCLATURE for certain items of military equipment is always good for a chuckle or two. The official name of the D-1 oxygen regulator is likewise amusing, but improper functioning of the device could prove to be extremely unfunny.

The Tech Order describes the regulator as an "Automatic Positive Pressure Diluter Demand Oxygen Regulator," which is an important sounding name for a very important piece of machinery.

With the automix lever set at "Normal Oxygen," the regulator will deliver a mixture of air and oxygen in the quantity demanded by inhalation at the mask. The ratio of air to oxygen varies with the altitude and is automatically regulated. As an airplane's altitude is increased, the quantity of air mixed with the oxygen is decreased until, at a cabin altitude of approximately 32,000 feet, pure oxygen is delivered to the mask.

Speaking of masks, there is only one type which should be used with the D-1, and the later model D-2—and that's the A-13A pressure demand mask. Many complaints of regulator malfunction have been traced to usage of the wrong mask.

By placing the automix lever on "100 per cent Oxygen," the regulator will deliver undiluted oxygen in the quantity demanded by inhalation at the mask. This handy little switch should be used whenever a pilot detects noxious fumes or gases in the cockpit. In addition, it's a good idea to have 100 per cent oxygen turned on for all taxi operations.

Upon reaching an altitude of approximately 39,000 feet, an aneroid mechanism in the back of the regulator automatically causes the internal regulator pressure to rise, thus causing a higher pressure to be delivered to the mask, compensating for any small leakage.

The regulator incorporates a built-in warning system used in conjunction with a warning light at the regulator station and a warning light at a central control panel. With the warning switch in the "ON" position, the lights will be dim under normal operating conditions. However, under conditions of zero flow or steady flow, the light will become bright, indicating a pause in the breathing cycle.

The warning light will shine brightly for the following reasons:

- Leaking hose.
- Leaking or accidental parting of the quick disconnect.
- Wrong type mask.
- Oxygen supply depleted.
- Mask valve blockage.
- Regulator failure.

If the warning lights fail to work at all, any one of three things may be responsible:

- Switch off.
- Bulb burned out.
- Electrical failure.

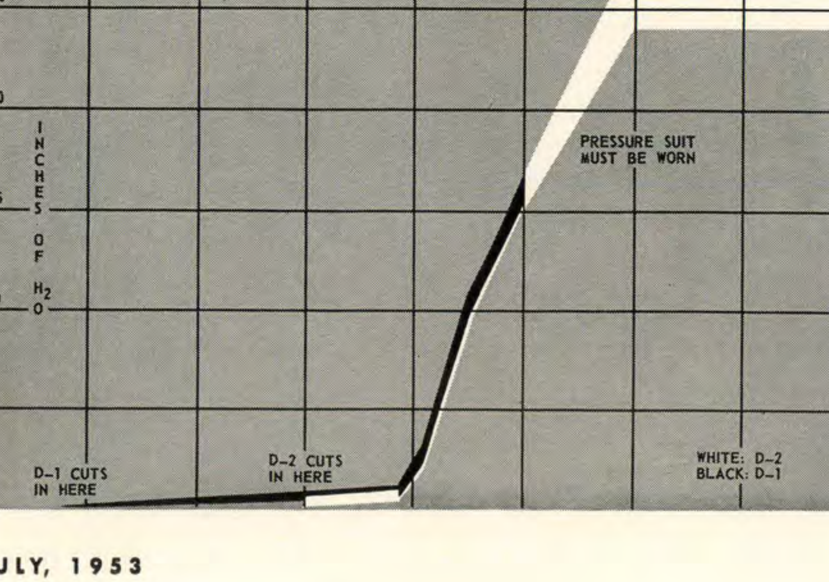
There's an important thing to remember about the regulator . . . if you're flying at extreme altitude and you get in trouble which you can't diagnose, use your bailout bottle immediately. Then, with the bailout bottle providing your oxygen, start your descent and get down to a safe altitude. There, you can do a more thorough job of experimenting.

Research specialists at the WADC Aero-Medical Lab have developed a new model of the oxygen regulator, known as the D-2. Physically, in design, it is similar to the D-1.

However, where the D-1 starts metering pressure automatically at 12,000 feet, the D-2 does not perform this function until 30,000. Then, the D-2 evidences a marked superiority. While the D-1 will not sustain consciousness above 50,000 feet, the new D-2 will sustain life at altitudes up to 80,000 feet, provided the proper counter pressurization exists.

The D-2 is soon to be used in conjunction with the T-1 High Altitude suit, which will supply counter pressure over most of the body. ●

Note the difference in operating altitudes of the D-1 and D-2 Oxygen Regulators.



The ejection trainer operates out of a cockpit mockup and the seat is propelled from nine to 16 feet up the track.

Ridin' the rails—

WITH the development of aircraft capable of speed in excess of 300 MPH, successful escape by simple bailout has become increasingly hazardous, if not impossible.

The engineer's anwer to this problem resulted in the development of the ejection seat. This device in turn introduced a need for reassurance of aircrew personnel that the ejection seat was not in itself a great hazard, and that proficiency in its use would provide successful escape. To provide such assurance, practice ejection during actual flight was impractical; therefore some other means of indoctrination and training became a primary necessity.

Two large ejection seat towers, one at Williams Air Force Base, the other at Wright-Patterson AFB, have been used for study and demonstration of the forces developed during ejection, but do not realistically simulate all conditions and procedures found in aircraft. In order to remedy this objection and to provide training conditions and procedures closely simulating those found in operational aircraft, a portable unit incorporating a cockpit mockup and a fighter seat has been built by All American Airways of Wilmington, Delaware. This portable device permits more effective practice in the procedures required for successful firing and ejection.

Twelve of these portable trainers were acquired and modified by having the face curtain removed from the seat, arm rests and an Air Force catapult installed. The trainers are in the process of assignment in the field.

Trainers Tested

Preliminary to placing trainers in the field, the Surgeon General of the Air Force arranged for Frankfort Arsenal to carry out exhaustive tests in the modification of the catapult and cartridge to assure safe and efficient operation. The first of the units was delivered to the School of Aviation Medicine, Gunter AFB, on 18 December 1952 and has been in operation since 20 January 1953.

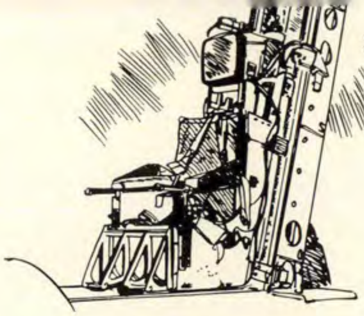
The portable trainer consists of a substantial base of steel beams to which the cockpit mockup and a track bearing tower are attached. The overall height of the assembled trainer is 25 feet and requires an area of 30 feet x 30 feet for operation. With the tower collapsed and supporting base pulled together, it has a length of 29 feet, a width of 8 feet and a height of 5 feet. Total weight of the assembled trainer is about 4,000 pounds. The base rests on five wheels, three of which are swivel mounted to permit movement. Screw jacks adjacent to each wheel provide a means for immobilizing and stabilizing the trainer during operation.

The T-14-E-1 Catapult used by the Air Force trainer is a two-tubed telescope unit with removable firing head, trunnions for seat attachment, base mounting and a locking mechanism. The brass cartridge has the casing of a 60 caliber shell and provides a maximum acceleration of 10 G's at the rate of 150 G's per second.

The propellant charge carries the seat from 9 feet to 16 feet up the 20-foot track. An upper buffer near the top of the tower has friction brake shoes to decelerate the seat if it should travel the full length of the track. After reaching the peak of its travel, it descends under control of an automatic brake device. A hydraulic system stops the seat in a pre-loading position on descent, and a hand valve permits lowering of the seat into the cockpit for firing position.

Instructor's Panel

There is an instructor's panel mounted on the forward end of the cockpit. It is so wired that a series of actions are required preliminary to firing the seat. These actions are indicated by lights on the panel. The lights record proper throttle position, activation of the bailout oxygen cylinder, feet placement in the stirrups, and elevation of the left and right



The new "seat with a send-off" will boost you up and let you down—easy.

arm rests. Various types and models of aircraft will depart from the procedures as wired in the trainer but alteration may be made to simulate the desired sequence for ejection.

For example, the canopy release may be a separate release lever in some aircraft and as such may be wired into the panel for indoctrination. The sides of the cockpit are hinged and wired to a buzzer which is activated when the arms or any part of the body strikes the sides during ejection. The forward fixed position of cockpit (wind screen) is simulated by aluminum tubing which is displaced if feet strike it during ejection.

The instructor has remote control of the firing pin assembly so that the seat cannot be fired by the trainee until the instructor activates the solenoid which releases the safety of the firing pin. As a safety factor in the trainer, this circuit cannot be completed unless the safety belt is buckled. The lap belt should be unfastened in aircraft prior to ejection at low altitude. The oxygen bailout cylinder need not be used at altitudes below 20,000 feet.

An added safety factor was provided by Frankfort Arsenal for the Air Force Trainer by introduction of a cable and lever device to lock the catapult tubes together so that in case of misfire or other malfunction the trainee may safely leave the seat. Locking the catapult tubes prevents the tubes of the catapult from separating and should the shell explode under these conditions, the pressure from the bases is slowly lost without ejection of the seat.

Trainee Indoctrination

Indoctrination of Air Force personnel in the use of the ejection seat includes a discussion of the problems of escape and a showing of the training film (TFI-4680) which demonstrates conditions and procedures preliminary to and during ejection. The trainees are then taken to the trainer where they are instructed in the proper position and sequence of the various actions required in aircraft and the trainer to eject successfully. The trainee then fires himself after satisfying the instructor that he can rapidly and efficiently accomplish the pre-firing actions in proper sequence.

Before the trainee is in a position simulating that of a pilot actually operating an aircraft the following sequence is performed:

- The trainee enters the seat in a pre-load position. The catapult is armed but a banana pin is left in place, locking the safety that is released by the solenoid.
- The seat belt and shoulder harness are fastened to complete a circuit permitting later release of the firing pin by the instructor.
- The seat is lowered into pre-ejection position in the cockpit by releasing the hydraulic brake and guiding the inner tube of the catapult into the outer shell.
- The banana pin is removed to permit the instructor to operate the solenoid release of the firing pin when the trainee has completed all the pre-fire steps.

