FLYING SAFETY

UNITED STATES AIR FORCE

NOVEMBER 1952

TWO TIMELY FEATURES:

- **FLYING THE MOUNTAIN WAVE**
- **THOSE MID-AIR COLLISIONS**

Colonel Kane and his crew pose in front of an early twin-engined bomber.

TEAMWORK . . . a key to safety

Col. John R. Kane

True accidents will be with us a long time. The majority of losses occur through error on the part of some individual. To eliminate these errors, the military organization offers a very convenient instrument whereby a unit can apply assorted pressures on probable offenders. I do not refer to the idea of discipline but to those intangible factors of teamwork which bind a real unit together. It is not a problem of leadership and supervision in the accepted sense. These are only part of the spirit of a unit. It is chiefly a problem of creating a spirit of belonging to the team and having others accept their word or work without question that draws out the best in the men who keep our airplanes flying safely. To me, true leadership brings this into being, not by a magic formula kept secluded in an ivory tower, but by merging with the unit as a whole. The unit then strives to strengthen its weakest links. I may be wrong, for I have observed many individuals progress upward under a different idea of leadership while those who thought as their units have made little progress. Yet despite such fame and glory as men know, I have experienced no greater thrill of accomplishment than when working with men from all races and walks of life in building an organization capable of performing its Air Force mission.

The Mountain Wave . . .

Have you ever heard of a foehnwall, rotor lenticular or mother-of-pearl cloud?

If you haven't heard of these strange-sounding clouds before, read this article right now—because these are the clouds to watch for, and be wary of, particularly during the winter months.

After reading this story, you might be tempted to alter your minimum altitude over mountainous terrain during IFR conditions. As a matter of fact, existing IFR minimums might be changed in the near future, as a result of tests conducted by the Air Force Cambridge Research Center.

Personal Approach . . .

Brig. General Carl B. McDaniel is probably high man on military flying hours. Having logged approximately 14,000 military flying hours, the General should know whereof he speaks when he talks up flying safety. His views and feelings on flying safety are found on page 12.

Your Responsibility . . .

On page 18 we point out again a few of the serious responsibilities which an aircraft commander must assume for the safety of his crew, his passengers and his aircraft. You've heard this, no doubt, time and time again, but according to the statistics, some pilots are still disregarding the advice. Read this and, for pete's sake, remember it!

Share This Copy . . .

When you've finished reading this copy of FLYING SAFETY magazine, please pass it on.

While it would be desirable for everyone to have his own personal copy, economy directs that the distribution ratio be roughly one magazine for each 15 Air Force members.

So, when you've read the magazine, from cover to cover (we hope), pass it on to one of your friends, and — direct his attention to any particular article you liked.

The Cover . . .

The C-119H on our cover is one of the Air Force's newest. You'll find an article about the plane on page 28.

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FLYING SAFETY

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FLYING the MOUNTAIN WAVE

A special research project finds that clouds can be a tipoff to safer flying over mountains

By Carl F. Jenkins
Air Force Cambridge Research Center
Air Research and Development Command

Is 2,000 feet enough clearance over mountainous terrain in IFR weather?

This and many other equally important questions are being answered by tests and experiments being conducted in the "Mountain Wave Project."

Preliminary results of the "Mountain Wave Project" sponsored jointly by the Geophysics Research Directorate of the Air Force Cambridge Research Center and the Office of Naval Research, and directed in the field by the Geophysics Research Directorate, indicate that the generally held conception of the wind flow pattern over mountain ranges is in error. This is particularly true when there is a strong flow perpendicular to the ridge lines, and a mountain wave forms.

• • •

OCCASIONALLY, in the past, we've lost some very experienced pilots and crews due to unexplainable circumstances, apparently for no reason except that they misplotted their positions and flew straight into the mountains while IFR. In some cases, it has been almost impossible to believe, knowing the experience in flying hours and years which these crews had. How could it have happened? All too often, after a thorough investigation has been made, the inevitable answer is: Pilot Error.

Research has now come up with a few more ideas as to possible causes of those accidents. Indeed, some accidents which have been attributed to pilot error for lack of any other obvious cause might have been prevented had the pilot been properly informed of the extreme hazards in flying a strong mountain wave. The severe turbulence, vertical currents, and altimeter errors encountered in the wave combine to form very hazardous flight conditions.

A more complete knowledge, on the part of the pilots, of the flow patterns to be expected under wave conditions may prevent many aircraft accidents in the future.

In a research project, which was carried out in the Sierra Nevadas, specially instrumented sailplanes were used to investigate the wind and pressure fields over mountain ranges when a strong flow existed perpendicular, or nearly perpendicular to the ridge lines.

Conditions were investigated up to a record height of 44,500 feet by use of these sailplanes which were tracked by radar, Raydist and cinetheodolites. The air currents were also investigated by taking time-lapse motion pictures of the associated cloud structures from the ground and correlating these results with data taken in the sailplanes.

Gliders Used

Gliders were used in this project because of their low sinking rate, low speed, maneuverability, and ease of calibration. They can remain aloft for many hours traversing the wave, using updraft areas to gain altitude and, due to their low speeds, can be used to investigate areas of severe turbulence which would severely damage higher speed, conventional aircraft.

There are cloud types which are peculiar to the mountain wave. These are the cap (foehnwall), rotor or roll, lenticular, and mother-of-pearl clouds.

The cap cloud hugs the tops of the

Gliders like this one can remain aloft for hours, gathering important data.

mountains and flows down the leeward side with the appearance of a waterfall. Because it hides the mountains and is in the strong downdraft area on the lee side of the peaks, this cloud is dangerous. The downdraft can be as strong as 5000 feet per minute.

The rotor cloud, which looks like a line of cumulus or fracto-cumulus clouds parallel to the ridge line, forms on the lee side with its base at times below the mountain peaks and its top extending considerably above the peaks, sometimes to twice the height of the highest peaks. The rotor cloud may extend to a height where it merges with the lenticulars above extending solidly to the tropopause. While often appearing very harmless, the rotor cloud is dangerously turbulent with updrafts of up to 5000 feet per minute on its leading edge, and equivalent downdrafts on its leeward edge. There is a constant boiling motion in and below this cloud. In overall shape and location, it is effectively a stationary cloud constantly forming on the windward side and dissipating to the lee.

The lenticular or lens-shaped clouds, which appear in layers sometimes extending to 40,000 feet, are relatively smooth. The tiered appearance of these clouds is consistent with the smooth laminar flow in this section of the wave.

The tiered type of structure is due to the stratified characteristic of humidity in the atmosphere and the lifting effect of the wave on the whole depth of the atmosphere. These lenticular clouds, like the rotor, are stationary, constantly forming on the windward side and dissipating to the lee.

Severe Turbulence

Above the extremely smooth lenticulars, at times, severe turbulence is again encountered. The turbulence layers above and below the lenticular levels are comparable to ball bearings allowing the atmosphere between to flow through at very high speeds.

Occasionally a breakdown of the laminar flow sets off the formation of severe turbulence throughout the whole depth of the wave. When this happens, the highest lenticular clouds show very jagged, irregular edges rather than the normal, smooth edges. The juxtaposition of very turbulent and very smooth flow, however, is typical in the wave.

In most cases, the clouds tilt toward the mountain range as you go up through the layers from the rotor cloud to the highest lenticular layers. As a consequence of this tilting, the streamlines are packed closer together in the downdraft side of the rotor. Thus, the wind speed is considerably increased in this area and local jets form which introduce an additional flight hazard.

The mother-of-pearl cloud is an extremely high level lenticular cloud appearing at about 80,000 feet in polar regions under wave conditions.

The dimensions of the wave can be tremendous. In the Sierra Nevadas, for example, the wave clouds can extend several hundred miles parallel to the ridge lines with a well defined leading edge to the clouds. The wave clouds are visible from great distances and can provide the pilot

Sailplane pilots of the Southern California Soaring Association flew many of the flights, cooperating with Air Force, Naval, and civilian meteorological research scientists.

←

Radar tracking devices contained in these mobile units tracked specially instrumented sailplanes investigating wind and pressure fields. Many of the planes soared above 40,000 feet.

This shows the clearly-defined physical profile of the standing wave. Picture was taken near the Sierras.

Electronic devices check the mountain wave's effect on the sailplane, and record a "play-by-play" account.

with a warning of the existence of wave conditions.

There may be several wave crests or there may be only one. The amplitude and intensity of the waves decrease as you go downstream. The distance of the first wave crest from the mountain peaks varies with the wind speed, the type of wind profile, and the lapse rate.

The roll cloud may be present anywhere from a position immediately to the lee of the mountain peaks to a distance ten miles downwind. With a long wave length, one might naturally assume that the lift zone ahead of the rotor cloud would taper off gradually. This is not true, however. The updraft area is just as sharply defined as in shorter wave-length cases.

While the overall context of the cloud formation is stationary over a considerable period of time, the clouds can change position, shape, and structure in an extremely short time, and there is continuously a considerable amount of motion in and around the clouds. Extensive clouds can form or dissipate in a matter of seconds.

The Dry Wave

There are times when the wind is favorable for a wave condition, but there is not enough moisture present for the clouds to form. This cloudless or "dry wave" gives just as much turbulence as when clouds are present, but none of the warning features that the clouds provide are present.

The strength of the flow during a strong wave may be from 90 to 150 knots in the upper troposphere. During the winter months, over a range like the Sierra Nevadas, waves can be expected during eight to ten days in each month on an average, with two or three strong waves included.

"Wave" Conditions

A wave condition affecting flight operations arises with a component of the wind of a speed of 25 knots or more at the mountain top level flowing perpendicular to the mountain range. The actual wind direction can vary somewhat (with 50° being the maximum deviation from the perpendicular) and still cause a wave, but the strongest waves occur with a strong, perpendicular flow. The stronger the flow, the more severe the effects to be expected on the leeward side.

Any mountain range with crests of 300 feet or higher can produce a wave. Over low mountains the wave effect can be felt up to a height 25 times that of the range. The intensity of the wave is, in part, a function of the mountain height and the degree of slope of the mountain range as well as the strength of the flow. In the Western United States where these waves have been most frequently observed, it has been noticed that the strongest waves develop when there is a cold front approaching the mountains from the northwest and/or a trough aloft approaching from the west. This produces a strong westerly flow over the mountain ranges which have a north-south orientation.

There is generally a stable layer or inversion present on the windward side of the range up to an altitude slightly above the peaks with a strong wave. A prefrontal area usually includes this condition. The top of this stable layer is just above the cap cloud and dips to its lowest level at a point directly over the foot of the roll cloud. Without this stable layer, convective instability tends to break up the wave pattern.

The most favorable wind profile for the existence of a high wave has winds exceeding 25 knots at the mountain top level, with a strong wind of almost constant speed and direction extending up to the tropopause. The character of the wave varies with different wind profiles. A very strong increase of wind with height can eliminate the wave, leaving only stagnant air in the valley. Frequently, when a strong wave forms, the jet stream, or zone of strongest wind flow, moves southward to a

Air currents were investigated by taking time-lapse motion pictures from the ground and correlating them with sailplane recordings.

Tips on Flying the Wave

• If possible, fly around the area when wave conditions exist. If this is not feasible, fly at a level which is at least 50 per cent higher than the height of the mountain range.

• Do not fly high speed aircraft into the wave. Particularly, do not fly downwind. Structural damage may result.

• Avoid the rotor cloud.

• Avoid the foehnwall area with its strong downdrafts.

• Avoid high lenticular clouds if the edges are very ragged and irregular, particularly if flying high speed aircraft.

• If necessary, updraft areas, especially the one in front of the rotor cloud, may be used as an aid in gaining the altitude necessary to pass through the downdraft area and cross the mountain range.

• Do not place too much confidence in pressure altimeter readings near the mountain peaks.

