DECEMBER 1952

FLYING SAFETY

UNITED STATES AIR FORCE

WEATHER BRIEFING FOR JET PILOTS..... page 2

FLIGHT SAFETY AWARDS

In recognition of extraordinarily commendable accident prevention records that contribute to the increased efficiency and combat effectiveness of the Air Force, each six months engraved bronze and mahogany plaques are awarded to certain outstanding units. Achievement of an award reflects great credit upon an organization and all its personnel.

Winners of these FLYING SAFETY awards for the first half of 1952 are shown below.

Congratulations are extended to all the winners for meritorious achievement in the field of flight safety.

Particular notice should be taken of the fact that Bergstrom AFB and the MATS units at Westover are two-time winners.

Barksdale Air Force Base, Louisiana

Vance Air Force Base, Oklahoma

Turner Air Force Base, Georgia

Bergstrom Air Force Base, Texas

Lawson Air Force Base, Georgia

MATS Unit, Westover Air Force Base, Mass.

Our Back Cover

The back cover features lovely Elaine Stewart, MGM starlet, who holds aloft a copy of our favorite magazine. Unfortunately, we cannot offer readers Elaine as a subscription premium, as FLYING SAFETY has more "customers" than we can supply.

Shape of Things to Come

The next issue of FLYING SAFETY starts a new year and a new 12-issue volume of the magazine.

Looking back through the old issues, it seems that there has been an overall improvement on stories, pictures, and format; but as with all things of a creative nature, perfection is difficult to attain.

The best judge of a magazine is the reader, who "knows what he likes and says so." This upcoming year the editors of FLYING SAFETY hope to give you the best twelve issues ever produced, but in order to do this, we must have your continued support. We want to hear more about your side of the picture. Keep the stories and ideas coming in . . . and if you don't like a feature, tell us about that, too!

FLYING SAFETY has one, and *only* one goal . . . to carry the message of flight safety to you of the Air Force in such a way that there will be an effective impact on the aircraft accident rate. So, let each of you consider himself a member of this staff . . . "write when you get news!"

Thank You, SAC!

"Three Turning and One Burning," (page 6) a very complete story on engine fires, appeared originally in SAC's *Combat Crew*. It was considered of sufficient importance to present to the many pilots outside of SAC, who surely can benefit by the information therein.

VOL. 8 NO. 12 DECEMBER 1952

FLYING SAFETY

DEPARTMENT OF THE AIR FORCE THE INSPECTOR GENERAL, USAF

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WEATHER BRIEFING FOR JET PILOTS

In this article Captain Griffith gives the elements which he thinks are necessary in a complete weather briefing to help those who may face this problem in the future. His experience consists of some ten months service as a staff weather officer, part of which time he filled the dual role of jet fighter pilot and forecaster with the 27th Fighter Escort Wing and the 136th Fighter-Bomber Wing in Korea.

By Capt. Rolla C. Griffith

THE briefing of combat crews flying jet fighters is a job comparatively new in the Air Weather Service. Although the elements included in such a briefing are generally the same as those given to conventional pilots, the speed at which jet aircraft operate and the vast difference in fuel consumption at various flight altitudes call for additional information necessary in the briefing. The type of mission to be flown determines which elements may be eliminated, while the importance of others must be stressed.