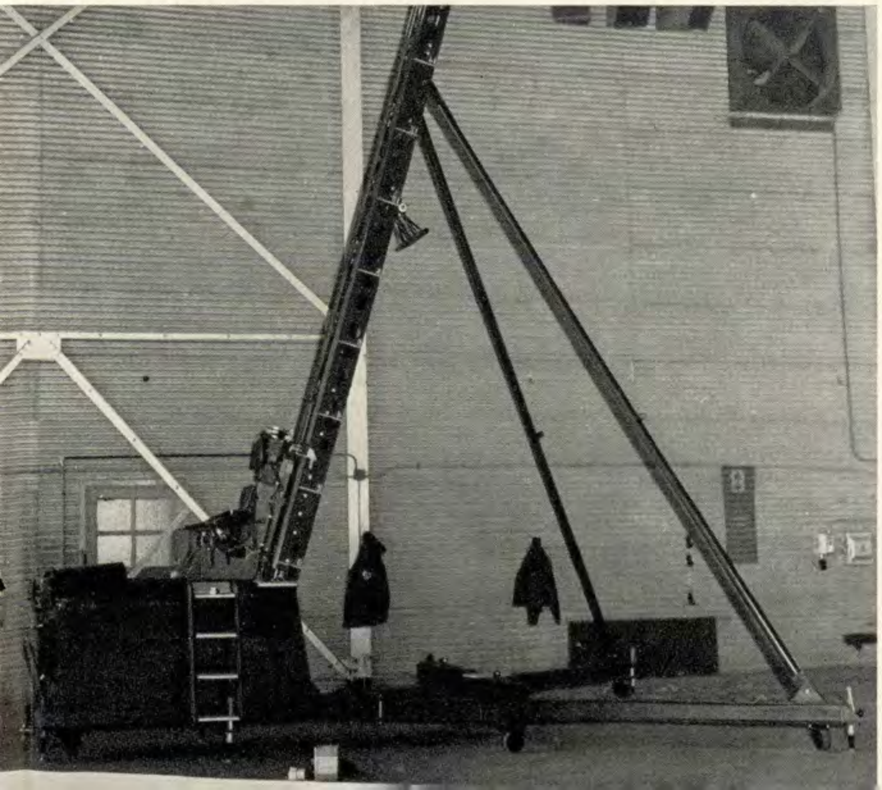
After the trainee is lowered into the proper pre-ejection position in the cockpit, he proceeds to take the following actions which are indicated on the instructor's panel:

- Throttle retarded.
- Oxygen cylinder activated.
- Left arm rest raised.
- Right arm rest raised.
- Feet properly placed in stirrups, head back against head rest, chin in, back straight against seat. (Instructor releases solenoid to permit firing.)
- Squeeze the trigger on the right arm rest until catapult is fired.

• • •

After reaching the peak of its flight up the track, the seat automatically descends slowly to a pre-load position. Subjectively, the sensations are the same as those from a heavier charge in the larger tower or actual ejection from operational aircraft, and the trainee should have acquired a knowledge of procedures and an assurance that the seat will provide an escape at high speeds and high G accelerations without injury. ●

After reaching the peak of its travel up the track, the seat is then decelerated and descends automatically to a pre-load position.



Gunnery techniques have changed since the days pilots exchanged pistol shots in passing. Today, high speeds call for more emphasis on safety.

. . . it takes

THOSE who were there claim that aerial gunnery started one day during the first big hassle when an irate Frenchman splashed a German counterpart with a load of Old Dad's Special Number 7 chilled birdshot. The Boche being somewhat annoyed by such unorthodox behavior, responded by emptying his Luger clip after the retreating Frenchman, and the fight was on.

In those pioneering days safety consisted mainly of staying in the animated box kite after blasting off both barrels of the old twelve gauge. Later, when they got around to using a Lewis, the main safety problem was to keep from shooting off your own prop during a dogfight.

As gunnery techniques advanced and aerial and ground practice gunnery ranges were developed, the need for more emphasis on safety became apparent. It was one thing to close on a target at 100 knots or so and quite another as speeds were upped.

In today's aircraft, which are infinitely more complex and employ complicated gunsights, a pilot approaches his target at high speeds. At best he has but a few seconds to sight, fire and pull off before he is right on top of the target. If a pilot waits too long, flies an improper pattern or tries to stretch the regs and SOPs

TWO to tangle!

set forth for gunnery runs, the chances are that he will be involved in a major accident before he knows what is happening. The lucky ones inflict major damage to the aircraft; those less lucky end up as statistics.

100 Major Accidents

In 1952, over 100 major accidents occurred during gunnery practice. Most of the accidents involved collision with either a tow target, a ground target or occurred when the aircraft was flown into the ground after firing; although a few involved collision between two aircraft.

Naturally every pilot wants to get a high score when firing gunnery but when he breaks the rules to do it he is only inviting disaster while cheating himself. Typical examples of these needless accidents show that in every case pilot error was the primary reason they happened.

A typical head-up stunt was pulled by the pilot of an F-86. On his first firing run at a tow target he flew directly into the sun and was blinded. Instead of obeying his unit SOP which stated that a firing pass will be aborted when the pilot is blinded, and completely ignoring the dictates of common sense, this pipe jockey bored right on in. Needless to say, he rammed the target. He broke off only after he had embedded the tow bar firmly in his right wing.

Explaining the accident later, he admitted, "I lost the target in the sun after starting the pass but figured I would be able to see it when I got close in. I never did find it again and didn't know I was close till I felt the aircraft hit something. I lost control after the collision but after a few rolls I straightened it out and got it down." This lad was walking with the angels and didn't know it.

An F-84 received major damage when an over-eager pilot pounded into the target, tearing up the wing and ripping off the tiptank. The pilot violated his squadron SOP by holding his fire until he was below minimum firing distance of 600 feet.

Competition in the outfit for high score was keen and this joker decided he would really raise his hit total by getting on top of the target before firing. He did; in fact he got so close that when he tried to break away he scored a direct hit he hadn't planned upon, only this one was made with his plane. As a result of his effort to win the competition the accident board recommended that "the Squadron Commander be cautioned to observe carefully the extent of the competition among pilots firing aerial gunnery and temper such competition when it may interfere with safety."

In another accident involving an F-86 the pilot hit the tow bar and cable while making a low angle firing pass. The pilot disregarded the briefing he received before the flight and started firing from an in trail position, out of a long, flat pass.

He opened fire at 250 feet and while he didn't shoot the target off before colliding with it he did manage to scare the pants off the tow pilot. His poor technique and disregard for briefing instructions resulted in major damage to the plane and almost in the loss of another.

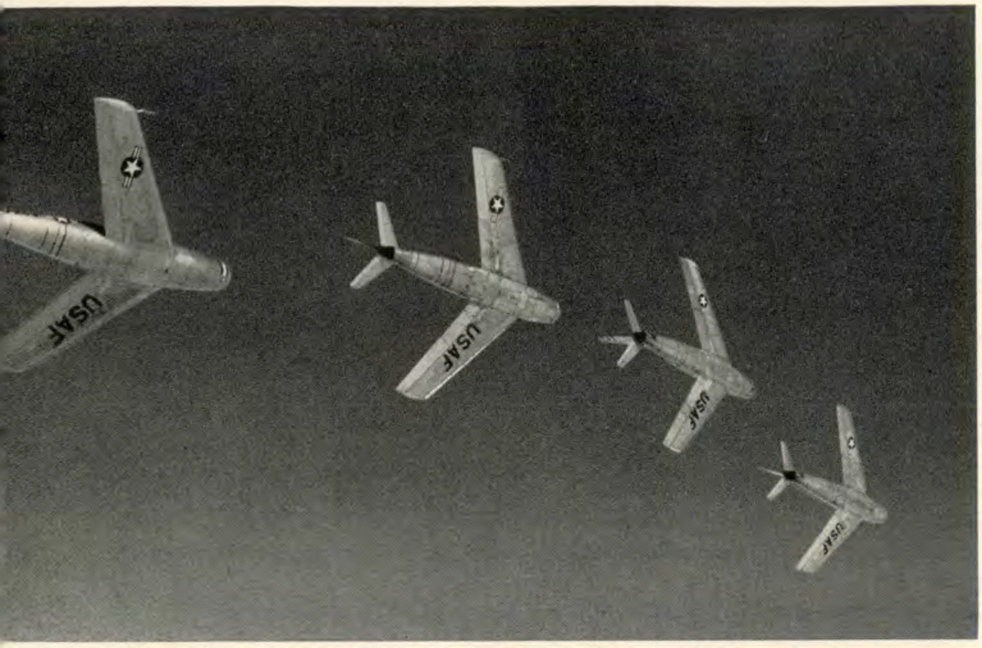
A third F-86 pilot wasn't so lucky. On a ground gunnery mission he flew his aircraft into the ground 1,000 feet beyond the target. On several of his five previous passes he had trouble lining up on the target and had refrained from firing. On the sixth and last scheduled pass the aircraft came in at between a 30 to 35-degree angle, dive brakes weren't used for recovery and no attempt was made to pull out till well below minimum altitude. Investigators concluded that the pilot badly misjudged his distance above the ground, probably due to over-eagerness to expend all the remaining rounds of ammunition. Another case where a stretched regulation ended up tragically.

Misjudged Altitude

An F-51 jockey was more fortunate after trying for a high score by pressing his attack in too close to the target. He stated that he was very anxious to get a high score and misjudged his altitude, starting the pull up too late. He slammed into the top of the ground target but was able to keep the aircraft flying and got home, with a badly damaged plane.

Another F-51 also figured in an unusual target collision accident. The pilot had made several passes and evidently had frayed the cable on one pass. He then made an extremely poor pattern and ended up flying straight and level behind the target and tow ship. Instead of breaking off as briefed to do on poor passes, he closed in on the target. However, before he could fire the cable parted and the target hit his plane. The major damage to his aircraft would have been averted if he had followed his squadron SOP, written for his safety.

In a similar accident another F-51 was badly damaged when it collided with a shot off target. The pilot went in too close, shot off the target and



Principal cause factors in aerial gunnery accidents are poor gunnery pattern techniques and failure to obey gunnery SOPs and regulations.

then decided to break down and away instead of up. As he started his break the tow cable parted and the target fell down and away, proving the old adage that two objects can't occupy the same space at the same time.

In-Trail Position

Another jet boy who conclusively demonstrated that he had his mind elsewhere than on his business was the F-80 driver who hit a target while in an in-trail position.

He stated, "I *guess* I made a poor pass because I ended up directly in trail with the target. I lost sight of it but thought when I closed in I would be able to see it again." Unfortunately for himself and his aircraft he didn't until he was too close to avoid hitting it. Accident causes were listed as poor planning, poor judgment displayed by the pilot in not aborting the pass after losing sight of the target, and misjudging his distance and angle of attack.

An expensive accident to another F-80 came about in the same way when the pilot decided to fire up the tail pipe of the tow ship.

He also got in trail with the target but claimed that he could see it all the way. Despite this, he fired when directly behind and within 200 feet of the target. He continued on until hitting it, lost control of his aircraft and narrowly averted crashing before regaining control.

Several accidents were caused by a pilot taking his eyes off the target at the last moment, usually by putting his head in the cockpit.

In one, the pilot of an F-51 made a sighter pass and then proceeded to make a firing run. After entering into the pass he looked into the cockpit to change the gunsight switch. Seemingly, he found something sufficiently diverting to hold his attention until he felt a hard jolt. The jolt turned out to be the tow target. He managed to add a few gray hairs to the tow pilot's thatch as he was unable to regain control and break off until he had barely missed the tow plane.