The mountains are to the right and the flow from right to left. The foehnwall hides the Sierra peaks to the right.

position in the neighborhood of the range.

The same type of wave pattern as found in the Sierra Nevadas has been observed all over the world, and sailplane pilots have made use of these waves as an aid in soaring for years.

As a warning of the possibility of a wave formation over *any* mountain range, watch for the following:

• Wind flow perpendicular to the range line and with a speed of 25 knots or more at mountain top level.

• A wind profile which shows a strong consistent flow extending several thousand feet above the mountain tops, or a slight increase in speed with altitude.

• An inversion or stable layer somewhere below 600 millibars.

Flight in the Wave

The most dangerous features of the wave are the turbulence in and below the rotor cloud and the downdrafts just to the lee of the mountain peaks, and to the lee of the rotor cloud. The downdrafts to the lee of the rotor, and the updrafts below it can carry a plane into the rotor cloud while a pilot is attempting to pass above or below this cloud. The best procedure for one caught in the rotor cloud is to nose down to pick up speed and attempt to reach the updraft area in advance of the rotor to regain altitude.

These dangers cannot be stressed too much. A pilot without specific and considerable experience in flying the wave should not attempt a flight through such conditions.

Since the mountain peaks are hidden most of the time by the cap cloud, a plane flying at minimum clearance altitude could easily fly into the mountain peaks due to a combination of the winter temperature error and "wave error" in the altimeter reading as well as the strong downdraft conditions near the peaks.

From calculations and instrument considerations, it has been shown that altimeter errors are associated with the wave conditions. Since the wave is mostly a winter phenomenon, the temperature error in the altimeter reading contributes to an overestimation of the flight altitude. The maximum total error possible has been computed to be about 1000 feet. Altimeter errors as high as 2500 feet near the mountain peaks have been claimed by pilots although this seems an extreme figure. Data are not yet available to prove or disprove these figures.

Pilots who have the greatest experience in both soaring and flying under wave conditions relate that they consistently lose control completely for short periods while under the influence of the roll cloud. For example, a BT-13 flown under full power at 10,000 feet from the rotor zone toward the peaks will lose altitude, even though attempting to climb. The pilot who took some of the cloud pictures in this article soared a P-38 from 15,000 to 30,000 feet in the updraft area with the props feathered while taking his pictures.

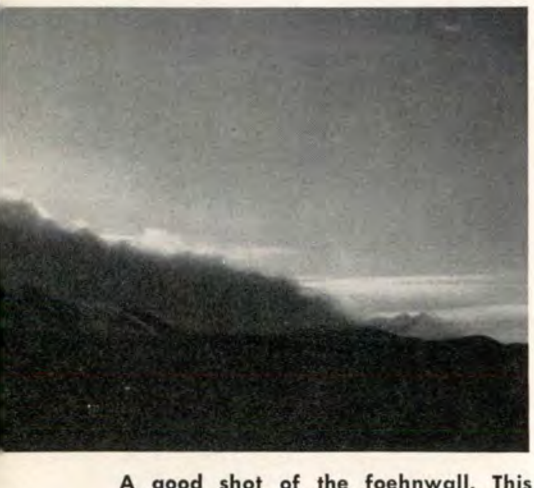
Pilots investigating the wave relate that they have experienced more hazardous flight conditions in the wave than they have encountered in any thunderstorm. In fact, effective gust velocities measured in the sail-

Here is shown the horizontal extent of the rotor cloud and the tops of this cloud merging with the lenticular layers.

The downdrafts are striking the floor of the valley, kicking up dust, and carrying it up into the rotor cloud zone.

There was extreme turbulence at high levels on this day. The high lenticulars in this case shown very rough edges.

Many heavy lenticular layers blanket the sky. The smooth texture and well-defined edges of the clouds indicate the laminar motion of the cloud formation.



A good shot of the foehnwall. This shows complete coverage of the mountain peaks which this cloud affords.

planes at heights up to 39,000 feet were of the order of 50 feet per second. In wave flight full controls have to be used to maintain a heading.

Calculations show that high speed aircraft (jet class) would experience accelerations of from 8 to 14 g's while flying downwind through the areas of varying vertical motions. Thus the wave is structurally dangerous to these aircraft.

Acknowledgment is made to the following for their assistance in gathering and interpreting the data and results included in this article—

Dr. Joachim Kuettner, Field Director of the Mountain Wave Project, and the Mountain Wave Project scientists of the Atmospheric Analysis Laboratory, Geophysics Research Directorate;

The Meteorology Department, University of California at Los Angeles;

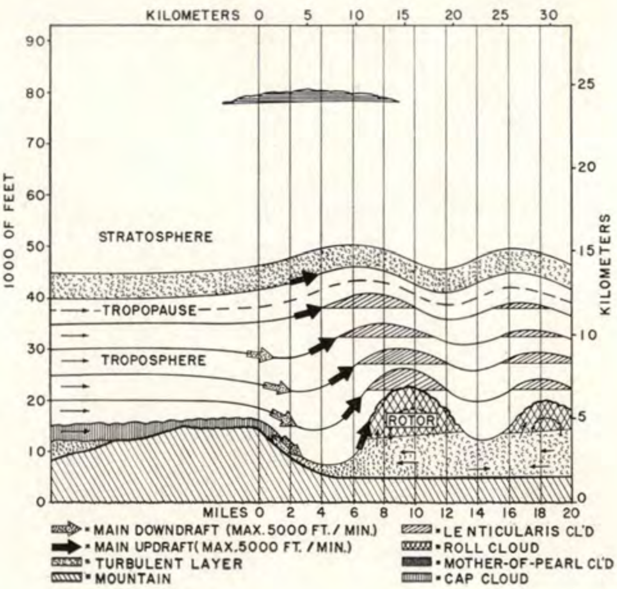
The Southern California Soaring Association;

The Symons Flying Service of Bishop, California, and

The Los Angeles Forecast Center, The United States Weather Bureau.

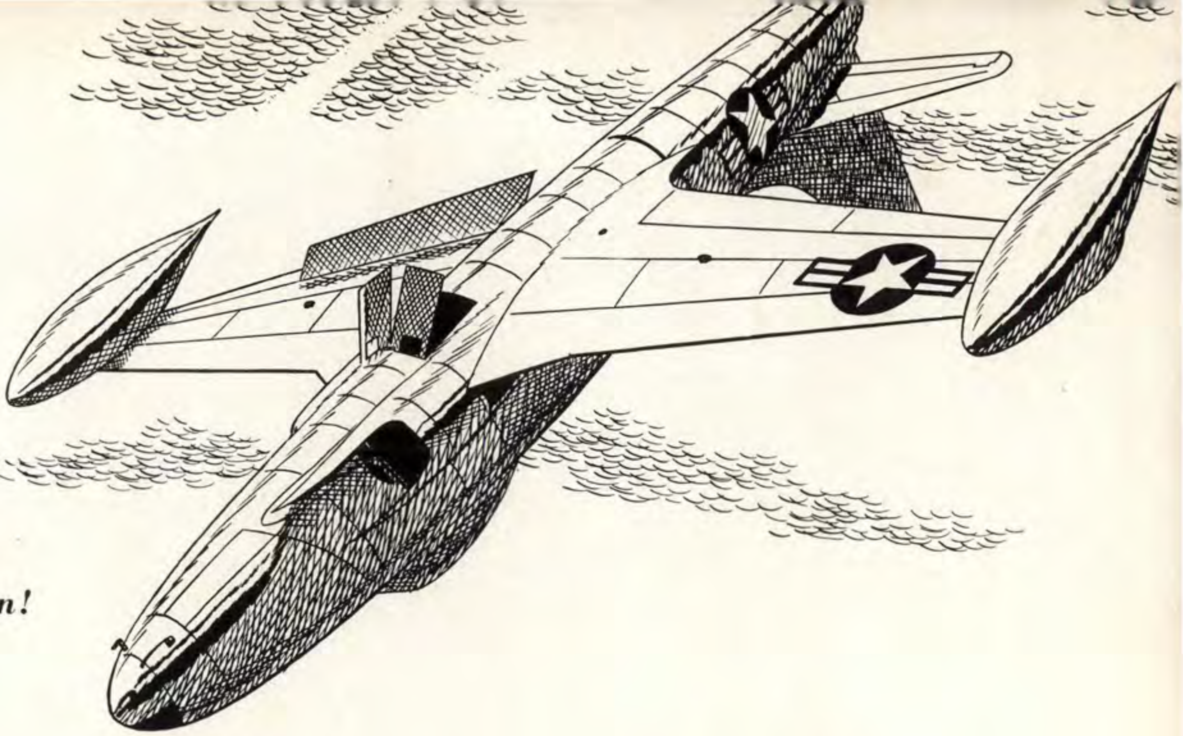
Appreciation is also expressed to Mr. Ephraim Radner of the Geophysics Research Directorate for his guidance in the preparation of this article. ●

Picture of a WIND WAVE



The graph here is a cross-section describing the conditions generally associated with a typical wave. The mountain range is pictured to the left extending to about 14,000 feet MSL and sloping sharply down to the valley floor at 2000 feet. The line and arrows depict the wind flow from the left to right. Areas of turbulence are indicated by small curls as shown in the captions.

The dot-filled arrows indicate the position, relative to the mountains, where strong downdrafts occur. The solid arrows indicate the updraft area.



Don't Be Caught With a Flap Down!

Wrong Diagnosis!

A PILOT in an F-80 turned onto final approach for landing. Coming in on final, he called the tower and reported that he was having difficulty in controlling his plane. He was advised to turn off aileron boost. Immediately after turning off boost, the plane began a series of rolls and crashed just short of the runway.

From all indications, the most immediate diagnosis was aileron boost trouble. The split-second decision made was wrong. In this case, only one flap had extended and when he turned off boost, the plane became uncontrollable.

Although it is not a common occurrence, failure of a wing flap actuator screw jack in an F-80, a T-33, or an F-94 can create a rather serious type of emergency.

After several split-flap emergencies had occurred, FEAF conducted an in-flight test with an F-80 in which the right wing flap was disconnected to determine if a pilot could control the plane with aileron boost on or off. The pilot conducted the test at 20,000 feet and began lowering the left wing flap in increments of 10 per cent, starting at an airspeed of 250 MPH. By the time he had lowered 100 per cent the airspeed was down to 180 MPH.

He further reduced the airspeed to 125 MPH with the left flap extended 100 per cent and found that he could control the plane. The flap was retracted and the airspeed was increased to 250 MPH. The aileron boost was then turned off and the left flap was lowered 10 per cent.

At 240 MPH with 25 per cent flaps, the pilot had to use considerable effort with one hand to prevent the plane from rolling. The airspeed was lowered to 180 MPH and 30 per cent flaps extended. He was able to level the wing by applying stick pressure with both hands and then hold the wings level by stick pressure with one hand.

Heavy Pressures

At an airspeed of 150 MPH and 50 per cent flaps extended the pilot stated that it took all of his strength to level the wings by applying stick pressure with both hands. Any time he released his left hand from the stick, the plane began to roll to the right. The use of approximately one-half left aileron trim did not appreciably affect the stick pressure.

The test pilot did not extend the left flap beyond 50 per cent with the aileron boost off. He stated that he was right-handed and doubted if he would have been able to apply sufficient stick pressure with only the left flap extended 50 per cent and the aileron boost off.

These tests indicate that the pilot of a plane equipped with aileron boost should NOT diagnose a roll tendency as aileron boost trouble when wing flaps are extended. First retract the flaps to determine if that will correct the control difficulty. If that does not, then try to correct the condition by turning off the aileron boost, but keep your hand on the aileron boost switch so it can be turned on immediately, if necessary.

In airplanes that are not equipped with an aileron boost system, it would be difficult to prevent the airplane from rolling unless the flaps were immediately retracted. In some cases, depending on the amount of flaps extended, it might be possible to counteract the roll without retracting the flaps. The pilot flying a plane without aileron boost will have to act quickly to correctly diagnose the difficulty and retract the flaps.