Winds

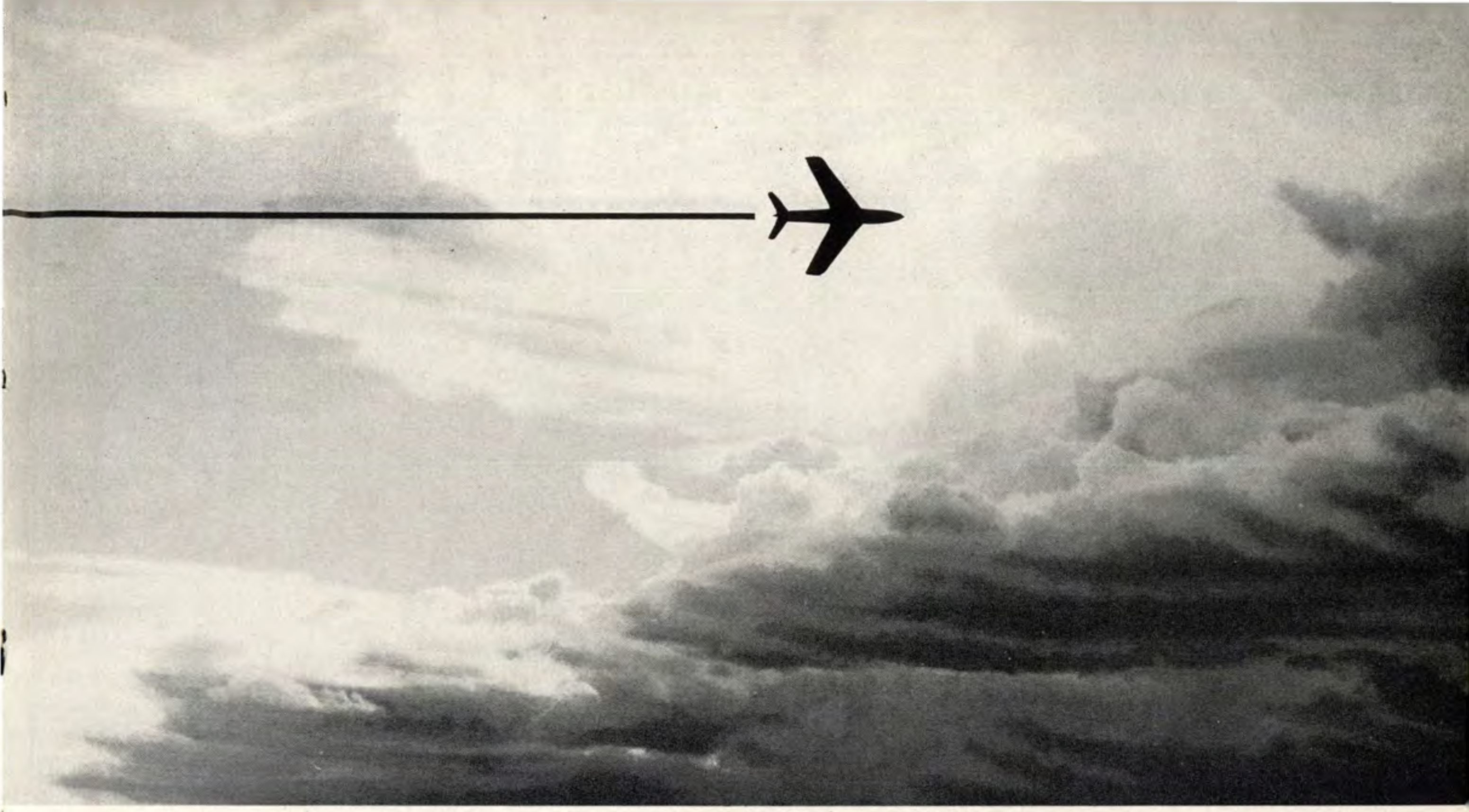
The wind direction and velocity for the 10,000, 20,000, 30,000 and 40,000-foot levels must be given accurately. The amount and type of ordnance carried by the aircraft depends on the winds aloft and whether the winds will be beneficial or detrimental. It appears that a headwind on one leg of the flight would be compensated for by the resulting tailwind on the opposite leg but this is not true in jet operation. A headwind on the flight to the target requires a reduction in the ordnance load because the aircraft is unable to attain optimum altitude with an external load.

The first principle of jet operation is that, as the flight level increases, the fuel consumption decreases and fuel consumed on the trip to the target cannot be compensated for on the return flight regardless of the flight altitude.

The minimum fuel load with which the aircraft must break combat or leave the target area is computed prior to takeoff, and the wind forecast is of prime concern to the operations officer who makes the decision on the minimum fuel figure. To have a jet land with an extra one hundred gallons of fuel aboard because of a poor wind forecast is a great waste. One hundred gallons of fuel means five minutes flying time at one thousand feet, but thirty-five minutes at forty-five thousand feet. The importance of accurate wind forecasts cannot be overemphasized.

Density and Pressure Altitude

The optimum altitude is the most efficient altitude at which the aircraft can proceed to and return from the target. Optimum altitude is given as density altitude and the weather officer converts it to pressure altitude,



which the pilot reads directly from the altimeter, by taking into consideration the temperature correction. The indicated or pressure altitude varies with warm and cold air advection aloft.

In warm air, fuel is saved because the jet can fly at a lower indicated altitude and still be at optimum. For example: If thirty thousand is the optimum altitude and the temperature at thirty thousand feet is —35° C., then the pilot levels off at twenty-nine thousand feet which actually puts him at his optimum altitude of thirty thousand feet. Conversely, if the temperature is —55°C., the pilot must climb to an indicated thirty-one thousand feet to be at optimum of thirty thousand feet. This is a simple calculation on an E-6b computer, available in any operations office.