Sweating It Out

An F-94 pilot found it necessary to sweat one out the hard way when his vision was obscured by sweat running down into his eyes. He had been having touble getting positioned and had been making all his passes too close and at too low an angle. The tow pilot warned him several times about getting in so close at an improper angle.

Finally, he decided to stabilize the gunsight by depressurizing the cockpit at an altitude of 12,000 feet. It soon became very warm and he started to sweat profusely. The perspiration ran into his eyes and while in his next pass he used his right arm to wipe his eyes while flying with his left hand. He had trouble clearing his vision and lost sight of the target but made no attempt to break away. While still trying to regain full sight he hit the target and cable, which became embedded in the wing.

Another head-in-the-cockpit deal ended when an F-86 crashed while on a ground gunnery mission. The pilot made two dry runs, claiming he was having trouble holding his sight on the target. On his third run, he called again and said he would readjust the sight and make it a dry run. Instead, he started firing when very close to the ground and flew the aircraft so low that recovery was impossible. Investigators concluded that he had become preoccupied with the sight and didn't realize his altitude.

Occasionally, supervisory personnel contribute to these accidents by not enforcing regulations or by allowing inexperienced pilots to fly gunnery before they are ready.

A case in point occurred when a relatively inexperienced pilot received a brief checkout in an F-84 and then was sent on a strafing mission.

During the checkout period his instructors noted that he was a slow student and seemed unsure of himself in certain phases of the training. Despite this, he was scheduled for ground gunnery training.

During his first strafing mission he was repeatedly warned to adjust his pattern as he was far too low and slow on his base leg and when turning onto the final.

Finally, he made an especially low turn at an obviously low airspeed and flew the aircraft into the ground several thousand feet short of the target. Observers stated that he had evidently put his head down in the cockpit and didn't look up until it was too late to effect recovery, as the aircraft came in at a steep angle, with no attempt made to pull up until just prior to hitting the ground.

Supervisory personnel and flight leaders also come in for a share of the blame on these accidents. The findings of a study of ground and aerial collisions made by the Directorate of Flight Safety Research, showed that published procedures for aerial gunnery and simulated fighter attacks are not being enforced by flight leaders and supervisory personnel. The study recommended that these procedures and simulated attacks be reviewed for safety by commanders and that supervisors and flight leaders be required to thoroughly brief pilots for these missions.

If the day ever arrives when you have to bail out of a Bravo 25, you had better . . .

know BEFORE you GO!..

In some B-25 administrative aircraft seats forward and aft of the rear hatch preclude an SOP for bailout.

THE SUBJECT OF PROPER bailout procedures in B-25 airplanes has arisen on numerous occasions, all of which have not been exactly auspicious. The Bravo-Two-Five, in addition to being used as a trainer, is doing yeoman service in many commands as a transport. To say that most B-25's are getting a bit long in the tooth is somewhat less than an understatement, and there have been times when passengers in this usually reliable beastie have looked frantically for an exit from which to drop into the vastness below.

Even pilots who should know better have suggested under duress of emergency, that they were "just about ready to go out through the top hatch." The plight of the passenger, who more often than not—is a non-rated type, can be appreciated. In the absence of an alarm bell, when the crewchief worms his way through the tunnel and suggests leaving the machine for greener pastures, the passenger is likely to stagger around the aft section like the proverbial blind dog in a meat house, hunting a way out. Even when he finds it, he doesn't know what to do with it.

This lucid presentation of the problem at hand, is primarly directed to the *passengaire*. Pilots will do well to spell out the longer words, because from the ample quarters of the flight deck, it is awful easy to panic out through the roof. The result of this act is a sharp blow across the *derriere*, inflicted by the rudder section, which renders an otherwise safe parachute landing null and void.

In leafing through the compendium of the Dash-One on the B-25, we come to Section III, "Emergency Operation." On the first page is a large drawing. The arrow points right down to the top hatch, and the "balloon" says, "*Do not, under any circumstances, use the pilot's escape hatch for emergency exit in flight.*" This hatch is used primarily for crawling out of, red faced, after you have landed with the gear retracted.

As anyone should know, there are only two holes for in-flight bailout, the front hatch and the rear hatch, both located on the floor of the machine. The front hatch has an inner door, accordion hinged, and on many administrative models, the rear hatch also has an inner door. These doors must, of course, be raised before the escape hatches can be jettisoned for bailout purposes. Therefore it is not good practice to stow luggage atop this inner door. It only adds to the confusion.

When the decision to abandon the airplane has been made, the pilot, if possible, reduces the airspeed to 170 miles per hour. He trims it slightly nose down, and points the nose for an open, uninhabited, and preferably flat, area of the countryside.

At this point, we digress slightly. Ordinarily, there is an alarm bell system installed in the B-25. It should be tested during the preflight check, and explained to the passengers. The bailout signal is three short rings for the stand-by, and one long ring for the actual jump. However, as an added safety factor, it is imperative that at all times during flight, one passenger in the aft section keep the earphones on his head, and listen for instructions via the interphone.

Another safety point. If the aircraft is in such distress that the hydraulic pressure is lost, those bomb bay doors are going to drop open as far as two-thirds full travel. If you still have hydraulic pressure, make sure that the bomb bay doors are closed before you try to bail out from the forward hatch. If the doors won't stay closed, drop them full open, as the danger of striking them is lessened if they are down full travel. We can say without contradiction that striking the edge of a bomb bay door at 170 MPH is similar to falling on a picket fence.

Bailing out from the forward hatch takes a little clear thinking, and some prior planning. First you open the inner door. Do this before you jettison the hatch, as a vacuum may be set up which could keep the inner door from being lifted.

The next step is to stand at the forward edge of the hatch, facing the rear of the airplane. Crouch down, and put your hands on the rear edge of the hatch. Roll out head first through the hatch, using your hands and arms to protect your face. All this after pulling your parachute leg straps good and snug. (We have assumed, of course, that you wear your parachutes at all times in a B-25.)

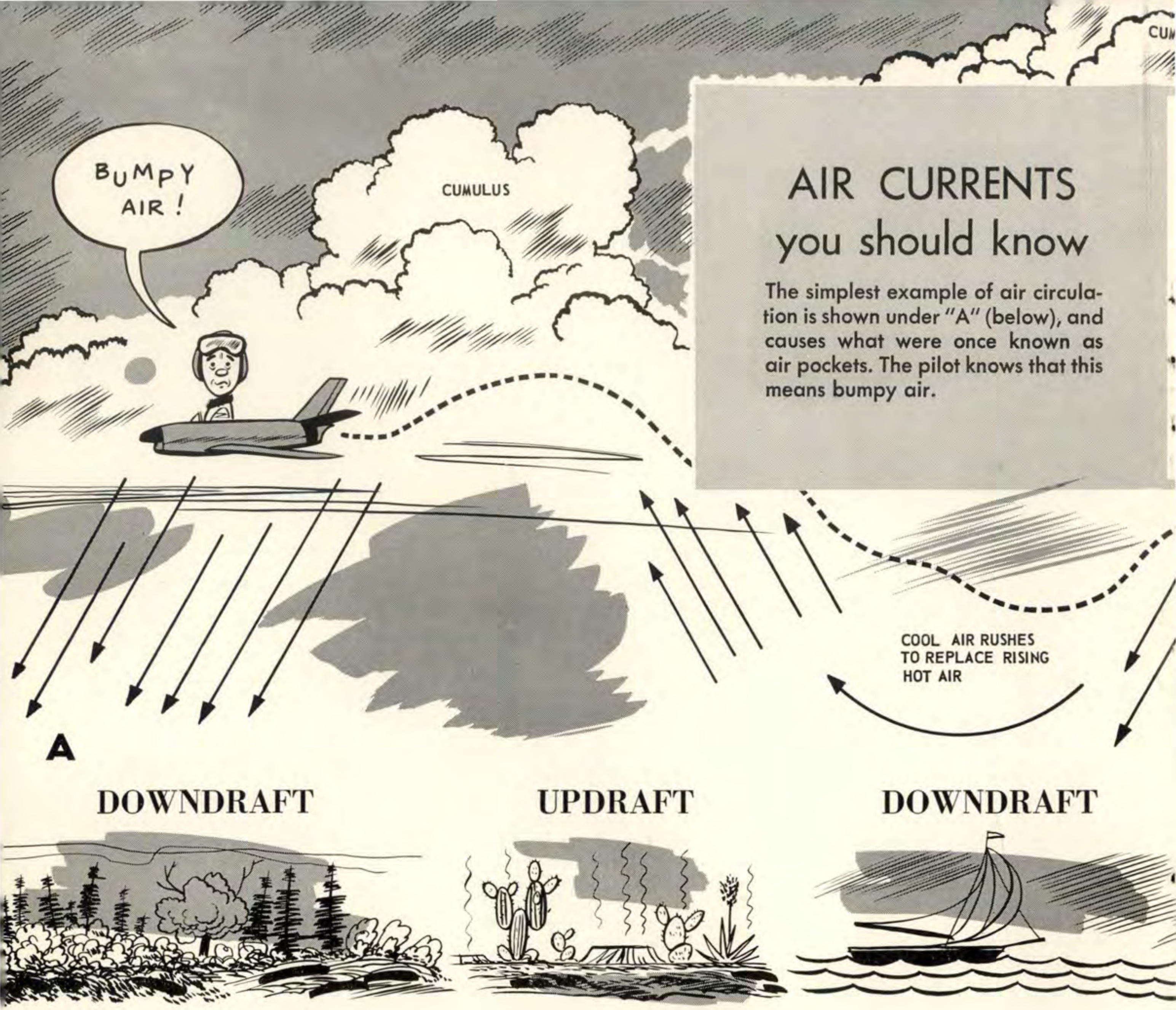
In bailing out from the rear hatch position, a slightly different procedure is recommended. After opening the upper door, and jettisoning the hatch, squat down at the rear edge of the hatch, grasping the edge of the hatch with your hands, and facing the front of the airplane. Using your hands as a pivot, roll through the hatch head first, and drop through, keeping your head tucked well down on your chest, and your hands clasped under your knees. Freefall for at least three seconds before you pull the D-ring. Best way to do this is to count, "one thousand one; one thousand two; one thousand three," and then pull the ripcord.