Remember you are not going to be able to diagnose flap trouble by a glance at the flap position indicator. The flap position indicator operates in conjunction with only one of the wing flaps. On the F-80, T-33 and F-94 the flaps position indicator shows the position of the left wing flap only.

Wright Aeronautical Development Center indicates that action will be initiated to install two standard flap position indicators so the pilot will be able to tell at a glance if both wing flaps are extended.

Fighter-interceptor pilots must scramble, in any kind of weather, on all unidentified aircraft approaching or entering "sensitive" areas. Many scrambles, however, are sent up into weather or into night skies needlessly, because some pilot "forgot" or failed to give an accurate ETP.

The rules apply to you, too; ignore them and you may endanger someone else's neck as well as your own — Don't cause a needless scramble

A PILOT, be he military or civilian, has an extremely healthy regard for his own neck. Usually, he strives to follow established rules of flying safety insofar as they concern him and his own aircraft. Were he accused of being dangerous in the air, he would become incensed and offer irrefutable proof of his personal observance of safe flying rules.

And yet, this same pilot frequently is dangerous; not to himself or his aircraft, but to another pilot—not even airborne and many miles away. Sounds impossible, you "safe" pilots say? Not so. That other pilot is standing an alert as a member of a fighter-interceptor squadron, (part of the Air Defense System). His job is to scramble, in any kind of weather, on all unidentified aircraft approaching or entering "sensitive" areas. As every pilot knows, the ADIZ and prohibited areas are designated as key defense zones in the United States and are guarded constantly from attack. But many pilots seem unaware that the rules set forth for these zones apply to them.

Scramble Made

Failure to follow these rules can have dire effects on the pilots awaiting the word to scramble. One interceptor pilot reported that in a 12-hour period his outfit scrambled five times during extremely bad weather. Four of the five intercepts proved to be violations involving aircraft either off course, at the wrong altitude or considerably over the five-minute leeway in estimated time of penetration into the ADIZ.

Here are a few of the stories heard from interceptor pilots and radar observers concerning needless bad-weather intercepts caused by someone's carelessness and lack of proper technique. Each involves danger for someone.

A scramble on unidentified aircraft had to be made under zero-zero conditions. The GCI control unit held

ADIZ ALERT

up takeoff as long as possible because of the weather but since identification was not established it became necessary to go up after the plane. Ten minutes after the fighter was airborne the mission was aborted when the unknown called in and satisfactorily established his identity. The pilot was on flight plan all right, but was away off on his ETP, not on course, and flying at the wrong altitude.

The interceptor pilot was unable to get into any field in the area; each was socked in tight. Fortunately, the mission had been called off before much fuel had been consumed and he was vectored to another base 150 miles away where the ceiling was slightly below 1000 feet. If he had been forced to continue the intercept, which was at a relatively low altitude, it is unlikely that he would have had enough fuel to get in anywhere. The pilot was unable to return to his home base for some time, so not only did the unknown cause him to risk his life and aircraft but the defense capabilities of the system were automatically reduced during the period that the plane and pilot were absent from the base.

In another case, an aircraft coming in from a long, overwater flight was picked up at a low altitude. This pilot had left his assigned altitude to fly between cloud layers where the weather was better. By dropping down as far as he did he lost favorable tailwinds and was much later making penetration than estimated. A mission was scrambled for an intercept during rapidly deteriorating weather conditions. When the erring pilot saw the interceptors approaching, he evidently realized that he was due to have a violation filed on him for his carelessness. In an attempt to avoid identification he dived his plane into the lower cloud deck at approximately 700 feet. He was finally picked up and identified at about 300 feet above the water. No comment on his foolhardiness need be made but it would be interesting to know whether or not he was aware that he attempted evasive action against two aircraft with loaded guns. Both interceptors had to divert to another field because of weather, and landed dangerously low on fuel.

Of course, not all of the intercepts made by ADC pilots involve risk to the interceptors. Many are made when weather poses no problem. At such times, the main item of concern is the unwarranted weakening of the defense system which results from absence of planes and pilots from their posts. If the "real thing" should occur while an alert flight was returning from one of these "friendly" intercepts, low on fuel and therefore unable to complete a further mission, the purpose in being for the defenders would be voided. Careless USAF pilots, by being the cause of false intercepts, could conceivably endanger the security of the nation.

Know Procedure

Very briefly, each pilot can insure that he does not fall into this category, first, through figuring carefully his flight plan, particularly that portion having to do with ADIZ penetrations, and secondly by conscientiously reporting any variations in the plan during flight. Proper ADIZ procedures, all of which are listed in the Radio Facility Charts, are, of course, a must. Here is a further example of what can happen when these rules are ignored:

A pilot, flying at a high altitude, picked up tailwinds of almost 100 mph. He had filed a flight plan but made no attempt to correct his ETP although he was obviously making far better time than he had originally estimated. He later stated that he had radio contact at all times and knew

(Continued on page 10)

The Filter Center must "go to work" on every plane which enters the ADIZ, and if a pilot is challenged, fails to identify himself, a costly and perhaps hazardous scramble will result.

(More About ADIZ Alert)

just where he was but he still didn't bother to call in until well into the ADIZ. Meanwhile, an interceptor was sent up after him from a base where the weather was extremely bad. After making an identification, the fighter returned to his home field where the ceiling was now slightly below 300 feet with about one-half mile visibility. Several GCA runs and many gallons later he finally got down, wondering, no doubt, why the intercepted pilot couldn't have picked up his mike and called in a little earlier.

Fighter-interceptor crews are well aware that their mission is such that they will be called upon to fly in any kind of weather after an unidentified aircraft. They receive constant flight training aimed at enabling them to do their job well and safely. In addition, they receive approximately 250 hours of ground school per year on flying safety and allied subjects such as aircraft accident study, maintenance, communications, instruments, electronics, meteorology, personal equipment, physiology of flight and AF regs. However, their safety is still partially dependent on other pilots obeying the rules.

There are many ways that a pilot, with a little forethought and good sense, can avoid causing a needless and costly scramble:

• Always correct your ETP when there is any question that it may be off more than the allowed five minutes.

• Don't forget to make a position report at least once an hour flying VFR and over each obligatory check point IFR.

• Stay on your assigned altitude and follow your flight plan exactly. If it is necessary to make a change, report in plenty of time to allow the information to be relayed to the proper agencies.

• Be careful on local flights, particularly those emanating in or near an ADIZ: it is very easy to fly in and out of an identification zone accidentally.

• On round robin flights out of the ADIZ be sure you send an ETP well in advance of your return penetration.

Remember, a violation is filed on any unknown that must be intercepted and, even worse, you might be risking someone else's life in the bargain. ●

University Train

THE impact of aircraft accidents upon the combat potential of the Air Force is so great that personnel charged with conducting aircraft accident prevention programs must be professionally qualified. Up to the present time, flight safety officers have been required to pick up their knowledge of accident prevention largely from the hard school of experience.

Long Needed

The Directorate of Flight Safety Research, and flight safety officers themselves, have long been aware of the need for a special training course to more adequately qualify flight safety officers in their field. Now, this special course for flight safety officers will soon be a reality. The University of Southern California has been selected by the Air Force to develop and conduct this school.

Such training is unique, as the course content must cut broadly through the fields of aeronautical engineering, education, psychology, and physiology. Personnel from the University of Southern California are working closely with the Office of Flight Safety Research, the Air University, the aircraft industry, and other Air Force agencies to develop the kind of instruction most useful in preparing the flight safety officer for his work.

Broad objectives of the course are to train flight safety officers in aircraft accident prevention procedures, safety education methods, practical engineering, human factors in accidents, aircraft accident investigation, and aircraft accident reporting.

The requirement for this course has existed for many years. The Air Force in the past has attempted to fill flight safety officer positions with officers possessing appropriate experience, but this procedure has not always been successful. Frequently, inexperienced officers have been assigned because no one else was available, or the proper importance was not attached to the aircraft accident prevention program.

Need Acute

Along with the intensification of the Air Force Flight Safety program in the past two or three years, the need for trained Flight Safety Officers has become more acute. Therefore, the Office of The Inspector General initiated a program to establish the short course to furnish proper training.

The course was established at the University of Southern California for three important reasons: (a) Train-

USAF and USC Join Forces to Turn Out Professionally Qualified Investigators

Now it's university training in a new career — Flight Safety Officer. The first class will start hitting the books on the 19th of January, 1953 at the USC campus in Los Angeles.

ing for the FSO's

ing at a recognized university will afford greater prestige to the flight safety officer in pursuit of his career; (b) USC possesses the necessary personnel and facilities, and a desire to furnish high-quality training in aircraft accident prevention methods; and (c) accomplishment of the training course would afford stability to the flight safety officer's assignment as Air Force regulations require that he be retained in a Flight Safety position for at least one year following graduation.

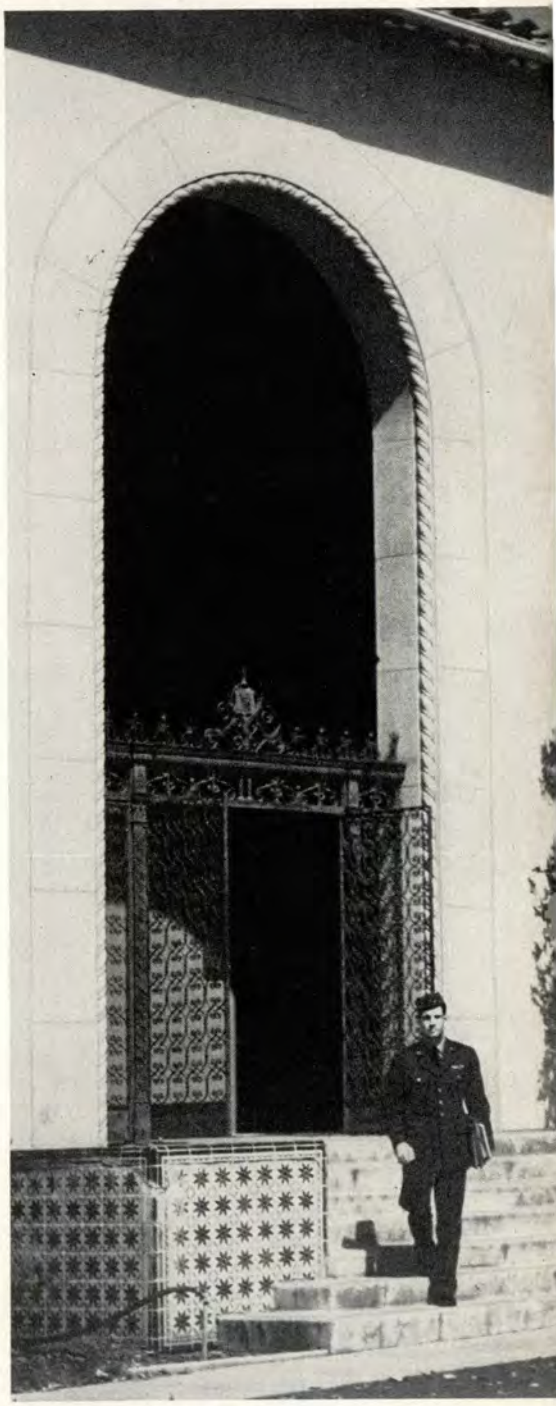
The University of Southern California is located in the heart of the aircraft industry and is readily available to the Directorate of Flight Safety Research and nearby training, tactical, and research bases. The university has available a human centrifuge valuable in furnishing indoctrination on problems associated with high performance aircraft.

The development phase of the course started 15 August 1952, and the first class is scheduled to begin 19 January 1953. Each flight safety officers' class will be limited to 20 students and the course is of six weeks duration. Seven classes a year will be conducted. The Deputy Chief of Staff, Personnel will allot school quotas for each command. Trainees will be selected from officers with backgrounds in operations, engineering and flight safety activities.