Target Winds

For increased accuracy on dive bombing missions the surface wind must be taken into consideration. If an approximation is given at briefing then the direction of the dive bombing run and release altitude are planned before takeoff. Briefing on the prevailing wind direction and velocity below ten thousand feet serves a secondary purpose.

Interrogation of pilots who have bailed out of their aircraft over enemy territory brought out one fact. Had they been aware of which direction they would drift after jumping, their bailout could have been planned more carefully. One pilot stayed with his plane until an instant before it exploded in order to get out over the Yellow Sea. Actually, he could have jumped much sooner and been carried over the water by the prevailing wind. This will be particularly applicable in combat areas, such as Korea, where a landing in the water means almost certain rescue.

Runway Temperatures

The ambient temperature is all important in jet operation. Warm days lengthen the takeoff run, lower the ordnance load, and reduce the efficiency of the jet engine by lowering the amount of thrust available at maximum power settings. The reasons for this may be found in any manual explaining the principle of jet propulsion. For example: With a 6000-foot runway and a runway temperature of 40°F., an F-84 can

Briefing jet combat crews is a comparatively new job for Air Weather Service.

carry an external load of 2200 pounds. At 80°F., the load is reduced to 700 pounds, and with a 95°F. temperature, the external load becomes *zero*.

Mechanical aids are used when temperatures are high, but an accurate temperature forecast is essential for planning purposes. Many elements effect the runway temperature. They are: amount of cloud cover, surface wind direction and velocity, and the construction of the runway. Radiation differs slightly on pierced steel plank, concrete and asphalt.

Freezing Level

Glaze and rime icing are of minor importance to jet aircraft because their cruising altitude is high enough that all moisture is in ice crystal form. The ascent and descent through the dangerous icing levels are made at speeds which allow the ice a minimum of time to form on the control surfaces. The intake screen is the danger point. When glaze ice forms over this screen, no air reaches the impeller section, and engine failure results.

Areas of super-cooled droplets, such as thunderstorms, are the most dangerous and must be emphasized. Windshield icing is picked up on all descents through clouds, but normally is of little importance. Frost forecasts to the maintenance section are necessary to enable them to place protective coverings on the aircraft at night.

Target Temperatures

Briefing on the temperature in the target area and of bodies of water flown over or near is very helpful information for the combat crews. An example of poorly informed pilots are those who dress for the temperatures at the home base regardless of the temperatures in the area where they might be forced down. The jet pilot is overburdened with equipment and anything the forecaster can do to lighten the load is helpful. If they are informed, they may dress to suit the weather for all areas over which they fly.

Synoptic Situation

For briefing, the weatherman and pilot should go over a map which covers a large enough area to show the pressure system and frontal locations effecting the route of flight. Also, a pictorial cross section should be gone over showing just exactly what the pilot may expect in connection with the synoptic situation.

JET WEATHER HIGHLIGHTS

• *Winds* . . . The amount and type of ordnance carried by the aircraft depends upon winds aloft.

• *Altitude* . . . The optimum altitude is the most efficient altitude at which the aircraft can proceed to target and return.

• *Target Winds* . . . Surface winds must be taken into consideration on dive bombing missions.

• *Runway Temperatures* . . . The ambient temperature is all important in jet operation.

• *Freezing Level* . . . Glaze and rime ice are of lesser importance to jet aircraft due to their high cruising altitude.

• *Altimeter Setting* . . . A forecast altimeter setting is essential for safe flight.

• *Trail Levels* . . . Condensation trail levels are important for security reasons.

• *Tropopause* . . . The tropopause has the same effect at altitude that an inversion has near the surface.

• *Turbulence* . . . What may be a slight bump in a C-47 becomes severe turbulence at 450 knots.

• *Alternates* . . . In doubtful weather, two or three alternates should be given, with fuel as one of the primary considerations.

Weather information graphically displayed is more easily assimilated.

Altimeter Setting

Under instrument conditions, an altitude is decided upon as the minimum to which the aircraft will descend in the overcast. There is no problem at an established base where the latest altimeter setting is available, but a great change is possible over a distance of four hundred miles and a forecast altimeter setting is essential for safety. This is particularly true when the letdown is made in mountainous terrain.

Inherent error in the altimeter at high speed is a new problem. The weather officer cannot compensate for the error, but awareness of it is important. For every mile per hour increase of airspeed over 200 mph, the altimeter will indicate one foot too high. In other words, at 600 mph, the aircraft will be four hundred feet lower than the altimeter reading.