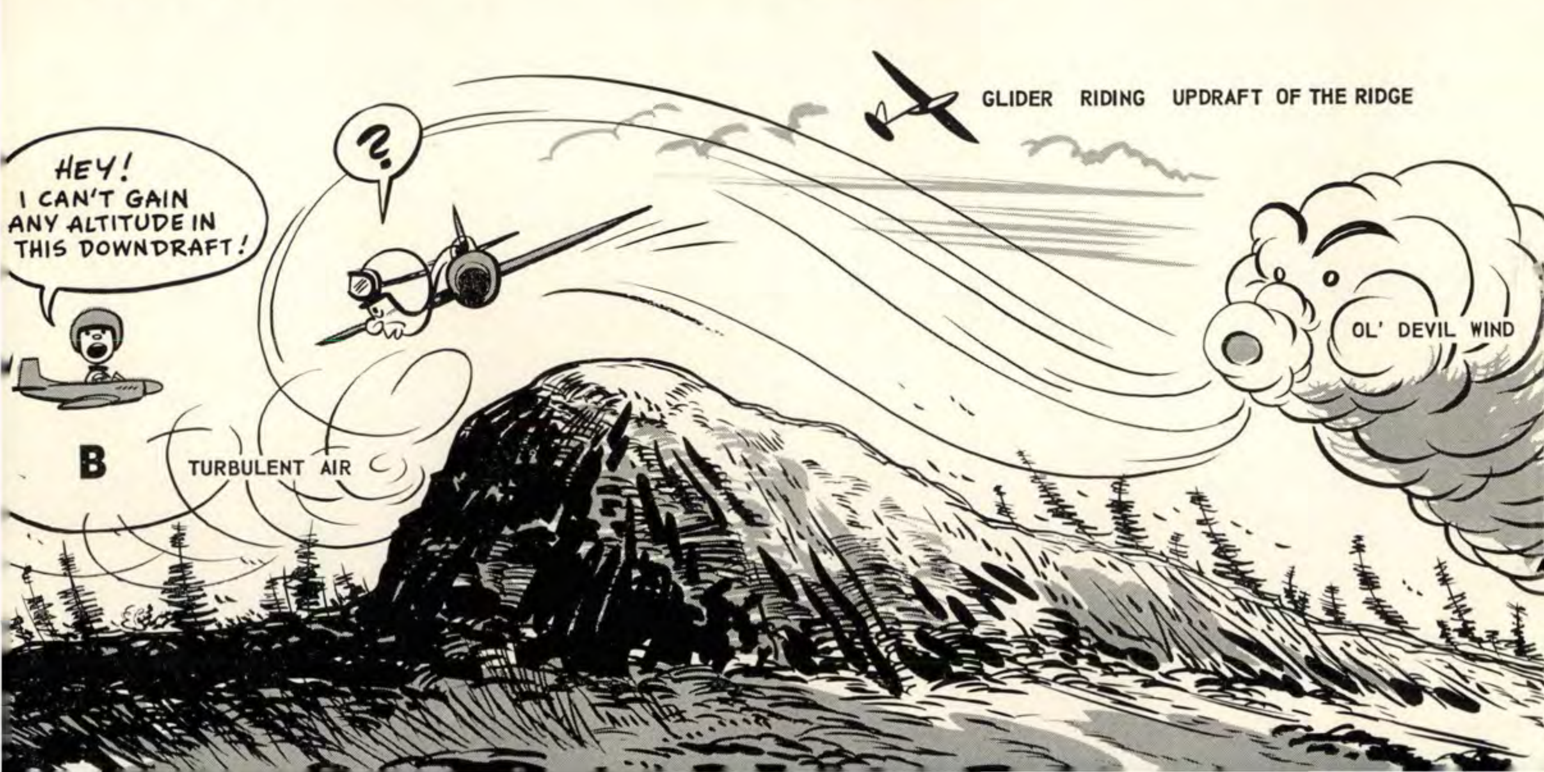
Knowing your way out of an airplane, coupled with proper chute adjustment, and an understanding of how to strike the ground will preclude injuries, and result in an easy landing, only slightly harder than jumping off Mom's icebox or the woodshed roof.

Thousands of soldiers have jumped out of airplanes with nary a scratch, so there's no reason why you can't do the same . . . PROVIDED you know what you're doing, and keep clear of the panic button. ●

AIR CURRENTS you should know

The simplest example of air circulation is shown under "A" (below), and causes what were once known as air pockets. The pilot knows that this means bumpy air.



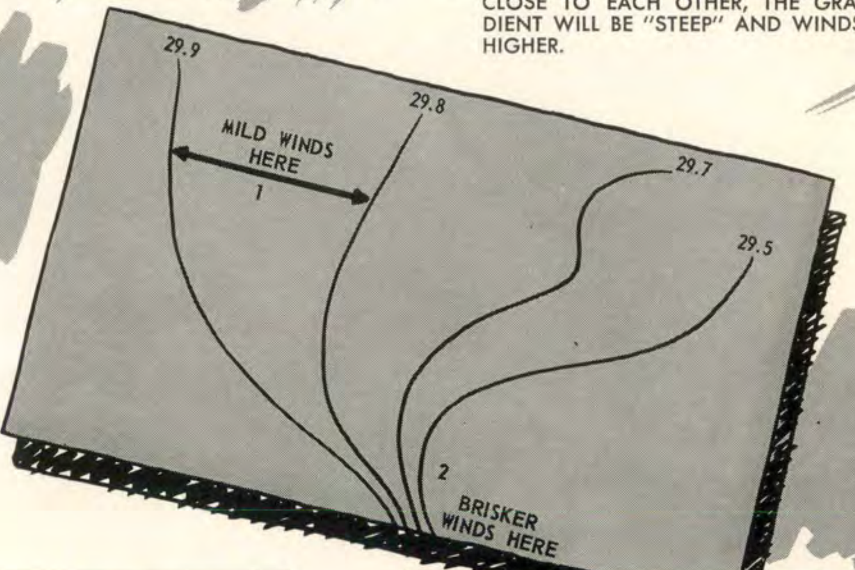


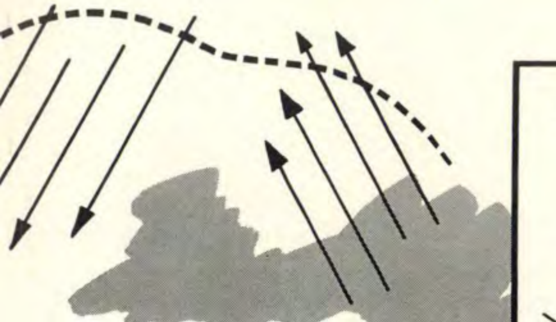
Moving air will follow the contour of the land over which it flows. When air flows over a mountain it makes a turbulent waterfall effect on the lee side. Note "B".

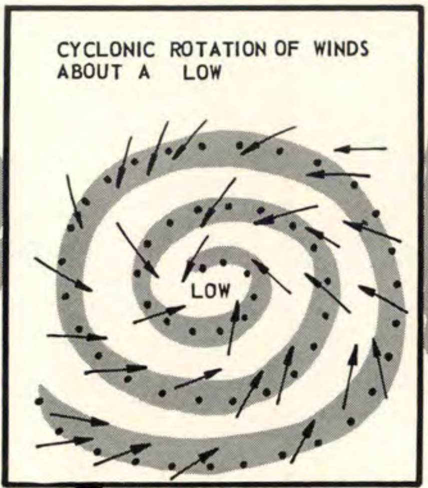
The disturbance between high and low pressure areas always results in barometric argument, and the high usually wins (Note "C").

1 SHALLOW GRADIENTS SHOW MILD WINDS.

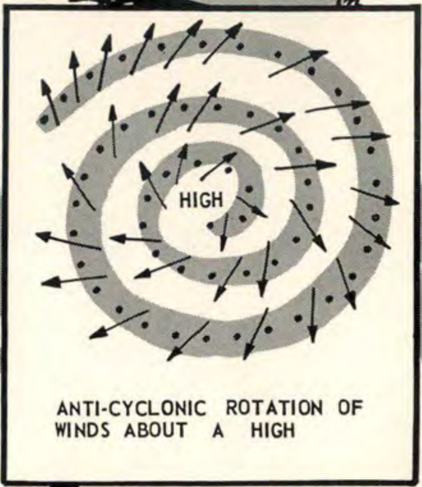
2. IF WEATHER MAP'S ISOBARS ARE CLOSE TO EACH OTHER, THE GRADIENT WILL BE "STEEP" AND WINDS HIGHER.





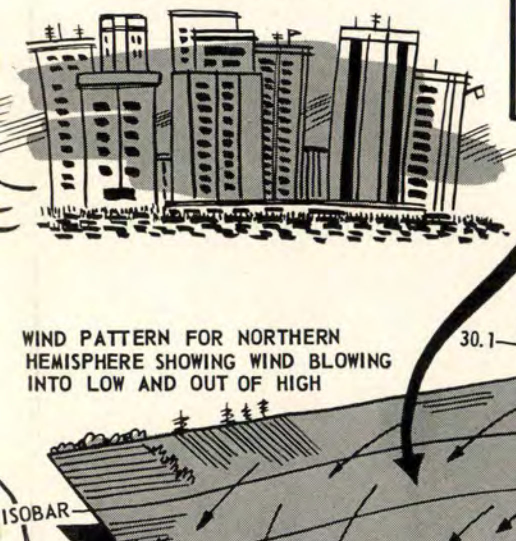


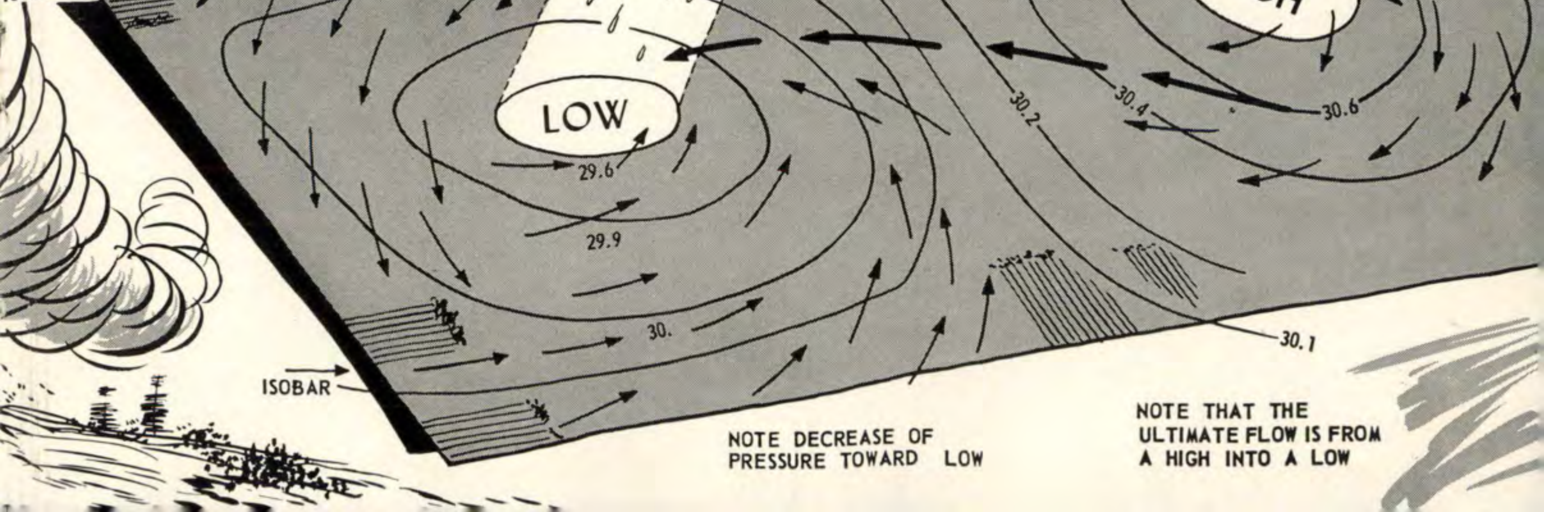
NOTE: WIND IS INWARD AND ANTI-CLOCKWISE.