Course Objectives

Purpose of the Flight Safety Officers Course at the University of Southern California is to train Air Force pilots for duty as Flight Safety Officers at all echelons of command. A graduate of the course should have:

- An understanding of Air Force Flight Safety educational methods and an ability to teach.
- Knowledge and skill in aircraft accident investigation. This entails an understanding of Air Force procedures in investigating and reporting aircraft accidents.
- An appreciation of the importance of physiological and psychological factors in Flight Safety, and the contribution the Flight Surgeon can make to an effective aircraft accident prevention program.
- An understanding of the current Air Force accident prevention program.
- Knowledge of recent developments in aerodynamics, aircraft structures, materials and power plant engineering as affects the safety of flight. ●



Personal Approach to Flying Safety

A pilot-General with 14,000 hours of flying time outlines some common sense rules.

Brig. Gen. McDaniel receives the Oak Leaf Cluster to the Legion of Merit from Lieut. Gen. Robert W. Harper, commanding General of the Air Training Command.

One of the Air Force's leading exponents of Flying Safety is Brig. Gen. Carl B. McDaniel, who began his military flying career in 1920. As anyone who has served under him will readily testify, Flying Safety has been a "personal" matter with him throughout his career.

General McDaniel is the Inspector General of the Air Training Command, and, as such, is responsible for the entire Flying Safety program in that command. The success of his program is attested by the current accident rate of 28 for the first six months of 1952, which is lower than the Air Force rate for the same period. Particularly remarkable is the fact that Training Command pilots annually log approximately 40 per cent of the Air Force's total flying time . . . (The Editor.)

When General McDaniel addresses a group of pilots on the subject of Flying Safety, he'll often start out by asking the following question, "How many men in this room are 27 years old, or younger?"

As soon as the hands go up, the General adds, "That means that you men have been born, grown up, joined the Air Force, and learned to fly since I had my first and only military aircraft accident."

With that as a lead-in, the listeners can sit back and enjoy themselves, because it's obvious that the man knows what he's talking about. It's also a well-known fact that experience is the best teacher, and there isn't an officer in the Air Force with any more military flying experience than General McDaniel.

"Flyingest" Pilot

The General recently logged his 14,000th hour in military aircraft, which makes him the "flyingest" pilot in the Air Force. During his outstanding career, he has flown an estimated 2,100,000 air miles or approximately 84 times around the world.

General McDaniel was graduated from pilot training in 1921 while still an enlisted man. Then a technical sergeant, the General became an instructor in preliminary work at the advanced flying school at Kelly Field.

Because he was less than 21 years old, he could not be given a Reserve commission. Administratively it was decided that he could not actually be rated an airplane pilot. So he was issued a certificate of eligibility which "permitted" him to act as an airplane pilot.

After officially receiving his pilot's rating in 1923, General McDaniel, then a second lieutenant, was assigned as an instructor at Brooks Field, San Antonio. It was there that his only accident occurred, in 1925.

Describing the accident, the General says, "We were practicing forced landings and the student was at the controls. He overshot the field. When he opened the throttle to pull up, the engine failed to respond and I took over and landed in the best available space, an orchard about five miles from the field."

Neither General McDaniel nor the student was injured, and both were able to fly the next day. The accident occurred in a Curtiss (JN-6H), and the accident report consisted of a few typewritten lines on a 5 x 7 card, a far cry from the extensive, informative Form 14, now being used for accident reporting.

Since the accident, more than 12,000 hours have been logged on the General's Form 5, in more than 100 different types of military aircraft, among them the XB-1A, the PG-1, the C-1, the P-1, the PT-1, BT-1, and AT-1.

Speaking of his early flying days,

General McDaniel says, "It took me more than 400 hours to learn that I didn't know how to fly. Since determining that fact, flying has had a constant soberizing, stabilizing influence on me. My thousands of hours in the air have built up my judgment, but not to the point where I feel that I can't learn something new."

Be Prepared

The General's rule of thumb when it comes to flying safety is to be prepared for anything, even when you know it won't happen. Always have the answer to "suppose it does."

In this regard, General McDaniel says, "There's no such thing as a split-second decision. If a pilot has planned properly, using his judgment and experience, he knows what to do. He's not making a quick decision, but merely a series of running decisions—'If this happens, I'll do so-and-so.' As a result, the good pilot will continuously estimate the situation.

"Quick decisions lead to trouble, and while we've all been guilty of them, survival then becomes a question of luck, rather than taking advantage of experience, judgment, and planning."

During the General's military career, he has established a remarkable record in flying safety, both from a personal and from an official standpoint.

As a result, he is one of the most successful Flying Safety speakers in the Air Force. When the General stands up in front of a group to spread the Flying Safety "word," his audience sits up and listens.

Possessed with a wry sense of humor, an imposing physique, an enviable flying record and the knowledge that he knows whereof he speaks, the General makes his talks impressive, informative, and most important—interesting.

When he starts delving into his long career for examples of flying safety, he can come up with some surprising "firsts." He was one of the first Army pilots to fly the mail from coast to coast; he took part in the first B-17 cross-country flight; he was the first Regular Army pilot to reach the five-digit flying time mark; and he was among the first to make a completely blind cross-country flight in a hooded cockpit from time of takeoff until landing.

Perhaps General McDaniel's proudest achievements in flying safety took place between 1942 and 1945 while he was commanding officer of Hendricks Field, Florida, the AAF's first B-17 school; and then supervisor of the first B-29 transition school at Maxwell Field, Alabama.

At Hendricks, the General was responsible for the development of a pilot's checklist and method of its use, which later, with a few changes, was adopted as standard by the Air Force.

Use Checklist

The General has some very definite ideas about checklists. He says, "If you have a checklist upon which the pilot can depend 100 per cent, arranged in normal sequence so that nothing can happen to injure the pilot's pride, I'm convinced he'll use it.

"For example, suppose a pilot has confidence in his checklist, and uses it religiously. He likes it because it gives him a specified time to do everything necessary to operate his airplane. Now, suppose someone redesigns the checklist and leaves off, for example, "wheel chocks removed."

"The pilot has learned to trust the checklist and starts to taxi with the wheel chocks in place. In the eyes of his crew, he's made to look ridiculous. His pride suffers, and he's no longer confident of the checklist.

"Now removal of the wheel chock isn't a so-called killer-item, but other things on the checklist are. So, we must take great care in designing our checklists, so that our pilots have confidence in them. Otherwise, they'll resort to memory checks, which can result in lots of trouble."

Hendricks Field was widely known for its outstanding safety record while commanded by the General. There were but eight fatal crashes in more than 453,000 training hours, and of the 600,000 takeoffs made from the base, there were only five accidents, an average of one every 120,000 takeoffs.

At Maxwell, procedures adopted under General McDaniel's direction proved that the B-29 was just another airplane. The Maxwell school proved the acceptability of quantity production landings, and made possible the highest number of flying hours per month, per airplane assigned, per airplane in commission than any other B-29 base in the world.

General McDaniel's philosophy with regard to flying safety is to eliminate as far as possible accidents that are caused by automatism; and by violation of regulations, SOP, and common sense.

"By automatism I mean the physiological definition as given in the dictionary," the General stated. "In short, it means automatic acts without voluntary control.

"I feel that our designers have failed to recognize automatism as an accident potential. Therefore, I insist on crew unity, a crew operating as such, when flying an airplane with more than one pilot."

It has been said many times that Flying Safety is a full-time job with each and every member of the Air Force who is actively engaged in the flying phase of the overall mission. With General McDaniel, Flying Safety is more than a full-time job—it's a way of life.

All pilots might do well to take a page from the General's Flying Safety book, because then it would not only be a way of life, it would be a way of living — a long, long, time! ●

It was more than 27 years and 14,000 pilot hours ago that General McDaniel, then a Second Lieutenant, filed an accident report. The simple card, with a few typewritten lines, is in sharp contrast to the extensive, informative Form 14, now used for accident reports.

FORM 34
ENGINEERING DEPARTMENT

WAR DEPARTMENT
BROOKS FIELD, SAN ANTONIO, TEXAS

ACCIDENT REPORT

DATE Jan 6,1925,.

Plane Curtiss S. C. No. 24-44 Factory No. Type JN6H
Motor Wright S. C. No. 48933 Factory No. Type I
Propellor S. C. No. Factory No. Type
Location 5 Miles N.E.Airdome,.
Pilot Carl B McDaniels,2nd Lieut A.S,.
Details of Accident Gave Student Forced landings for Practice he overshot field ,gave the motor the gun and it only took on one bank,dropped plane in very small Orchid over and between high trees and cliff,.
Description of Damage washout undercarriage lower R & L Wings,Radiator and Propellor,.
Remarks
Signed Carl B McDaniel
Carl B McDaniels,2nd Lieut A.S,.
Witness Address
Witness Address
Inspector [illegible signature] Officer in Charge [signature] John D Corkille

those mid-air COLLISIONS

Most In-Flight Aircraft Collisions Happen Under Daytime VFR Conditions

A FORMATION of four fighter planes serenely wings its way into the blue. The leader makes a few gentle turns while climbing to altitude, and everyone stays with him easily. Then he makes a sharp turn to the right and follows immediately with a sudden turn to the left. His wingman collides with him. Two airplanes and one pilot are lost in the accident. Investigation shows that the wingman had recently been recalled to active duty, he had very few hours in the airplane and this was his second formation flight since recall.

Who was to blame for the collision — the wingman, who was not proficient in the airplane, let alone formation flying, or the flight leader who did not consider the capabilities of his wingman?

The pilots of two twin-engine planes are practicing instrument flight under the hood on the local radio range. The safety pilot in one of them sees the other plane just before his own airplane clips off the rudder. It's easy to see who was to blame here, isn't it?

Two planes are on the final approach at the same time. One is above and slightly behind the other, in such a position that neither pilot can see the other plane. Just before the first touches down, the control tower operator sees the situation and starts screaming into the microphone, "Go around, go around." Who is to blame for the mid-air collision which follows, the control tower operator for not spacing the traffic properly, or the pilots who did not clear themselves adequately?

The rash of mid-air collisions in recent months provides many more examples which might be given here. The big point is, however, that although the immediate blame for each of these accidents might be pinned down to one person or two persons, the whole problem goes much deeper. Ultimately, the cause for almost every mid-air collision can be placed with either poor air discipline or poor supervision and control.

VFR Statistics

A study of mid-air collisions, including all collisions during a recent 28-month period wherein at least one of the airplanes was in flight, disclosed the startling fact that more than 98 per cent occurred during VFR operations. And all of those which occurred when weather was IFR were during attempted landings by one of the planes. Further, less than 15 per cent of the collisions occurred during night flight. Contrary to what one would expect, it is obvious from these findings that *most mid-air collisions happen when they are least expected — during daytime VFR operations*. A ready solution would seem to be for pilots to take the care during periods of good visibility which they apparently exercise when visibility is limited.

For the purposes of study, mid-air collision accidents may be broken down into four categories: those between non-associated airplanes, those during formation flight, collisions during tactical maneuvers and those during takeoffs and landings.

Non-Associated Aircraft

Accidents of this type involved twice as many fighter planes as any other category of aircraft. Most airplanes were engaged in MIT or transition training and, in a number of cases, when one of the pilots was under the hood simulating instrument flight. All these accidents occurred below 10,000 feet altitude; low ceiling was not a factor in any of them, although visibility was low in one case.

The leading cause factor was inadequate control by control towers or

GCA, pointing toward the desirability of establishing firm operating procedures which will provide strict control in the vicinity of airports. The fact remains, however, that all accidents occurred during VFR conditions and the pilots still should have avoided collision, even though control was lacking. Other cause factors for collisions between non-associated aircraft varied from letting down through a hole in the clouds to flying through a dive bombing range danger area. In each of these cases, the obvious cause factor is poor air discipline, failure to fly by established safety rules and procedures.