Contrail Level

Condensation trail levels are important for security reasons. Jets avoid the level at which they may be seen by moisture condensing behind their aircraft when approaching or over enemy territory. It is not a definite rule, but a temperature of —49° C. will usually determine the altitude at which the condensation trails form. During the month of January, the trails form as low as twenty-nine thousand feet while in the hot summer months are not noticed until altitudes of approximately forty-five thousand feet are reached. This is a general rule and each forecaster must make maximum use of the adiabatic chart to determine the exact level.

Tropopause

The Tropopause has the same effect at altitude that an inversion does near the surface. Above the Tropopause, the visibility is unlimited, while below it the forward visibility is often limited by heavy haze layers or a thin deck of cirrus. Every rated man has topped a smoke, haze, or fog layer into a clear sky, and this is the feeling when passing through the Tropopause. With present jet aircraft, flight above the Tropopause is impossible during the summer months because of the height at which it is located.

In the winter months, the Tropopause is located well below maximum operational altitude. Turbulence at the Tropopause varies from light to severe, but the smooth, unrestricted flight above is the reason for cruising above it.

Turbulence

Areas of turbulence are important because of the high rate of speed of jet aircraft. A light bump to a C-47 traveling 160 mph becomes severe turbulence when encountered at 500 mph. Consequently, the pilot should know about those areas in which turbulence may be encountered.

Jet Streams

Here is a phenomenon that a weather officer with only a surface and 700 mb chart is powerless to locate. A full complement of constant pressure charts is a necessity. When no facsimile chart of the 500, 300 and 200 mb levels are available, a call to weather central is the best solution. The reason for locating the jet stream becomes apparent when one realizes that it is strictly a one way aid and must be avoided when traveling in the opposite direction. In this area, they are a help only on the flight home. Aircraft flying against the jet stream have been forced to jettison their ordnance before reaching the target.

A good tip for the pilot is that if he is five minutes or more behind on his navigational check points, to descend a thousand feet and recompute his groundspeed. Luckily, the jet stream is a problem to be concerned with only from the latter part of October through April. It is usually of little consequence the remainder of the year.