NOTE: WIND IS OUTWARD AND CLOCKWISE.

UPDRAFT





WIND PATTERN FOR NORTHERN HEMISPHERE SHOWING WIND BLOWING INTO LOW AND OUT OF HIGH

NOTE DECREASE OF PRESSURE TOWARD LOW

NOTE THAT THE ULTIMATE FLOW IS FROM A HIGH INTO A LOW

The giant eight-jet YB-52 is undergoing additional test programs.

SHAPES IN THE SKY OF TOMORROW

By Flight Lt. D. G. Bailey, RAF Travis Air Force Base, Calif.

IT was plainly obvious at the conclusion of World War II that for several years at least the heavy type aircraft of the United States Air Force and Royal Air Force squadrons would be of the type that saw front line service from the early 1940's.

The USAF had its trusty B-29, the RAF its Lancaster; but these types were not in themselves sufficient for the requirement of the postwar years and the need for aircraft capable of superior performance was met by several products of interim design.

The American B-50's and the British Lincolns, themselves derivatives of the war-time designs, took their places in the front line squadrons and an old American design concept, the B-36, was once again sought out from the designer's cupboard to become a most successful, very heavy, atomic bomber which may well, on its own, have been a reason for deterring the potential aggressor.

So much for the past, now what is to be looked for in the future? New design features have matured into realities and old, hazy mutterings of Mach numbers, compressibility, sweepback, razor thin wings, delta and crescent form wing shapes are now practical facts which should be understood and appreciated by all service pilots who possess aspirations for positions as commanders in later years, and who are destined to partake in the sub and supersonic phase of air power development.

It is both interesting and thought-provoking to study the trend so far in the design features of the heavier type aircraft of the United States Air Force and the Royal Air Force. Both services are receiving, or will receive, aircraft of basically different design. The American designers clearly favor the razor thin, swept-back wing with the jet engines slung under the wing in streamlined pods, whereas the British counterpart favors the faired-in power plant. The American design is proving to be sound and from a maintenance point of view, the "pod" is a very accessible housing for the jet engines.

Mounting the engines in this fashion makes it possible to construct a very thin wing, although this calls for a new home for the under-carriage. Boeing has found the answer by placing the main under-carriage in the fuselage with light, stabilizing wheels outboard where the structural penalty is least.

But why the striving for the thin wing? Because a thin wing combined with sweepback delays the compressibility effect at high Mach numbers and thus makes it possible to achieve a much higher critical Mach number. A disadvantage of the swept-back wing is that stalling occurs at the wing tip sometime before the rest of the wing which makes control difficult at low speeds such as when coming in to land. Furthermore, straight

Above, the XF-92A goes over the top on a test flight.

Flight Lieutenant D. G. Bailey, of the Royal Air Force, is currently assigned under the exchange training program with the United States Air Force. Attached to the 72nd Strategic Reconnaissance Squadron at Travis Air Force Base.

swept-back wings of high aspect ratio, i.e., ratio of span to chord, have certain twisting tendencies. Movement of the ailerons may tend to twist the wing so that the change of lift opposes the control force due to aileron movement and thus reduces control.

The characteristic clean British line which may be found in the newer four-jet bombers such as the Valiant, the Vulcan and the Victor is not without its penalties. A buried engine causes complication and inaccessibility for the maintenance crews, notwithstanding the difficulties of wing construction in relation to bending and torsion. It may well occur that the engine type may have to be changed even before the aircraft is completed and it is easy to imagine the design complications which might arise whilst modifying air intakes, or changing engine position to obtain that final, acceptable center of gravity. The Valiant is an almost conventional looking aircraft, whereas the Vulcan employs the delta wing shape which looks quite odd as applied to an aircraft the size of the B-29.

Perhaps the most interesting shape of all is to be found in the new British Handley Page 80 bomber aircraft which has now been officially named the "Victor." This aircraft has a crescent form wing design and first flew as recently as last December (1952). The crescent form wing allows ample space for fuel tanks, under-carriage, et cetera, in a light, efficient structure with parasite drag kept to an absolute minimum. The angle of sweep back progressively decreases towards the tip, thus permitting the use of high aspect ratio for altitude performance with good behavior at the stall. The absence of the tendency for the wingtips to stall before the rest of the wing naturally gives docility in handling at low speeds. There is much less twisting tendency due to aileron control movement with the crescent wing owing to the reduced sweep back at the wing tips. The large center wing section provided by the crescent wing allows the main load bearing structure to be placed well forward, with the undercarriage and engines tucked in behind. With the main structure ahead of the fire zone the risk of an engine fire proving disastrous is remote.

It will be seen from the picture of the Victor that the flaps are affixed to the leading edge of the wing and that the inboard pair appear to deflect farther down than the outboard pair. Leading edge flaps, it would seem, have an unstable hinge movement—i.e., when deflected up or down they would tend to move to the full limit of their travel. Very powerful, long arm jacks would have to be employed to achieve adequate control over the control surface movement. Leading edge flaps when deflected down increase the camber of the wing at high angles of attack—such as at low speed—and thus afford an increase in lift. When deflected up the leading edge flap would still result in an increase in lift but would also incur a considerable increase in drag, the overall gain being slight. At supersonic speeds the leading edge flap would be much more effective than the conventional flap because the conventional flap normally obtains an increase in lift by raising the pressure beneath the wing; and at supersonic speeds the air under the wing would not be aware of the flap position, whereas the leading edge flap would obtain its function by altering the pressure and flow of the air behind the flap surface. Whether this supersonic advantage would apply to the new Victor, I do not feel disposed to conjecture. . . . It may be that this new crescent wing bomber will fly at very high *sub* sonic speeds in order to force attacking aircraft to fly through the sonic barrier hazard in order to obtain enough speed to enable them to position for attack.

Of one thing we may feel sure. Whatever the wing plan—may it be delta, swept-back with high aspect ratio or crescent form—the aircraft will be basically the same to handle as the "has beens" of today. Sub and supersonic aircraft must be easy enough to fly so that the normal, average and well trained service pilot can "tailor his touch" to the new type after a short period of transition training. In operating such aircraft the younger service pilots may well find that they have responsibilities far more heavy to shoulder than their counterparts of yesterday, and their decisions will have to be right the first time, as the margin of error will be very small. Surely, it is in their interest to study, think and discuss tomorrow's air—before the dawn has time to illuminate it. ●

SUIT FOR SURVIVAL

Don't wait till you hit the drink to try this suit for size—you can get awfully wet in a hurry.

. . . Out of the plane

. . . Into the water.

. . . Into the "bird."

"MAN, dig them crazy coveralls!"

This might be a bopster's approach to the M-4 anti-exposure suit, but you, my friend, had better start digging the instructions on the correct way to fit and wear this drape shape before you become swayed and greyed!

This contraption, known to the trade as Suit, Flying, Anti-exposure, M-4, consists of an insulating liner, or sort of long-drawers effect (sans drop-seat), and an outer covering of watertight material. In this chic number, the boots are securely attached to the pants cuffs with cement, achieving an airtight effect, frowned on by Dior, but blessed by flyers who abhor seawater seeping into their socks!

Note of Warning

A note of warning is sounded here. Be sure that the supply people know the correct boot nomenclature and can identify it correctly; otherwise, it just won't work. One of FLYING SAFETY's editors recently spent several musty hours culling through dozens of pairs of variously designed boots before it was discovered by the warehouseman that nobody in the place knew just exactly what the boot looked like. The M-4 suit isn't worth a square tissue paper without boots that can be sealed on!

The correct boot for the M-4 anti-exposure suit is the Type 4 boot, developed from a combat infantry model. This boot is worn over a light or medium sock *only*. Do not wear heavy wool socks with this boot. The boot has a sealed air chamber for cold protection, and this chamber expands with increasing altitude. There is a valve on the boot for venting to relieve discomfort at high altitudes.

Sizing and Attaching

It is most important that the wrist and neck sizing and the attaching of the boots be done correctly, or the suit is useless. These nine cardinal rules should be followed in order to obtain watertight suit integrity:

- Always apply three coats of cement to a fabric surface.
- Always apply two coats of cement to a rubberized surface.
- Always allow one-half hour between coats for proper drying.
- Never skimp on coats of cement. Use it with a lavish hand.
- Never join two wet surfaces.
- Never join two surfaces until they are "tacky" (sticky).
- Always roll finished seams with a slow heavy pressure.
- When separating two surfaces that have been cemented, always brush Ethyl Acetate into the area to be separated.
- Always use powder (talc) on a surface when you have finished working with it to prevent it from sticking to another surface.

Whenever you are issued your exposure suit, be sure that the wrist and neck seals are correctly fitted to your individual measurement. A rule to follow is to take your neck circumference, subtract $2\frac{1}{2}$ inches from this figure, and divide by two. This will give you the proper neck circumference for your suit.

Care of your exposure suit is also important. It should be stored in a cool, well-ventilated place, never in the sunlight. Never try to make repairs to major damage. Turn in the suit, and be on the safe side. It is practically impossible to make watertight repairs of any sizeable nature.

So much for fitting the Mark IV.

Now, let's look at the business of wearing the suit. The first step in achieving the "Man from Mars" effect, is to don a suit of heavy woolen underwear. Over this goes your anti-G suit, if you usually wear one. As we said, be sure your socks are light or medium weight, and be sure to pass the G-suit hose through the opening provided in the liner. Then don the outer suit.

When you put on the outer suit, be sure to powder your hands and wrists well with talcum powder so your hands will slip through the holes easily. You get into the outer suit by spreading the suit in front of you, and putting your legs through the entry opening. Pass the G-hose through the left side of the suit. Insert your arms into the sleeves by putting the entire left side of your body into the suit first, and then the entire right side of your body. Grasp the neck seal firmly in both hands, spread it apart, and pull the seal over your head. Be sure that this seal lies flat against your neck. This goes for the wrist seals, too.

A word of caution. When you come to the boots, *pull* on the boots, and not the fabric garment, lest the seal break loose. Another warning . . . when you put on this suit, DO NOT PULL on the entry canopy material, but on the suit fabric itself.

On the M-3 modified suit fasten the middle (colored) snap of the inner entry portal and then secure the other six snaps. After you make certain that the inner snaps are secure, roll the portal canopy as tightly as possible by grasping the winding strips near the end.