Corrective measures which might be taken to prevent future accidents of this type are many. Outstanding would be:

• Use of GCA equipment and surveillance radar to provide separation of traffic within control zones at all times. This should help to reduce the number of collisions in airport areas.

• Insuring that instrument flight hoods are of the prescribed type, that they are clean and otherwise in such condition as not to restrict visibility of the safety pilot.

• Pilots *must* be made to realize that in the final analysis, they are responsible for insuring adequate separation between airplanes during visual flight conditions. Although they may accept aid from other sources, there can never be a substitute for the eyes in the cockpit.

Every pilot from the time he entered flying school until he was given his silver wings, had drummed into him the necessity for keeping his head on a swivel, constantly turning. Now, with more air traffic flying at greater speeds, the necessity is even more pronounced.

Aircraft in Formation

Fighters were involved in 80 per cent of all accidents in this category. In more than two-thirds of these cases the missions were operational training. Most of these accidents occurred during cross-overs or cross-unders of the wingmen, with joining-up of aircraft in formation as the second most important cause factor. Half of the accidents occurred during level flight and only one during formation takeoff.

All formation collisions were the direct result of personnel errors, such as over-running other aircraft, maintaining inadequate clearance between planes, erratic flying technique and confusion of the maneuver being executed. All collisions in formation occurred during VFR weather conditions and only four occurred during night flight.

Obviously, collisions during formation flight can most easily be eliminated through the establishment of good formation flying procedures, followed by intensive practice by the pilots concerned. Formation procedures must insure that adequate nose-to-tail and wing-to-wing clearance is provided. Also, cross-overs and join-ups should provide for adequate clearance of all aircraft. Supervisors and flight leaders must insist that pilots observe safe formation practices.

Tactical Maneuvers

In this category, fighter aircraft accounted for all but 9 per cent of the total number of accidents. In order of descending importance, the maneuvers being performed were acrobatics, aerial gunnery, simulated fighter attacks, dog fights and rat races. Again, all accidents occurred during VFR conditions and only one happened during night operations.

Regarding the collisions during acrobatics the only possible solution would seem to be some means of insuring that pilots clear the area before performing acrobatics. Acrobatic maneuvers are an important part of the aviation cadet's flying training, yet very few collisions occur during acrobatics in the flying training schools.

It would seem that pilots are becoming careless once they obtain their ratings, and a return to the practice followed by flying instructors of requiring the students to clear themselves adequately before attempting any acrobatic maneuvers is in order.

Mid-air collisions which result during aerial gunnery and simulated fighter attacks in many cases are caused by pilots concentrating too seriously on the job at hand and losing sight of the fact that other airplanes are operating in the vicinity. To prevent this type of accident, commanders should review local SOPs and make any changes which are considered in the interest of safety. For attacks being simulated on bomber aircraft, commanders should utilize only their best qualified pilots, then should establish and enforce minimum distances for breaking off the attack.

Takeoff and Landing

Once more fighters gain the dubious distinction of being involved in more collisions of this category than any other type of plane. They were involved in two-thirds of all on-base collisions. Trainers were second. Most of these collisions occurred during the landing phase of flight, with only one out of seven occurring during takeoff. In most cases the aircraft which was landing or taking off struck another aircraft on the runway although collisions during formation activity, i.e., one airplane overtaking another, also contributed to a sizeable number of the accidents. Approximately one out of every three such collisions occured at night, with one under IFR conditions.

Personnel error, with pilot error

being the most prevalent, was responsible for all accidents except four. These were charged to materiel failure. In most cases where personnel error was evident, closer supervision by control tower operators or mobile control operators might have prevented the accidents.

Among recommendations for the prevention of landing and takeoff accidents, the following are considered to be most logical and easiest to initiate:

• At all fighter bases, landings be monitored by a mobile control unit with a well qualified flying officer supervising. Duty as a mobile controller must of course be rotated. However, commanders should insure that pilots who take over this function are not only well qualified in the aircraft involved but are thoroughly familiar with such landing techniques and problems as spacing of flights and aircraft, length of runway required for stopping and the experience level of the pilots who are flying.

• Flight leaders and supervisors must be well chosen and then given responsibility for compliance with safe formation procedures.

• Frequent checks of the control tower should be made to insure that airplanes on the ground are being moved efficiently and effectively. Control tower operators should also be given a thorough understanding of formation takeoff and landing techniques so that they may more efficiently control this type of operations.

The problem of preventing mid-air collisions cannot be solved by a general recommendation or by a set of such recommendations. Each situation which might lead to a collision requires preventive action which may not apply to any other situation. Our purpose here has been to focus attention on a type of accident which offers considerable in the way of prevention possibilities. Mid-air collisions are very costly in that for each accident, there are at least two airplanes damaged or destroyed, at least two crews placed in jeopardy.

Each crewmember, each controller and each supervisor can help avoid these accidents—just keep your eyes open. ●

Collision Letdown

● The intercept mission over, the jet pilot checked in with control and started back to the base. Letdown was made between cloud layers until the 12,000-foot level was reached. There, the jet jockey noticed a big hole and turned to it to let down VFR. He was indicating around 320 knots with a 3000 fpm letdown. He took care to maintain plenty of clearance from the surrounding clouds and as he broke out of the bottoms he caught a glimpse of the base. A few seconds later he and his observer were hurtling to the earth with the wreckage of their plane.

What had happened is obvious. He had let down directly on a slower moving aircraft flying under the overcast.

Neither pilot had violated any flying regulation or SOP and yet both lost their lives, along with the lives of the observer and the passengers and crew of the AF transport. The jet pilot had maintained a 2000-foot horizontal clearance to all clouds during his letdown and the transport pilot was well below the 500-foot vertical limit called for in AFR 60-16.

The jet pilot's rate of descent only allowed him ten seconds to spot an aircraft that was 500 feet below him the instant he broke out. The closure angle prevented his even seeing the transport up until the moment of impact. The gooney bird driver was equally unable to see the jet descending on them and would have had trouble avoiding him in the brief time left if he had. No one was at fault, and yet valuable lives and equipment were washed out forever in a few split seconds.

Accidents of this kind aren't too frequent, fortunately, but there is an ever increasing backlog of reports of near misses.

Another case in point involved two jets and two conventional fighters. The prop driven aircraft had just departed from a base and were flying well below an overcast when the two jets barrelled through the formation. One of the older fighter planes was destroyed, the other received severe damage but managed to return to the field and land. Both jets were well battered but flyable and the pilots made safe landings.

The flight leader of the jets stated that he had let down through a hole in the overcast and had just started a turn toward the field when the flight over-ran the other planes. Evasive action was attempted too late to avoid collision.

There are a number of ways in which accidents of this type might be prevented. Some are very complex solutions and require high level policy decisions. For the present, there is no remedy to VFR airspace control which assures traffic separation as exists under IFR. Each base commander can, in coordination with local agencies such as CAA commercial operators and other military commands, established defined areas for various flying activities under VFR conditions. However, primary responsibility still remains with the pilot. ●

It's Your Responsibility!

As airplane commander, any decision you make in the interest of safety is final, whether you're flying a B-36 or a T-6

THE commander of an aircraft, be it a multi-million dollar bomber, a world-girdling transport, a plushed-up administrative plane or a two place trainer or jet interceptor, is a man with heavy responsibilities. The safety of his aircraft, his crew and any passengers in his aircraft depends upon his acceptance of these responsibilities and upon the manner and degree of conscientiousness with which he fulfills these special obligations.

Certainly one of the primary responsibilities of the aircraft commander is to brief thoroughly each crewmember in his duties; particularly as to his job in emergencies such as fire, engine failure, ditching or bailout. Special care should be taken when briefing the copilot, not only to insure that he knows exactly what is expected of him in an emergency but also to preclude the possibility of his making an irretrievable, split-second mistake that spells fatality.

Perhaps this sounds too elementary. Many aircraft commanders will protest that they brief for each mission or flight as a matter of course, that it is merely SOP. Perhaps they do, but the records show that some don't. By way of illustration note what happened in the following accident account when the pilot and copilot of a heavy bomber tried two opposite procedures simultaneously during an emergency.

The bomber was lined up for takeoff. The pilot didn't bother to use all the available runway, and he failed to become airborne at the predetermined distance and at the predetermined airspeed and the airplane lumbered on down the runway.

Witnesses to the accident agreed that *someone* finally decided to abort, as the conventional engines were throttled back, but that *someone* else decided to try and get it in the air, as full power was advanced on the jet pods and it was pulled into the air shortly after reaching the overrun. Without the necessary power it quickly settled down again a half mile off the runway, and hit an embankment.

Despite the obvious errors of not using all the runway and an improper cockpit check (the trim was found set in nose-low position) it was determined that the accident could have been averted if full power had been left on or if the flight had been aborted in time.

Good Briefing

Another specific duty for which the aircraft commander is responsible is that of making certain that all passengers are briefed in how to wear and use a chute and survival equip-

One of the pilot's responsibilities is the thorough briefing of each of the crewmembers as to his duties.

The pilot can tell the crew about the mission and call attention to weather and the nature of terrain they will fly over.

ment correctly; in bailout procedures; in ditching procedures; and how best to abandon the aircraft after ditching. Interphone contact must be maintained throughout the flight in compartmented aircraft and the aircraft commander should warn his passengers if an unusual or violent flight maneuver is necessary or when turbulence is encountered.

The importance of this warning is emphasized by the case of the light bomber that landed minus a passenger. The passenger became frightened and bailed out after the pilot started an extremely steep, high speed letdown out of a wing over.

The importance of adequate passenger briefing was demonstrated by an accident in which four passengers were killed when they failed to bail out of a burning aircraft. On this flight no ground check was made to determine that the passengers were standing by on interphone. The alarm bell was not tested prior to takeoff and the entire briefing was decidedly sketchy. Investigators were unable to determine if two of the passengers in the rear compartment even had their chutes on.

The aircraft caught fire in flight and the copilot, who had not been briefed on emergency procedures by the pilot, opened a hatch, allowing the flames to be sucked into the cockpit. Shortly thereafter the flames engulfed the cockpit and both pilots abandoned the aircraft. Apparently, no attempt was made to use interphone to warn the passengers to leave the ship; doubt exists as to whether the alarm bell was used or that it was functioning properly.

Cruise control and fuel management are the direct responsibility of the aircraft commander. While this duty may be delegated to another crew member, the aircraft commander must maintain a constant check on remaining fuel as he is directly responsible for the actions of all the crew flying with him.

A major accident and a near miss illustrate the results of an aircraft commander depending completely on his crew without checking fuel consumption for himself.

The accident occurred less than 30 minutes from the home base of the crew when all four engines of the bomber quit due to fuel starvation. The fuel gages gave ample warning that fuel was running low long before the tanks ran dry but the pilot chose to ignore them. His engineer improperly operated one of the tanks but insisted that the indicators were wrong. The pilot accepted his statement without checking, with the result that the crew had to make a night bailout after the engines quit. It was determined that approximately two hours fuel remained in the unused tank at the time the aircraft was abandoned.

Check Needed

Careful checking by the aircraft commander both as to the fuel consumption rate and the qualifications of his relatively inexperienced engineer could have prevented this needless accident.

Thoroughly brief any pasesngers . . .

In the near accident, a transport making a special passenger run from an overseas base, lost an engine on landing roll due to fuel starvation. It was found that the other three engines would have quit if a go-around had been necessary. Primary responsibility for this incident and near accident is directly attributable to the aircraft commander's failure to check fuel consumption of the aircraft and to cross check his navigator's position reports through available radio aids.

An error of two hours in estimat-

A major factor in flight planning is a study of past, current and future weather.

Be sure that each crewmember knows his job, and what he is to do in case of emergencies.

ing the fuel consumption was made by the engineer and not discovered until the gages indicated that the remaining fuel was dangerously low. At this time, approximately an hour out, economy cruise control was set up, barely in time. Compounding the error is the fact that at the time the engineer made his estimate, the aircraft was only a few minutes from a refueling base.

Another important responsibility of the aircraft commander is to make sure personally that each member of his crew is completely familiar with the aircraft and his duties in any emergency. In the case of a regular crew this should be supplemented by frequent spot checks and drills. It is

moved at least part of their equipment. No attempt was made to remove compartment ditching braces nor was any preparation made for leaving the aircraft via bailout, even though the pilot was aware that the windmilling prop was rotating freely on the seized shaft as evidenced by the gradually growing band of red around the nose section.

Bailout Ordered

The prop finally came off and tore a large hole in the fuselage, causing the pilot to lose control of the aircraft. At this time the pilot ordered bailout but the only two who escaped from the forward compartment did so by leaving through the hole in the fuselage. Testimony indicates that

ministrative aircraft, includes thorough flight preparation, by procuring all needed charts, publications, handbook, complete weather briefing and miscellaneous equipment such as flashlights, protractors, computers and pencils. In the case of regular crews, constant practice in emergency procedures and some cross-training in other crew positions are necessary.

Finally, the aircraft commander must remain proficient and current in his assigned aircraft. In this instance, part of the responsibility must fall upon supervisory personnel who must be sure that no pilot is assigned an aircraft with which he is not completely familiar and current.

Check the intercom system to make sure that you have contact with the crew and/or passengers in the rear of plane.

Ditching injuries can be eliminated or lessened by taking the proper position with backs braced against bulkhead.

Ditching briefings can't be overdone. Proper procedures are possible only if the pilot has adequate crew discipline.

too late to do much good if the instructions must be given while an actual emergency exists.

A case in point that illustrates the need for the crew to be well drilled and cognizant of emergency procedures is the accident involving a weather reconnaissance aircraft that crashed while attempting to return to its overseas base.

The mission was aborted after one engine was lost due to an excessive oil leak. The pilot was unable to feather the prop which windmilled at a high RPM. The crew was notified to don all flotation equipment but as more than an hour passed without further incident after the emergency was declared, most crewmembers re- most of the crew had no idea where the emergency bomb bay salvo han-

dle was located and the nosewheel was not lowered before the prop came off. Two of the crew in the rear got out through the rear entrance door; the remainder failed to get out. Part of the failure to leave the aircraft may be attributable to the fact that some of the crew did not have all the necessary equipment on at the time of the emergency.

In another instance a C-124 commander allowed his crew to take off from Hawaii and complete a seventeen-hour flight after only four hours' sleep prior to departure. Arriving stateside, restricted visibility was reported at the home base, and an actual GCA run was necessary. The aircraft commander allowed the "first pilot" a white card holder to make the GCA run *and* the landing. Un-

doubtedly crew fatigue was a contributing factor in this major accident which completely washed out a multimillion dollar airplane.

There can be no question that most of the fatalities in this accident are directly traceable to poor crew discipline and lack of preparation on the part of the aircraft commander.

A further responsibility of an aircraft commander, particularly on ad-

All the responsibilities listed here can be considered basic, and yet, the number of accidents attributable to some error by an aircraft commander fill too many Forms 14. Make sure that you, as an aircraft commander, don't overlook some "elementary" point and add to the list. ●

Survival Tip:

Save That Chute!

Don't panic and leave your parachute under some weeping willow tree, especially if you go down in cold country. The canopy and the risers (sometimes known as shroud lines), can be of great value to you in many ways, and can mean the difference between death by hunger and exposure, or survival for many days.

The risers of your parachute consist of a woven tube or case, containing seven twisted threads, each of which is made up of three smaller threads. Your imagination is the only barrier to the varied use of these risers. For instance, the complete riser can be used to secure fairly heavy logs in making a snare that can trap anything from a mouse to a moose. One of the inside threads, waxed, makes an excellent fishing line. Webbing and harness for snowshoes can be fashioned from this resilient material. You can lash logs together for a raft, make a shelter, and secure food in trees away from predatory animals. These threads come in mighty handily for sewing of any kind, and can even be used for emergency surgical sutures after having been boiled for twenty minutes.

Remember, each shroud line will support a weight of about 200 pounds, and in mountain country, can be used for a life line for crossing crevasses and scaling mountains.

The canopy of your parachute can serve in as many ways as any large piece of cloth can be used. Remember that this material is extremely insulative. It can be used to wrap around your feet to prevent frostbite; for shelter, for a sleeping bag, and for signalling. It can be used to wrap food, and for bandages.

Use Canopy

The canopy can also be used for a sail on a raft, or for protective underclothing. Of course, there is one other factor involved, and that is the one of auxiliary equipment. It would be difficult to make the best use of either the risers or the canopy without a few simple utensils, namely, a needle, a knife, a small ball of beeswax. Every pilot should provide himself with a small, compact kit containing bare survival essentials.

Stay Ahead of Your Airplane!

By 1st Lt. Thomas L. Bryant
Headquarters, Flying Training Air Force

How often have you seen a pilot while on the final approach chop all the power, reconsider, and add power, then repeat the cycle again and again all the way to the ground? How often have you observed a pilot flare out for a landing, overdo it, balloon, and frantically start making the control column resemble a yo-yo until the airplane finally settled to the runway in one position or another?

You may ask what connection a fatal accident might have to a basketball type landing in a "gooney-bird." The correlation lies in the area of aircraft control, or rather, the lack of it. In the case of a fatal accident, control was completely absent and was never regained. In a bounce landing, control might not have been lost, but it certainly was not all that it could have been.

In any one situation of flight, the result is obtained by one of several types of control. The first is a controlled action resulting from anticipation by the pilot of a particular response to his control action. This anticipation is a result of thought. Thought which involves the projection of the mind ahead of the airplane. Control action of this type is characterized by smooth, accurate, flight.

The pilot exercising control of the second order manages only to keep his thinking with the airplane and that is about all. His only concern is what is happening to his airplane at this particular point in time. He is too busy or too sleepy to try to think ahead of his aircraft.

The last type of aircraft control as utilized by pilots is comparable to an overmatched boxer. The surprise is if he makes it through the struggle. A pilot thinking behind an airplane is no longer in control of his aircraft. His flying has degenerated to the point where the airplane is flying the pilot.

Obviously the only correct manner of aircraft control is the first stated, which involves thought projected ahead of the airplane that will give the time necessary to cope with emergencies in a satisfactory manner. The essence of this type of aircraft control involves many factors, a great number of which are under the jurisdiction of the pilot. Pilot proficiency, aeronautical knowledge, knowledge of the aircraft, equipment, emergency procedures, and knowledge of physical limitations are a few of the many.

To effect aircraft control of the first order requires conscientious effort on your part. Study! Practice! Try thinking ahead of the airplane. It will soon become automatic and will result in smoother, more enjoyable and safer flying. ●

USE

"PRECISION APPROACH"

Whenever You Can!

RADIO commercials these days warn us about being only half-safe. Along the same lines, Air Force pilots should be completely safe and sane when it comes to the two different types of approaches available with GCA.

By knowing the complete GCA story, a pilot should be completely safe, but, either by misunderstanding or misinterpretation, many pilots know only half of the story. So let's take another look at the GCA equipment and its functions during the two different types of approaches.

First of all, the unit has two separate radar systems. One system provides search or surveillance radar data; the other provides precision or final approach radar data. The search system continuously scans a specific space area around the airport and is normally used for initial pick-up and pattern control purposes.

The precision system scans the final approach zone and is only used to control your azimuth and elevation corrections while on the final. This latter system presents the centerline and glidepath angle which should be maintained for a successful GCA precision approach.

Both Systems

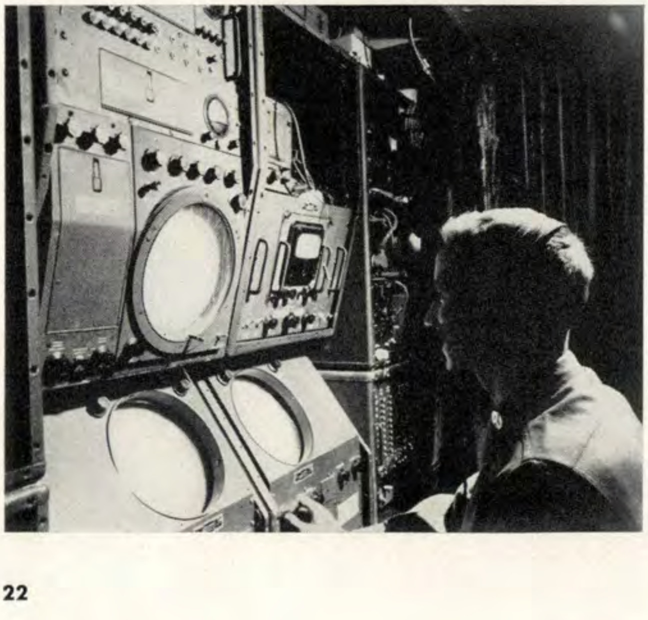
The normal, everyday GCA run uses both the search and precision radar. Your traffic pattern control is derived from the search radar system; when you turn onto final, your azimuth and elevation control instructions are derived from the precision radar system.

This type of approach is called a "precision approach." In fact, any final approach which uses a precision radar system—capable of determining azimuth and elevation data—can be called either a "precision approach" or a "PAR approach." PAR merely stands for Precision Approach Radar.

Many times it is impossible to locate the GCA equipment to serve all runways on an airbase. When this occurs, it is only possible to conduct "precision approaches" on certain predetermined runways. However, if GCA assistance is required for an aircraft landing on one of the runways not served by the precision radar system of GCA, a different type of GCA approach can be provided. This second type of GCA approach is usually called a "PPI approach" or "PPI assist."

The search radar system displays radar coverage data on Plan Position Indicator scopes. These scopes are merely called PPI scopes. The "PPI approach" consists of the search radar system picking up the aircraft, directing it around a traffic pattern and lining it up on a final approach. The search system is capable of con-

Using PPI, the operator can still handle an approach.



Limitations on PPI are usually the IFR field minimums.

BUT . . . WHICHEVER YOU CHOOSE KNOW THE LIMITATIONS OF THE FACILITIES EQUIPMENT!

Refinements to GCA equipment have greatly increased the effectiveness and range of radar operations. Shown here is the newer "dish" type antenna of the CPN-4 unit.

trolling your azimuth corrections but since it cannot derive any elevation data, *it cannot determine your elevation corrections.*

To assist you when making a "PPI approach," the GCA crew will tell you at what altitudes you should be at various distances from the runway. These altitudes are prepared beforehand and are merely designed to assist you in your letdown to the runway. Since the GCA unit cannot tell what your rate of descent actually is, your descent is *not* controlled by the GCA crew. You are on your own in that respect.

As you approach the runway, the GCA controller will usually say something like this: "You are now four miles out, you should be passing through 1,000 feet." When you receive this transmission, *immediately* check your altimeter and if you are high or low, correct accordingly.

Many bases are receiving new AN/CPN-18 Radar Air Traffic Control units. These units are search systems and will be used for pattern control purposes and "PPI approaches" when necessary. Many civilian agencies refer to the AN/CPN-18 type radar set as an Area Surveillance Radar unit. Common usage has condensed this name to merely an "ASR" unit. Remember, therefore, that a PPI approach, using this type of search radar equipment is often called an ASR approach. The terms "PPI approach," "PPI assist," and "ASR approach" are all synonymous.

Know Minimums

In addition to having a complete understanding of the GCA systems, it is also a *must* that you know the weather minimums in effect for each of the different types of GCA approaches.

Weather minimums for Precision or PAR approaches may be found in the Radio Facility Charts. However, at no time will they be lower than 200 feet and one-half mile visibility. The Pilot's Handbook (PHACUS) contains minimums for ASR or PPI approaches.