When the canopy is completely rolled, fasten the outer snap in place. All M-3 suits are equipped with "DOT" snaps on the outer flaps, and these will close only in one direction. The M-4 suit closure is similar to that of the modified M-3, except that the flap is closed with two slide fasteners. This flap is closed by first zipping the lower zipper, and then the upper zipper. Be sure to fasten

Arms are stretched high as leg length is measured in fitting anti-exposure suit.

the G-sleeve over the aperture. Now, put on your Mae West, parachute, and para-raft assembly.

Suits Have Buoyancy

Both the M-3 modified and the M-4 suits have a lot of positive buoyancy. This is due to the air that is trapped in the suit, the boots, and the insulating liner. The suit reaches zero buoyancy only when completely full of water.

If you go down in the drink, to facilitate swimming get into an upright position and release the trapped air by stretching the neck seal. If your suit is not torn, you will not need your Mae West.

The suit will permit exposure to seawater at freezing temperatures for approximately one hour. If you can keep your head warm, this time can be extended. Make use of your inner helmet and parka hood, and keep your head out of the water. Also, remember that your quick-donning exposure mitten gives protection for one hour before numbness occurs.

For survival on land, the suit assembly will give protection in subzero weather for an extended period of time. The Type 4 boot has been tested to minus 40 Degrees F., and is a comfortable walking boot, if properly fitted. The wrist and neck seals will continue to give protection on land, but if you get too hot, cut away the seals and replace by wrapping your neck wrists with torn strips of parachute cloth. ●

It pays to wait for your IFR clearance. If the weather is doubtful, stop and consider ALL the weather factors involved enroute.

. . . file and fly I F R . . .

"COLLISION with hill, primary cause, pilot error."

This was the conclusion reached by the investigating board as a result of a recent major accident caused by a pilot's failure to use prior planning and good judgment during doubtful weather conditions.

However, there is much more behind this brief conclusion, "Collision with hill." Let's go through the accident report and look at the tragic facts leading to this accident.

The pilot of the aircraft landed at a municipal airport after completing the first leg of an instrument proficiency cross-country flight from his home base, less than 100 miles away. After filing his clearance for the return flight, the pilot and his student boarded the airplane and taxied out to takeoff position. He had filed an IFR clearance, and had requested a return route via airways part of the way, and direct to home base for the remainder of the flight. Air Traffic Control was unable to approve the clearance as requested by the pilot, and issued the following clearance:

"Proceed to Sugar Radio, via Amber 1, Blue 14, ultimate route to be via Los Banos fan marker and Evergreen marker."

Since the pilot did not have enough fuel aboard to permit flying this route, (remember he had landed at a municipal airport where military service was not available), he did not accept the clearance. He taxied back to the line and managed to refuel on an emergency basis, anticipating that his subsequent clearance would be the same. After refueling, the pilot taxied out to position and requested another ATC clearance. The pilot was advised that ATC was not accepting any inbound flights for approximately one hour because of two existing emergencies. The pilot returned to the line again.

About two hours later, ATC advised the local tower that this particular aircraft could taxi out to takeoff position because an immediate clearance was available. At this point the tower advised ATC that the pilot had decided to return to his home base VFR. Here is where impatience undoubtedly entered the picture as a contributing factor. Weather at destination at this time was 600 to 1000 feet, visibility two to five miles.

At about 1600 hours the pilot departed from the municipal airport for his destination. At 1645 hours, the pilot called Approach Control at his destination, and reported that he was holding on the Northwest leg of the destination radio range, VFR at 2000 feet. He asked for further instructions from ARTC.

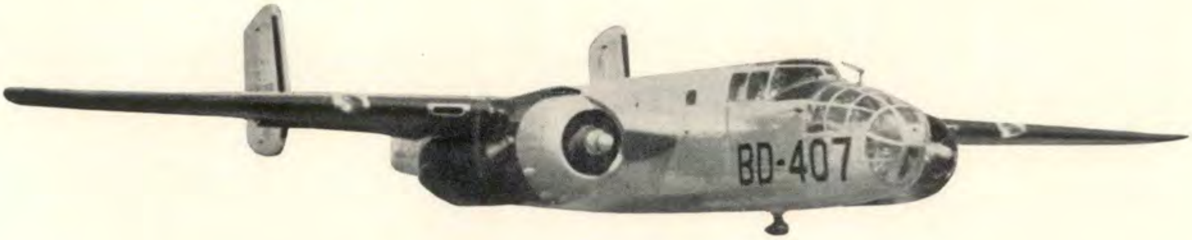
The pilot was advised that a clearance could not be issued at once, and he was instructed to remain VFR, and not to climb due to traffic in the immediate area. A few minutes later the pilot called Approach Control again, and reported that he was holding VFR in a *large hole in the clouds.* He added that this hole was closing up, and again requested instructions. It appears that an element of panic started to creep in at this point. The pilot was again advised that he could not be given a clearance, and again was advised to hold VFR and not to climb. *At no time did this pilot declare an emergency.*

A few minutes later, approach control tried to contact the pilot, but all attempts were unsuccessful. It was later discovered that the airplane had crashed about ten miles from the range station, on the Northeast course of the radio range.

It was the opinion of the investigation board that the pilot thought he was on the Northwest leg of the range, when he was actually on the Northeast leg of the range, and failed to maintain sufficient altitude to clear the terrain in that area.

The conclusion of the board was that the primary cause of this accident was the failure of the pilot to wait for an IFR clearance. The pilot also failed to consider all the weather factors involved, once he decided to clear VFR. When the pilot saw that VFR was difficult, if not impossible, to maintain and when he was not able to get an immediate IFR clearance, he should have declared an emergency right then and there. What the pilot failed to remember is that when the emergency presented itself, he should have *without delay* advised the controlling agency in such a manner as to leave *no doubt* as to the gravity of the situation.

Remember, that when you declare an emergency, or advise that an emergency is imminent, ATC will give you a Number One priority. While it is true that many pilots have an aversion to declare an emergency, based



Sometimes it pays to take it easy. In marginal weather ATC may get overloaded with traffic and hold up your clearance. Don't try to save an hour and end up losing years by switching to VFR to expedite your take-off.

no doubt on false pride, two other pilots had declared emergencies that very afternoon in the same area.

What pilots should keep in mind is that it is often impossible for the controlling agency to issue routine IFR clearances on short notice in areas where there is a high concentration of instrument flight activity. You should remember that a request for an en route change of flight plan from VFR to IFR should be made far enough in advance to insure a return to the point of departure, or to an alternate *before* the emergency is there staring you in the face.

AF Reg 60-16 definitely states that in order to aid in the establishment of a traffic sequence by ATC, and to prevent delays in departure of IFR traffic, operations personnel will, *if requested by the pilot*, transmit a proposed flight plan to ATC centers at any time within two hours prior to the proposed departure of the flight. In such cases the pilot of the aircraft will be required to obtain his ATC clearance within one hour of the proposed departure.

Remember that whenever you enter an area of high traffic density such as is usually found around metropolitan areas, when weather sets in you are going to be in the middle of a rat race because you have not only scheduled commercial aircraft clearing into the control area, but you will probably find a private pilot or two tooling around in the overcast.

In this story, the pilot not only used poor judgment, lacked sufficient preplanning, but was evidently smitten with "homewardbounditis," plus a false pride which precluded his calling for an emergency.

Some AF commands have found that it actually cuts down the time element if the pilot files his IFR, and waits on the ramp until ATC clears him. It is then only a simple matter to taxi out and take off. Holding time in the slot is reduced; it is easier on the engines and it saves gasoline . . . to say nothing of an occasional neck.

This accident was needless. It was 100 per cent pilot error. It can't be blamed on the forecaster, the airways facilities, navigation aids, or mechanical failure. To make the story more amazing, the pilot was an experienced instrument instructor, and was thoroughly familiar with the area around his destination.

There is no explanation as to why this pilot, who certainly by this time could make an accurate range leg identification, should have been holding on the wrong leg, and why he should have been cutting his minimum altitude so thin, when he knew the surrounding area was full of large, solid rocks. We'll never know what went through this pilot's mind, but we do know this, and we pass it on to you . . . Haste Makes Waste Strewn All Over The Surrounding Terrain . . . and if you are in doubt . . . always FILE and FLY IFR.

"Old Dad Says"

- *Plan your flight in advance.*
- *File your clearance early.*
- *Wait on the ramp for your ATC clearance.*
- *Don't be in too big a hurry to get home.*
- *Don't hold VFR in cloud breaks.*
- *Expect some confusion in congested areas.*
- *Be certain of your range leg identification.*
- *Check those rocks underneath.*
- *If in doubt file and fly IFR.*

. . . . *wherefore art thou?*

Even though blessed with new types of navigation equipment and radio aids some pilots still manage to make the same old mistakes that were made back in the road map days of flying.

NOT too long ago, in the infancy of aviation, planning a cross-country flight was considered to be rather elementary. A pilot looked his map over for a likely highway or railroad running in the right direction, found a few outstanding landmarks more or less on course, cursorily checked the weather, cranked up and took off. He usually got where he was going but sometimes he didn't.

Those days of rule-of-thumb and "iron beam" navigation are long gone, fortunately. Today, a pilot or navigator has at his disposal navigational aids ranging from a radio compass to long and short range radar navigation systems. New, improved charts and a vast network of radio facilities have helped make modern aerial navigation a science of pinpoint precision, in direct contrast to the old pilotage system. But, in spite of all the new and improved navigational techniques, nearly four percent of all major Air Force accidents caused by pilot error are attributed to navigational errors. While the overall percentage isn't high, the figure, when converted into terms of loss of personnel and equipment, presents an important picture.

A study of accident reports involving navigational errors for a four and a half year period revealed the following primary cause factors.

- Poor flight planning.
- Failure of the pilot to attend briefings and failure to follow standard flight procedures.
- Poorly computed ETE; disregard of forecast headwinds, frontal conditions and adverse weather.
- Failure to practice cruise control and neglect in determining fuel consumption.

• Poor selection of alternate airports.

• Incorrect use of available instruments and aids.

• Failure to take decisive action in turning back when continuation of the flight must be made under adverse conditions.

• Substandard proficiency and lack of knowledge and experience in navigational problems and procedures.

Many factors contributed to these accidents caused by navigation errors. Pilots were guilty of using obsolete charts, resulting in incorrect radio data. Others neglected to even take charts on a flight. In several instances pilots on a VFR flight plan, flew into instrument conditions without obtaining ATC clearances, even when forewarned that the weather was marginal.

Several major accidents took place after instrument letdown procedures were ignored, and the pilot let down through a hole in the overcast. Other pilots attempted to home in on radio range and homer frequencies without first making sure of identification signals. This, of course, resulted in ending up far off course.

Other cases of poor navigational technique and flight planning include those in which flight leaders inadequately briefed their flights. The flights went IFR direct instead of on airways. They used power settings too high for the distances flown, and they failed to land when they found their fuel low. Frequently a pilot refused to follow D/F steers which would have brought him to his destination. Failure to use all available equipment, and ignorance of procedures were also determining factors in many accidents.