Every pilot should know the established GCA minimums before he begins his GCA approach. You will always be advised if you are being given a PPI approach by the GCA crew. If you don't know the PPI minimums established for the runway in use—ask the GCA operator at the very moment he advises you that you will be given the PPI approach. Honor the minimum you receive.

If you've never flown a PPI or ASR approach before, ask for one during your next practice session with GCA. Remember—know the complete GCA story.

Third Method

There is a third method which may be used under certain conditions, especially when shooting GCA in latitudes where magnetic compasses are unreliable, or where variation is exceptionally large. This is the "locked gyro" method, and can also be utilized if gyros are inoperative.

The "locked gyro" method is just what the name signifies. Gyros are locked, and the GCA operators turn the pilot right or left, as the case may be, by saying "turn right *NOW*," or "turn left *NOW*." At the word "*NOW*" the pilot starts the turn, and holds it until the GCA operator instructs him to roll out and hold straight by saying "roll out *NOW*." This method, however, is not accurate, and should be called for only under unusual circumstances, where an emergency exists, and the landing must be completed.

A C-54 follows through on a takeoff after making a practice GCA run. Practice affords the necessary training for precision approaches.

"fisher controlled approach"

A new technique gives pilots practice GCA's without radar

EVER hear of a ground control approach system that didn't embody radar? It sounds impossible but such a system is in operation right now at Miami International Airport and 14 other Tactical Air Command bases.

The system, called the "Fisher Control Approach System" after its inventor, 1st Lt. Martin A. Fisher, a pilot in the 435th Troop Carrier Wing, Miami, employs an eight-channel VHF set and a sighting device to train pilots in GCA landings.

The sighting device has a slot and multiple grid on opposite ends of a 60-inch stand. When looking through the slot, the grid is superimposed on the sky from the horizon up to six degrees elevation. The grid has several cross wires which are spaced in ratio to elevation at a measured distance and to wing spread at a measured distance. (For the benefit of the mathematically minded, this is the principle of triangulation.)

The inside grid wires are spaced to measure an aircraft at four miles; the next set, which are twice as wide, measure the aircraft at two miles, and then at one mile, depending on the sighted wing spread. The horizontal wire in the center of the scope is spaced so that a line of sight will intersect 1000 feet at four miles or 1500 feet at six miles. This is the glidepath line. Another wire below the glidepath wire is for line of sight intersection at 1000 feet and six miles. The top of the scope is for line of sight intersection at 1000 feet and two miles.

To start the practice GCA run, a pilot contacts the controller in the same manner that any approach control system is contacted. From there on, the procedure, so far as the pilot is concerned, is identical to a regular GCA run.

Frequently, the controller will have him make an identifying turn to insure that the aircraft is sighted. If necessary the pilot is given a wind correction heading to keep him well out on the downwind leg. After he is lined up parallel to the sighting bar he is given a heading to bring him in on the base leg and told how far out from the field he is. Distance from the field is determined by which of the two horizontal sighting bars is used. One bar will place him six miles from the field and the upper bar will bring the base leg in to four miles.

The aircraft is kept lined up with the sighting bar until he enters the grid field. The pilot is then given a heading that will line him up with the runway and is turned over to the final controller. Actually the final controller will be the same man since only one controller is needed for the entire operation.

On the final approach the pilot is given the necessary headings and altitude corrections needed to keep the aircraft centered in the sighting guide; as long as the aircraft is centered it is aligned with the runway. The pilot is told to hold his altitude until the aircraft intersects the glidepath. This is determined by the size of the aircraft in relation to one set of grid lines. A standard rate of descent is started when the glide path is intersected and azimuth control and headings are given as needed. The pilot is informed when he is three, two- and one miles out from the end of the runway and when he passes through GCA minimums. As he crosses the end of the runway he is returned to contact to make his landing and is turned over to the tower for taxi instructions.

The system was originally devised to save pilots of the 435th Wing from having to go to other bases for their practice GCA landings. Tactical Air Command has recognized its value and has issued a directive giving full credit to a pilot making a practice run for his GCA minimum requirements.

The "Fisher Control Approach" was first tested at Miami International

The control device can be set up anywhere, and be ready in 10 minutes.

By utilizing Fisher system, pilots can get plenty of practice GCA runs, using only a one-man "crew." Below, the sighting device has a slot and multiple grid on opposite ends of a 60-inch stand.

Airport in cooperation with the CAA control tower by pilots who were familiar with the system. After these tests proved successful, other pilots, picked at random, were contacted in the air and were requested to make practice GCA runs on the equipment. These tests were equally successful as all the pilots contacted in this manner stated that they assumed they were making a standard GCA run with the usual radar equipment.

The system can be carried out, placed in position, aligned, leveled, squared and ready for operation in ten minutes by one man. Its economy of operation is shown in that one man can set up and operate the equipment as against the usual crew of one officer and twenty men used to operate and maintain the standard mobile radar equipped unit.

Obviously the equipment is only used as a training and practice aid under VFR conditions and when GCA units are not available for use. It can be invaluable to any base that has no GCA unit, as a trainer and to save time. The system also can be used at bases equipped with radar GCA where time is lost when radar sets are shutdown for maintenance work.

It should be realized, however, that the primary purpose for GCA requirements under AFR 60-4 is for the training of GCA operators, not for the training of pilots. AACS continually has trouble getting enough GCA runs to keep operators proficient. Advantage of this unit is utilization at bases where no GCA is available and pilots are required to fly excessive distances to make GCA runs. ●

D/F and GCA Teamwork

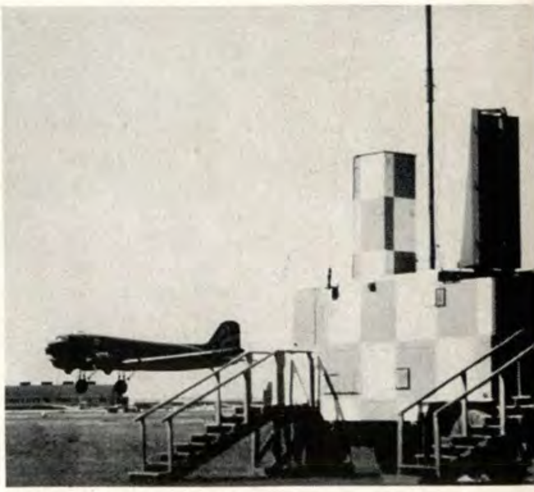
DIRECTION Finding (DF) and Ground Controlled Approach (GCA) operators of the 1932d airways and Air Communications Service (AACS) Squadron, Goose Bay, Labrador, recently fulfilled their mission as "lifesavers" by quickly and efficiently steering two distressed aircraft to safe landings. The operators worked hand-in-hand as they directed a lost Navy plane with nine passengers aboard and a British plane with a low fuel supply and no parachutes to safe touchdowns.

Approximately 20 minutes after the first call for help, the lost navy plane was given the final steer. At this point the pilot reported he had one hour of fuel and a defective left fuel pump. He was 48 miles from the station.

On the following day, a DeHaviland Dove with a faulty radio compass and a low fuel supply requested assistance for a safe let-down. Visibility was three-fourths of a mile, with drizzle and fog and an overcast of 200 feet.

The DeHavilland was steered to the Goose Bay station by DF operators who relayed the instructions to the distressed plane through the AACS airways.

DF operators on duty were: S/Sgt George R. Crandall; A/1c Sammy J. Vestal; A/2c Henry Blackshear and A/2c Louis Ruiz. GCA personnel included: M/Sgt James D. Leech; S/Sgt James L. Jackson, S/Sgt Robert J. Stacy; A/1c Joseph J. Bowen.



Briefing Cards

Shown below is a sample of the briefing card developed by the Directorate of Flying Safety, Headquarters, Tactical Air Command:

Welcome Aboard!

This aircraft is assigned to the 9th Air Force of the Tactical Air Command whose motto is, "Proficiency in Flight." You will be informed by the pilot of certain things that will add to your comfort and safety during flight. The following will serve as a reminder of some of the items covered during the briefing:

1. Fasten safety belts during taxiing, takeoff, landing, and at other times when directed.

2. Wearing of the parachute in military aircraft is mandatory during flight, except for temporary removal at the discretion of the pilot for required movement within the aircraft. At such times the parachute will be kept in proximity to the occupant to whom it is assigned. (AFR 60-5.)

3. In an emergency, in aircraft equipped with an alarm bell system, three short rings will alert occupants for bailout, and one long continuous ring will be the signal to abandon the aircraft. If the bell rings you will be happy that you had your chute on.

4. The Flight Engineer normally will open emergency exits and aid in your bailout. He will also answer your questions to the best of his ability regarding time to destination, weather, refreshments, relief stations, etc.

5. A short time before landing at destination, the Flight Engineer will collect all waste paper, cartons, etc. Your cooperation in policing your area will be appreciated.

6. The personnel of Tactical Air Command will try to make your flight a pleasant experience.

A supply of these cards is maintained in each transport type aircraft assigned to Tactical Air Command, to further the Command's "Proficiency in Flying" campaign, in that it will alert the pilot to the fact that as a member of TAC, he is expected to be proficient in his flying duties. Item No. 4 of the card serves as a reminder that the engineer is jointly responsible for passenger evacuation in an emergency. It also alerts him for the type of question he may be asked during a flight. The card serves as a reminder to passengers in the matter of safety regulations, and to let the passenger know that he is welcome aboard Tactical Air Command aircraft.

Lt. Col. L. J. Mercure
Director of Flying Safety
Tactical Air Command.

The idea of briefing cards is a good one. . . . It also seems to answer most questions that often remain unasked by passengers.

Danger Areas

In the interest of flying safety and to assist in the reduction of flying violations in regard to pilots flying through designated warning, danger, and prohibited areas, I would like to make the following comments and recommendations:

• During the years I have been associated with various operations sections within the USAF, I have observed that the majority of pilots are not properly versed on the correct definitions of warning and danger areas.

• Many pilots are under the assumption that they can fly through a warning area at their leisure, unaware that a warning area carries the same classification as a danger area, but is located more than three miles from the coast line.

• In addition, many pilots rely on aeronautical charts for location of danger, warning, and prohibited areas instead of consulting the appropriate facility chart.

• Airspace Area Directory as shown on pages 144 through 147 of the U. S. Facility Chart is an excellent source of information that all pilots and operations personnel should be cognizant of and have available at all times.

• I would recommend that all squadron operations officers thoroughly brief their assigned pilots on this matter and instruct them on the correct procedures to be followed before a flight is made through one of these prescribed areas.

• It is further suggested that Aviation Cadets be indoctrinated on this subject while they are still undergoing training.

M/Sgt. Richard M. Fillmore
Chief Acft. Dispatcher
Ramey AFB, Puerto Rico.

Fallen Belt

The other day I was getting set in the rear seat of a T-33 for an instrument flight under the hood. The left hand portion of the safety belt had fallen on the floor and without looking I reached and pulled up on it. I could tell that it was caught on something and my first impulse was to give it a sharp tug to see if I could pull it loose, but then I looked to see what was there. I had not yet clipped my oxygen mask to my helmet and it blocked my vision. Again the tendency was just to give the seat belt a tug but I thought better of it and adjusted my oxygen mask, then looked down. The seat belt had fallen, as I suppose many others have fallen, under the landing gear control. As I looked at it, it occurred to me that had I given it a sharp pull it is entirely conceivable that the safety spring of the landing gear control could have been pushed in by the seat belt and the control handle moved out of the down position without my knowing it had happened. The T-33 includes a safety which prevents retraction of the gear while the weight of the airplane is on the wheels; however, in the instrument takeoff which followed I believe the weight of the airplane came off the wheels and then came back on them. Had the gear been in the up position at that time it could have caused an accident.

The solution which suggested itself to me as the simplest and best way to prevent the possibility of such an accident is to provide a hook or clip to which the left-hand side of the seat belt could be fastened. It is possible that the same hazard exists in the front seat of the T-33.

Col. Paul T. Hanley
Air Attache
Rome, Italy

Your recommendation is being passed on to Air Materiel Command for any action deemed necessary.

Look Around!

Even as a novice in the business of flying I have become quite safety-conscious, and this is due in large part to your fine magazine. What I have to say has probably been thought of many times before, but it has been bothering me so I thought I'd write you about it.

Recently there have been several (three that I know of) air to air collisions involving aircraft on instrument training missions. Obviously the instructor or student in the front seat was too busy watching the instruments to see the approaching aircraft. But since the man in front *must* look at the instruments, and since the man in back is under the hood, there are only two steps that I can think of which might reduce the frequency of these accidents:

• Encourage the instructors to look at the instruments *less*, and to look around *more*.

• Discontinue the present practice of flying instrument training missions when "dual only" flying conditions exist. A dual flight has four eyes, a solo flight two eyes, but an instrument training flight . . . one eye on the instruments, and maybe one looking around.

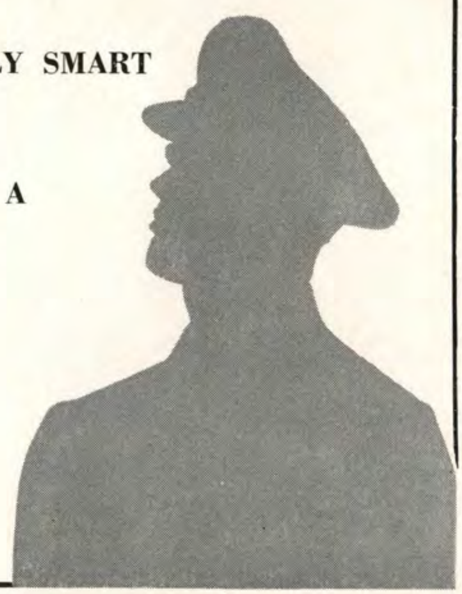
2d Lt. Thomas A. Nelligan
Kinston Air Base
Kinston, N. C.

WELL DONE

EVERY day somewhere in the Air Force, a pilot or crewman is faced with an emergency that he overcomes through skill and courage, and which warrants recognition in FLYING SAFETY *magazine's WELL DONE feature.*

Unfortunately, most of these instances never come to our attention. FLYING SAFETY *likes to print WELL DONES, but we feel that they should be newsworthy. The only way we can learn about the exploits of these outstanding people is for you to tell us about it. The writing doesn't have to be fancy . . . just write us the facts . . . direct. Address The Editor,* FLYING SAFETY, *and enclose a snapshot of the man in question. We'll do the rest.*

- **WHEN YOU FLY SMART**
- **BE SMART**
- **AND SEND IN A**
- **WELL DONE!**



KEEP CURRENT

news and views

Record Flight

A 1,234 mile non-stop flight in September, by Elton J. Smith in a Bell Model 47D-1 helicopter set a world's distance record for helicopters. The cross country flight which was made solo, was under the sanction of the National Aeronautic Association.

Taking off from Fort Worth, Texas, Smith flew a great circle course to land on the lawn in front of Bell Aircraft Corporation's main plant adjoining the Niagara Falls Municipal Airport. Elapsed time was 12 hours, 57 minutes, 30 seconds, for an average speed of 95 miles per hour.

The flight surpassed the official world's distance record by 530.4 miles and was 278 miles farther than the longest unofficial flight.

There were 187 gallons of gasoline in the 'copter's tanks when Smith took off from the heliport on the grounds of Bell's Helicopter Division at Ft. Worth. When he landed at Bell's main plant, Smith estimated the tanks held 27½ gallons, enough for more than 275 additional miles of flight.

Capt. Thurston L. James, commanding officer of the U. S. Naval Air Station, Niagara Falls, and Lt. Col. David H. Curran, Air Force Representative at Bell, also officially witnessed the landing and inspected the seals on the tanks. Their statements and Petrison's were notarized and forwarded to the NAA Contest Board in application for NAA and FAI (Federation Aeronautique Internationale) recognition of the record.

Surgeons in Combat

Air Force flight surgeons in Korea have crash-landed with their crews on combat missions. So Major William A. DeFries, Chief of Aviation Medicine for FEAF, recently told a meeting of command surgeons at the School of Aviation Medicine, Randolph Field.

So far none of the medical officers have been seriously hurt. Major DeFries himself has twice been involved in crack-ups without injury. The Far East doctors go out on combat flights to gain first-hand knowledge of the aero-medical problems faced by the man under their care.

"There is no greater incentive to promote flying safety," said Major DeFries, "than to become personally involved in such incidents."

The great majority of surgeons in Korea do fly combat missions from time to time, Major DeFries added. On these flights they are able to examine closely the use made of protective equipment and its condition, and to observe the health and morale of the crews in order to keep them at the peak of physical and mental fitness.

A New Plane—The C-119H

The advent of the jet engine has stretched the rubber band between minimum and top speed a little tighter. Today's designer is having difficulty maintaining flight characteristics — particularly stability and control—at both ends of the speed range, and the result is a "hotter" airplane.

There is talk that on a few of these "hot" jet types the margin for pilot error is *zero*. It is natural to follow this philosophy to a degree on non-jet types, and this is leading to a general trend of "hotter" aircraft where the pilot has less time to think, where ultimately the pilot is more liable to do the wrong thing in case of emergency.

In the post mortems of near-future accidents, "pilot error" notations will be on the uptrend. The majority of accidents now occur on landings, with takeoffs running second.

Low speed to allow maximum time for pilot reaction, together with exceptional stability and control aircraft characteristics, contributes materially to improved pilot safety. The new Fairchild C-119H medium troop and cargo transport has been designed to give the pilot a wider margin for error, plus an airplane with excellent visibility which is simple to fly.

Low landing and takeoff speeds of the C-119H naturally reflect in the airplane's short distance requirements. As an example, at the radius

midpoint of 1,000 nautical miles, with maximum overload of cargo of 30,780 pounds, an airstrip of 1,500 feet is adequate for standard day operation.

A cockpit bailout chute is located in the left-hand side of the cockpit floor where it is readily accessible to all crewmembers. With aerial deliveries of troops being made at 800 feet and equipment drops at 1,200 feet, the normal type egress provided in transport aircraft—out the after end of the cargo compartment—is not practical, particularly with full cargo and under night operating conditions.

The safety factor offered by the C-119H's external fuel tanks, where *all* fuel is external, materially reduces the hazard of fire. Dumping the fuel lightens the airplane by nearly 15,000 pounds and assists single-engine performance in the event of engine failure.

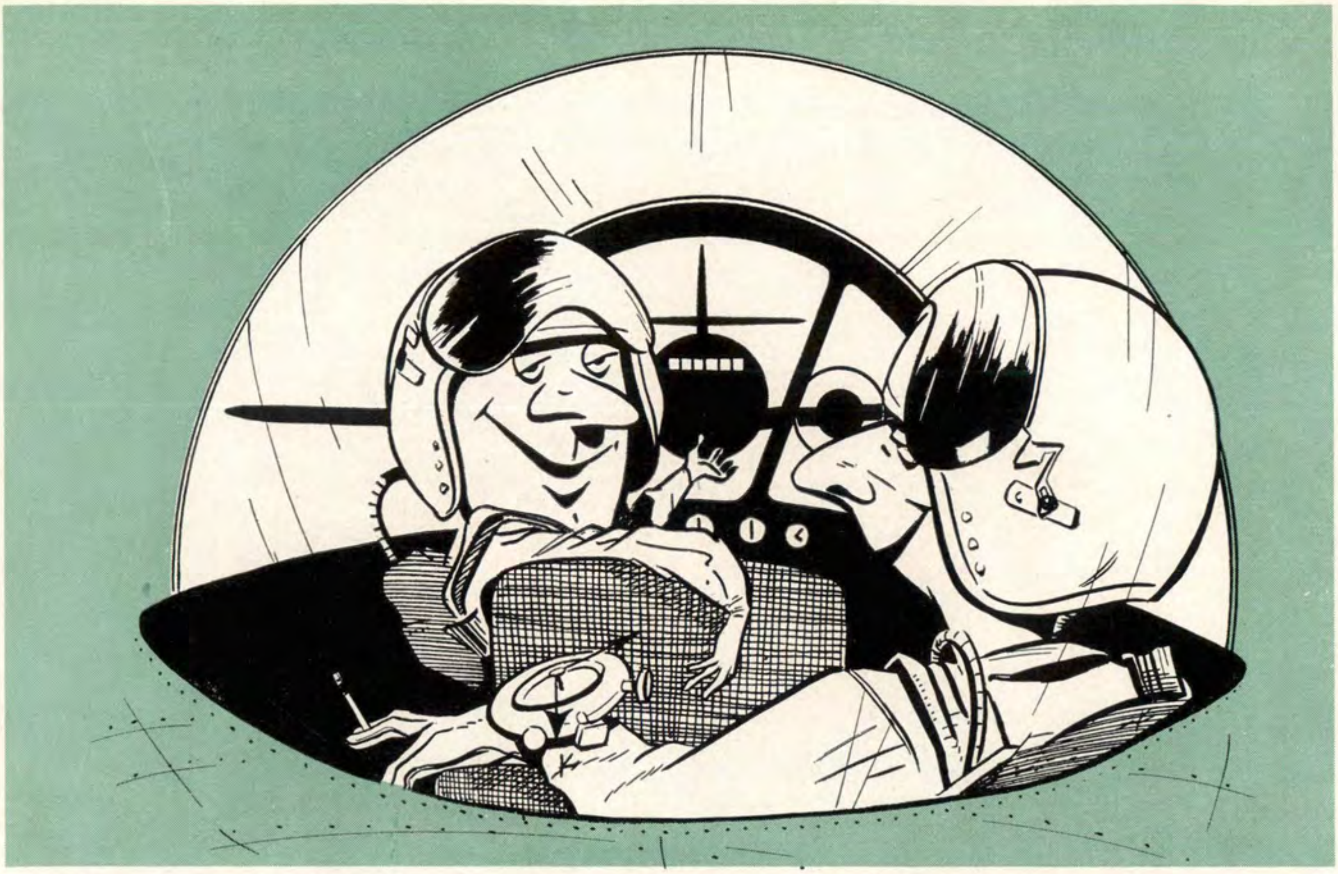
Watch those mountains!

During the past year there has been a series of major aircraft accidents in which aircraft have crashed in high terrain under IFR conditions. In nearly all of these instances, the aircraft were considerably off course, and flying at an altitude which did not permit terrain clearance.

Pre-flight training and in-flight navigation cannot be too highly stressed. Emphasis must be placed upon the hazards existing in mountainous terrain where aids to navigation are limited or unreliable.

There is no substitute for navigational charts, and these charts are worthless unless they are in constant use. Using the radio facilities chart for navigation is a slipshod method, . . . over any terrain!

Mary Castle
Columbia Star



"don't worry, joe, we've got an IFR clearance . . ."

But the figures show that the vast majority of mid-air collisions DID happen under VFR conditions, with unlimited visibility!

Play it safe and fly quadrangular headings . . . AFR 60-16 says . . .

"Wherever practicable an aircraft will be flown at an altitude above sea level appropriate to its magnetic course, as follows:

0° to 89° at odd thousands (1000, 3000, etc.)

90° to 179° at odd thousands plus 500 (1500, 3500, etc.)

180° to 269° at even thousands (2000, 4000, etc.)

270° to 259° at even thousands plus 500 (4500, etc.)

"There's a Reason for This Regulation
To keep airplanes apart
Pilots who may choose to slight it
Should learn to play a golden harp."

Now turn to page 14 in this issue of **FLYING SAFETY**

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