Investigation further revealed that many pilots were unable to orient themselves visually, even with excellent check points available. Testimony during investigation of many of these accidents indicated a definite inability on the part of many pilots to identify features of terrain on aeronautical charts.

Factually, it was determined that in accidents involving navigational error, about 50 per cent occurred after fuel had been exhausted. In jet fighters the rate soared to over seventy per cent; the importance of fuel conservation in jet navigation is best illustrated by the average length of flight prior to the accident being only one hour and 55 minutes.

Weather and night flying have been consistently associated with navigation accidents. Weather was a factor in nearly fifty per cent of the accidents, while forty-five per cent occurred at night.

Violations and supervisory errors also figured prominently in these accidents, contributing a relatively high percentage of the total. Materiel failure was virtually confined to radio failures and to inadequacies of radio range and homers.

The Medical Safety Division, Directorate of Flight Safety Research, has made several recommendations aimed at eliminating these needless navigation accidents.

Primarily, it has recommended that more stress be given to navigational proficiency of all kinds. A pilot should not be considered adequately trained till he is proficient in all navigational techniques. Refresher courses should be given to pilots to keep them current in all standard operating procedures, regulations and equipment. Proficiency standards, much the same as present instrument standards, should be established and all pilots required to keep current.

A further recommendation was that a standard operating procedure be adopted for all flights with greater emphasis on factors affecting navigation such as fuel consumption, landing conditions, wind, altitude and turbulence.

Finally, that a more strict adherence to regulations be stressed for routine cross-country and navigator training missions.

Faulty navigation left this iron bird nestled high and dry in the boondocks.

Good Flight Planning

• Check the weather carefully. It is a good idea to get the general weather picture and then obtain specific data as you are ready to enter it on your flight planning log.

• *Departure*—Get all the facts on takeoff, ceiling, visibility, freezing level, temperatures and winds up to flight altitude.

• *Destination*—Get an accurate picture of what the weather is and will be at your intended landing point. Ceiling, visibility, freezing level, tops of clouds and precipitation. From this you can determine whether it will be easy, difficult or impossible to get into the field. If it appears marginal, check the forecast against your ETA to see if the weather is deteriorating or improving and whether or not you can get in.

• *Route*—Determine the best route by studying available information on freezing levels, cloud types at various altitudes, tops of clouds, turbulence or thunderstorms, temperatures aloft and wind.

• *Alternates*—With a definite destination and a definite route picked out, check for alternates. Obtain the same information on alternates that you got for destination. Include a forecast for the alternates for the time you may have to use them and make sure that one will be available if needed.

Flight Plan Information should include wind and temperature data.

• *Wind*—Get wind velocity and direction for each 2500 foot level and compute an average for each 5000-foot level.

At your Flight Service—

Each center maintains a weather display board depicting the latest weather by a system of coded lights.

By Major Frederick H. Fahringer
Hamilton Flight Service Center

"No Emergency Equipment Located on Field—Call City Fire Department —Phone 42—Five Minutes From Field—Ambulance Service to City Hospital—Phone 98—Seven Minutes From Field".

USING the emergency information instantly obtainable from the Field Survey File, the Operations Officer at Hamilton Flight Service Center alerted the Madera, California, Fire Department and City Hospital for the expected emergency landing of an Air Force B-25 at Madera Municipal Airport. As the B-25 approached the Madera Airport, the best equipment in the area was standing by to render assistance necessary.

Lectures assist pilot in achieving accurate and current interpretations of air traffic rules and procedures.

This expeditious handling of an emergency was made possible by the Landing Field Survey Service available from Military Flight Service (MFS).

The eight Military Flight Service Centers comprising the MFS system in the United States screen all landing fields in their respective areas not already covered by other (CAA or Military) pertinent publications and surveys. Fields are then selected for survey according to their location, capabilities for handling military aircraft and availability of facilities.

Every six months a Flight Service officer visits each field selected and conducts the actual survey. The surveying officer personally contacts the airport manager and obtains first-hand information on the status of the runways, hangar space, obstructions to approaches, night lighting facilities, radio aids, and emergency procedures. He then establishes liaison with the airport manager, requesting that the appropriate Flight Service Center be notified if any changes occur in the condition of the field.

These physical surveys, coupled with good liaison, provide Flight Service Operations with immediate, accurate and complete landing field information for emergencies.

One night recently, a CAA Communications Station picked up a "Mayday" call from a military pilot who described his predicament as "lost, and short of fuel." The communications station, unable to establish contact with the aircraft, notified the nearest Flight Service Center.

As an emergency procedure, the Flight Service operations officer immediately checked the "Field Survey File" for all suitable fields along, and in the general area of, the intended flight path of the lost aircraft. From this file he obtained the information necessary to have the field and runway lights of these civilian fields turned on immediately. A short time later the lost aircraft made a landing at one of the "lighted" fields.

An F-51 pilot, with oxygen trouble, ample fuel, radio contact, and VFR conditions, *but* not familiar with this service, made an unsuccessful emergency landing at a civilian field with a dirt runway, 1900 feet long, when fourteen miles away sat 5000 feet of smooth concrete. The field survey file has repeatedly proved its value in aiding lost or distressed aircraft to safe landings at suitable airfields.

Besides its numerous emergency uses, this survey file can frequently take the "strange" out of a "strange field landing."

If your mission requires you to land at an unlisted, unfamiliar airfield, check through your base operations to Flight Service for detailed runway, approach, and communications facilities information. The only thing "strange" about a strange field landing is the pilot who fails to take advantage of this service.

"AF 1234, C-47, Over RBL ALT 10,000 IFR at 08 REQ MFS Advisory, 'Desire Alternate Procedure for Immediate Landing'."

As the Oakland ARTC controller finished relaying this request, the MFS team, operations officer and weather forecaster, swung into action. Within seconds, the requested MFS Advisory was on its way to the pilot. Utilizing the MFS Advisory the pilot made a successful VFR landing thirty-two minutes later.

Although MFS no longer employs "flight following" with automatic advisory service, the capability of issuing advisories has been retained. Any competent authority, such as a pilot, base operations or weather forecaster, can request an advisory.

Each MFS Center maintains a weather display board depicting the actual, up-to-the-minute weather by means of coded lights. This display board gives the forecaster and operations officer a constant over-all picture of weather conditions throughout their area.

Constantly current and instantly available information on weather, landing fields, NOTAMS, and radio aids enables MFS to provide prompt, beneficial advisory service when requested. MFS advisory service is designed to provide the pilot with additional, pertinent flight planning information, not readily available from other sources. When the unexpected is encountered, a working knowledge and prompt, timely use of the Advisory service will go a long way toward reducing the emergency operations of the Air Rescue Service.

"The regulation's been changed since I last looked at it," or "That's not my understanding of the regulation," are still among the most overworked expressions employed by pilots attempting to explain violations of flying regulations.

In an emergency, a survey file is checked for a suitable field in the general area. Below, an MFS advisory is sent out at the request of a pilot.

In an effort to eliminate these expressions, MFS can materially aid Base Flying Safety Officers by an educational program. Such a program is designed to assist pilots and operations personnel in achieving accurate interpretations and understanding of air traffic rules and procedures.

A qualified MFS officer and an experienced CAA representative from Air Route Traffic Control will travel to any military base to conduct a lecture when requested. These lectures include all aspects of military and CAA air traffic control procedures and regulations. If desired, the program may include a discussion period at which time individual questions may be asked. Frequently, Base Operations personnel take advantage of this visit to discuss and coordinate local traffic control problems.

Put the Service in Flight Service! Take full advantage of the readily accessible aids provided by MFS for your convenience, efficiency, and safety. The sky is no longer big enough to take care of "individual" pilots. Today, air safety can be achieved only with expert traffic control and competent, disciplined pilots.

★ ★ ★

Pilot Procedures

If your flight is departing a "P" field, file your flight plan with Flight Service through CAA communications and if it is IFR within a control zone or area, get ARTC clearance.

In leaving "PC" fields, fly VFR to the closest CAA radio and file your flight plan. If it is IFR within a control zone or area, again, call the closest CAA communications station. For a change en route, call CAA radio, if IFR get ARTC clearance.

In changing from IFR to VFR or DVFR, advise the nearest CAA radio or approach control of cancellation of your IFR flight plan *before* departing from the provisions of ARTC clearance. DVFR flight plans will be filed if any portion of your flight lies within or penetrates an ADIZ. To change from VFR to IFR, call CAA radio and get ARTC clearance.

For ADIZ flights, file your flight plan *prior* to takeoff either in writing or by telephone with appropriate aeronautical facility for any flight, all or part of which will be flown in an ADIZ. Designate VFR flights as DVFR, and include route and altitude while within an ADIZ. Do not change your flight plan to enter an ADIZ zone except in emergency. ●

• **117 Soft Landings**—Pictured below is a pair of tires recently taken off a T-33 assigned to the 1002nd Inspector General Group. According to M/Sgt Keck, who crews the airplane, this is some sort of a record, and is certainly a compliment to the ability of the pilots who fly this Thirty-three and to the men who maintain it. In view of the fact that the airplane has been used a great deal of the time for transition work, the 1002nd's policy of thoroughly indoctrinating pilots before and during T-33 transition training seems to have paid off.

We don't say that this is a USAF record but if you have definite proof of a set of jet tires that have lasted longer than 117 landings, give us the ungarbled word, and we'll print it!

• **New F-86-F Wing Design** — Every F-86-F pilot should read and remember this item!

The wing slats that have long been associated with the F-86 have been replaced by an extended leading edge starting with F-86-F-30, Airplane No. AF52-4505.

The root of the new leading edge has been extended forward six inches, and the tip extended forward three inches. This new leading edge improves high speed performance and turning performance.

It is interesting to note that no increase in the maximum obtainable G is gained with the new leading edge; however, the fact that the airplane can more closely approach the maximum G before buffet starts, makes possible better maneuverability at high altitudes. This is because the drag rise incidental to buffet inception is delayed, resulting in less speed loss during flight.

The extended leading edge increases stalling speed and brings about a yaw-and-roll not noticed on slat-equipped airplanes.

The coverage now contained in the February 20, 1953 revision of AN 01-60JLD-1 on this subject will be expanded. The specific differences in flight characteristics between F-86-F Airplanes with wing slats and F-86-F Airplanes with extended leading edges are as follows:

Low-Speed Stall

A yaw, accompanied by a roll precedes the stall on airplanes with the extended leading edge. To avoid this yaw-and-roll tendency, it is recommended that *10 knots* be added to the touchdown speed used with slat-equipped airplanes (120 knots in minimum for extended leading edge airplanes at normal landing weight). Also, note that any G forces abruptly applied during flare out for touchdown may cause a wing to drop. Landing patterns should be widened out with respect to those used for slat-equipped airplanes to avoid dropping a wing on the turns (150 knots minimum at normal landing weight). There is very little stall warning under landing conditions.

NOTE: It is highly recommended that the stall speed chart in Section VI of the F-86-F Flight Handbook be carefully reviewed in order that the effect of varied weight conditions and angles of bank on stall speeds be thoroughly understood.

Buffet preceding an accelerated stall will begin at a higher G on extended leading edge airplanes. There is no noticeable difference in high-speed stall characteristics when above the buffet initiation point.

On airplanes with the extended leading edge, a change in airspeed from trim requires less stick force than on airplanes with wing slats.

Maneuverability at high altitudes is increased on airplanes with the extended leading edge because more G can be pulled before the initiation of buffet. Although the maximum G obtainable (as limited by buffet magnitude) remains unchanged with the extended leading edge, less speed is lost during maneuvers, since the drag rise from buffet is delayed.

On airplanes with the extended leading edge, it is possible to turn in a smaller radius without losing speed as rapidly at higher altitudes. This is because the turn can be tightened considerably before buffet is encountered. For example, at 0.92 Mach. number at 30,000 feet, an additional 1½ G before buffet can be pulled; and at 40,000 feet, additional G can be pulled.

Because of the higher available load factor before buffet initiation on airplanes with the extended leading edge, familiarization with airplane response during rapid pull-outs is recommended, particularly in the medium altitude range (15,000 to 30,000 feet).

The recommended horizontal tail trim setting for airplanes with the extended leading edge is two inches forward of that recommended for airplanes with slats. To trim the horizontal tail for takeoff on airplanes with the extended leading edge, trim until takeoff trim position indicator light is "on" then trim until stick grip moves two inches forward of the trim light "on" position.

WELL DONE!

To 2/Lt. Robert V. Thomas

Thirty minutes out from destination, the right main gear on Lieut. Thomas' C-82-A dropped from the nacelle and hung several inches from locked position. All emergency procedures for locking the gear down were attempted, with full cooperation of the copilot and the engineer.

Although Lieut. Thomas had a total of only 560 flying hours, he demonstrated superior pilot technique in bouncing the left gear on the runway surface hard enough to shake the right gear into locked down position, and made a successful landing without damage to aircraft or injury to personnel. Well done, Lieut. Robert Thomas!

Cross Feed

Cockpit Lighting

After reading Captain Schreffler's article, "Seeing Red in the Cockpit," in the April FLYING SAFETY magazine, I feel I must express my congratulations to the Captain and to FLYING SAFETY for this timely article. I could not agree more strongly that cockpit lighting is badly in need of improvement and has been a contributing, if not direct cause of many night accidents blamed on "pilot technique."

As an oldtimer, I have been very favorably impressed with the work you are doing to try to correct the contributing elements that too often are overlooked in accident investigations. May I let my hair down to mention a few items which I feel have bearing on this problem?

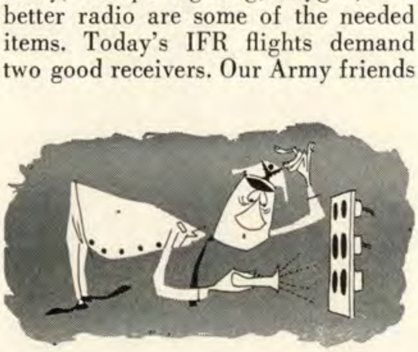
Today, there are thousands of Air Force pilots in staff jobs who are performing "proficiency flying." The aircraft available to us are usually, as Captain Schreffler stated, World War II C-47's, B-25's, C-45's, T-6's, etc. The instrument panel lighting in many of these aircraft is so bad as to put a severe handicap on the pilot performing normal night flying. I feel it actually constitutes a serious hazard to the pilot caught in night weather conditions. Not only are all the defects mentioned by Captain Schreffler true, but are usually emphasized in administrative and proficiency type aircraft. For example, the average B-25 fluorescent lighting is woefully inadequate. On top of bad lighting, all of these old aircraft usually have one or more instruments on which the radium is worn off, making the instrument dim. These are usually the most vital instruments needed for IFR flight. Why they cannot be replaced is beyond me, but it seems they never are.

Then there is the naive habit of hanging the pilot's microphone smack on the front windshield. Here it bobs around and is anything but helpful to the pilot trying to spot an approaching jet, or trying to land in rain, or at night. Yet, nobody can seem to get authority to move the darn thing.

Pilot visibility is also frequently cluttered up with unused gunsight brackets, and other impedimentia. All these things add to the night vision problem. Also, the B-25 has no windshield wiper, presumably because of the curved glass, but plenty of cars and trucks with curved windshields have them, and I don't believe it would be any great task for AMC to design one. The cost compared to one accident is infinitesimal.

Consideration might also be given to some sort of portable oxygen equipment that a pilot could draw from supply, like a parachute. This would help him on IFR flights when he is unexpectedly forced to oxygen level altitudes. It is hard to say when proficiency aircraft will ever be oxygen-equipped, and in the meantime we are all fooling around under marginal conditions, because if we played the game right we would never get off the ground due to lack of equipment in the airplanes. This is particularly true of flights made in the western United States where the terrain altitude is higher.

There appears to be a definite need to bring our World War II airplanes up to a higher standard. Pilot visibility, cockpit lighting, oxygen, and better radio are some of the needed items. Today's IFR flights demand two good receivers. Our Army friends have OMNI in most of their administrative aircraft, yet we still struggle along with a "Bird Dog" and a command receiver, and usually one of these is not working too well.



A partial cure may be more strict inspections, or closer coordination between Flying Safety Officers and inspectors, but I think the real answer is to get somebody with authority to *do something* about the defects which your magazine so ably points out.

Colonel F. H. Colby
AF Liaison Officer
Hqs. 4th Army
Fort Sam Houston, Texas

Magazine "Great Help"

It is felt that your articles in the March 1953 issue of FLYING SAFETY on Weather has good possibilities as instructional aids. Please send us 200 copies . . . to supplement our program at this station . . . if not available we will reproduce locally.

Most of the pilots at this station feel that editions of FLYING SAFETY such as the March 1953 issue devoted to Weather are of great interest and help in extending the pilot's knowledge of weather. This is especially true with the upper air regions as expressed by the pilots flying jet aircraft.

Robert G. Koch, Maj.
Director of Academic Tng.
Bryan AFB

Used as Training Aid

Please send us 200 copies of March 1953 FLYING SAFETY. These additional copies are to be used by the Director of Academics, for the ground school training program.

Roy E. Gardner, Capt.
3615th Pilot Tng Wg
Craig AFB

"Chuck Full"

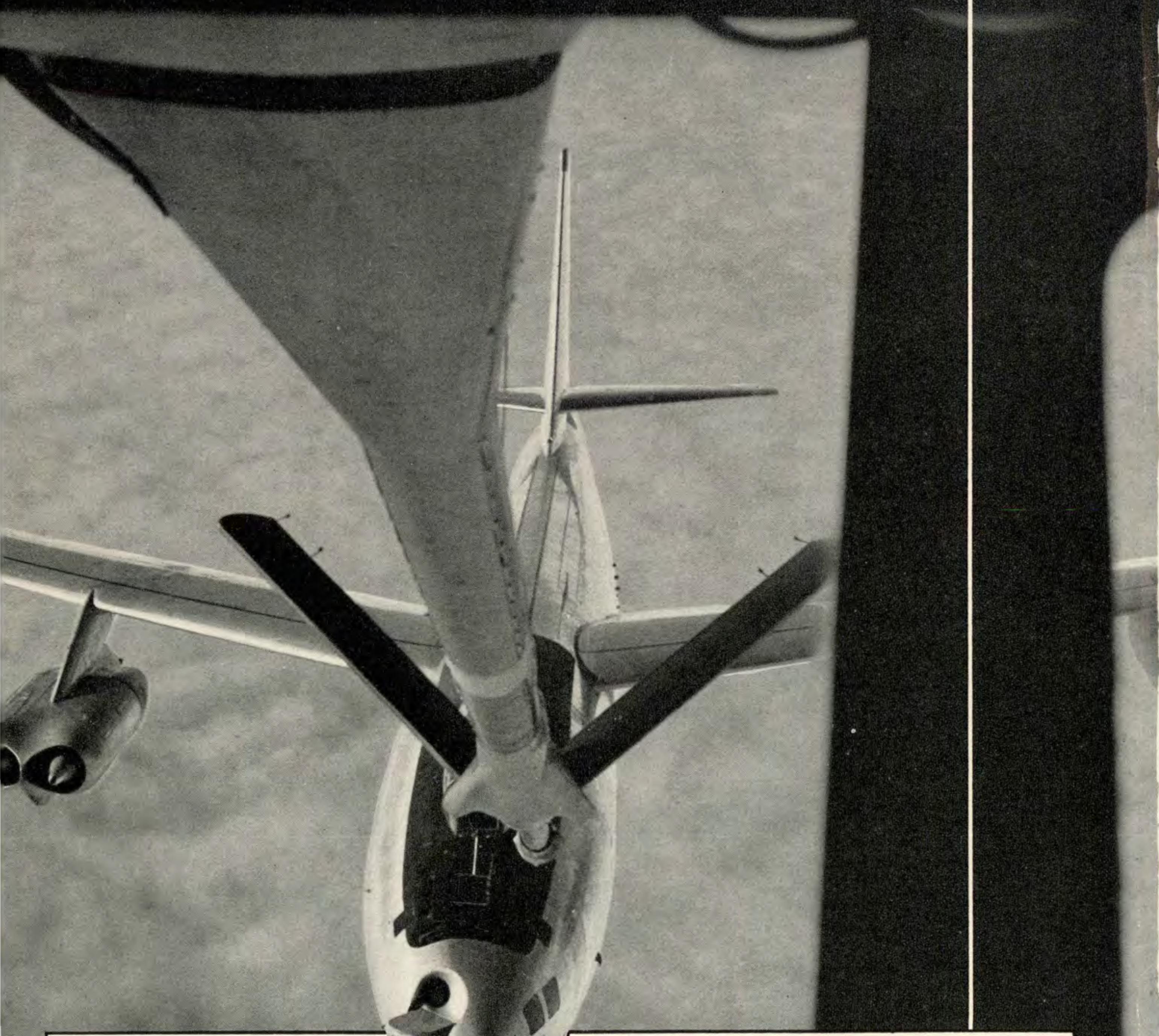
Personnel of this Flight Service Center think your publication is "chuck full" of valuable information.

Vernon E. Bonsett, Capt.
Asst Operations Officer
WPAFB Flight Service Center

Don't Take Off Like a Rocket!

Everyone wants to get where they are going as quickly as possible but the wise pilot makes haste slowly. If the weather is marginal, wait for that IFR clearance from ATC. Don't forget, those ATC boys get pretty busy during bad weather but you will get your clearance as soon as possible. The impatient pilot who switches to VFR to avoid delay may find himself on the receiving end of a large explosion . . . *and end up with a loud bang!*

PIPELINE TO SAFETY



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