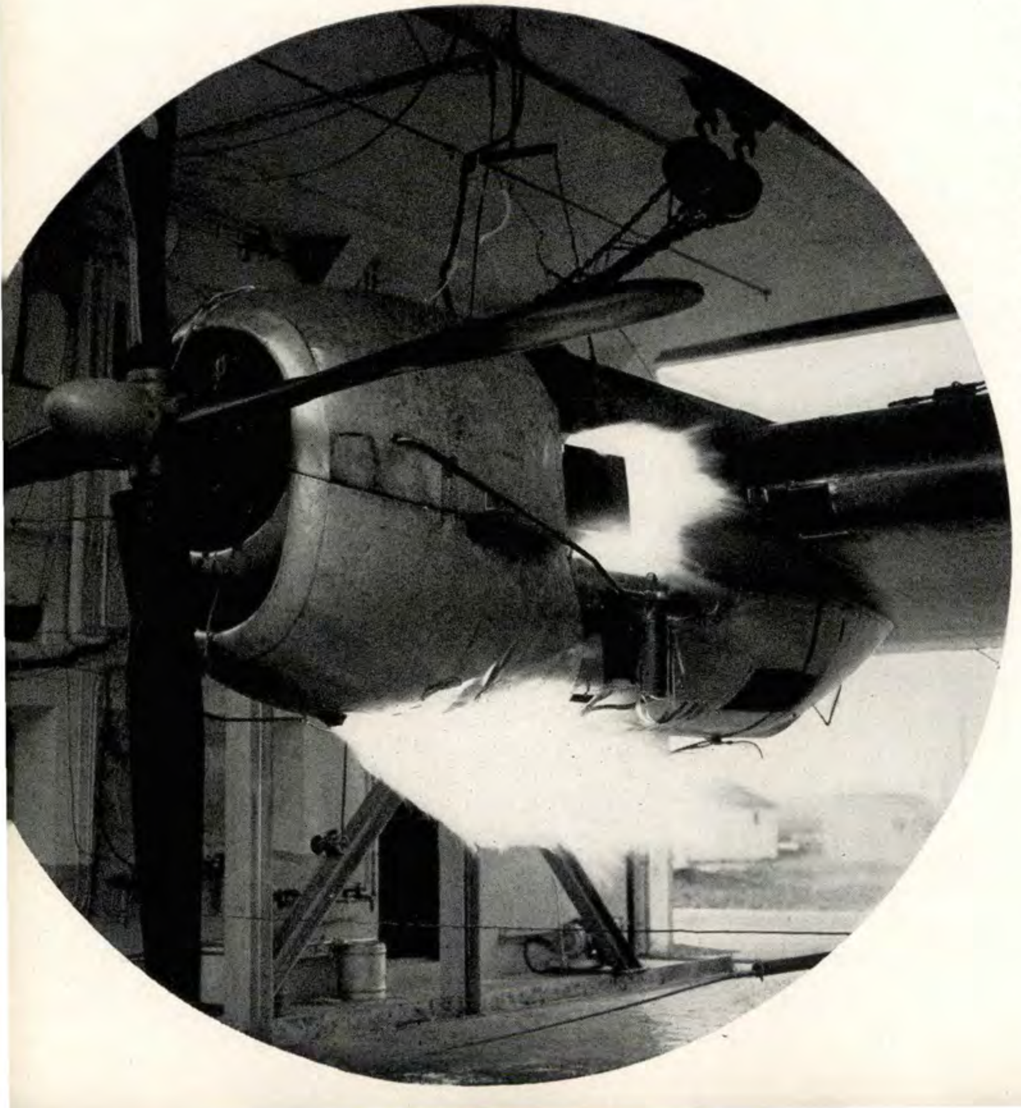
Alternates

In periods of doubtful weather, two or three alternates should be given. The operations officer will take the weather into consideration when planning the mission and add enough fuel to the amount with which the pilots leave the target area for a margin of safety. Jets are unable to proceed to an alternate after the letdown is completed because of limited fuel supply. They must be notified that the alternate is to be used before a letdown is started. If there apparently is no suitable alternate, the operations officer should be informed.

All things considered, one of the most difficult problems facing the staff weather officer is gaining the confidence of the personnel he is serving. The rated forecaster who is also a jet pilot will find this much easier. He is then able to understand the problems of a jet pilot and can present the briefing with these problems in mind.

From the pilot's standpoint, the importance of weather encountered should be emphasized. Although the majority of pilots are experienced and give reliable reports, a more accurate picture of the weather en route and return could be given. No two men see the same thing. Occasional poor forecasting or poor *PIREPS* are accepted as inevitable—it's the indifferent weatherman or pilot who is in for a hard time, from the group C.O. down to the wingman. ●

THREE TURNING AND ONE BURNING



OF the various type emergencies that can arise in flight, there is little argument that an engine fire rates as one of the most serious. The decision an aircraft commander and his flight engineer make toward combatting fire must be made rather quickly. For this reason, it is extremely important that every combat crew member who, either directly or indirectly, is responsible for engine operation become familiar with causes of aircraft engine fires and the proper procedures used in extinguishing them.

In order for fire to occur, certain conditions must be set up. Any combustive substance will burst into flame when the temperature of the substance is raised to its kindling temperature and sufficient oxygen is present.

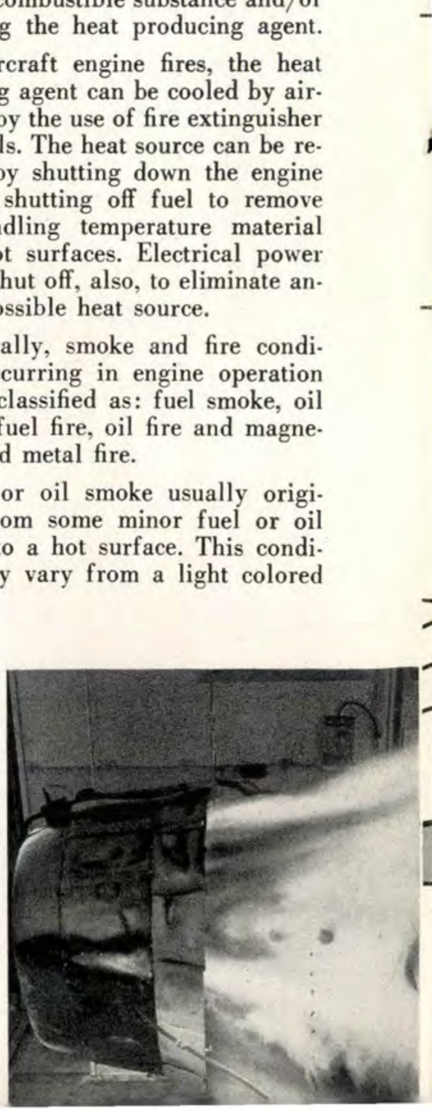
Fire can be prevented by either one or both of two actions: eliminating the oxygen necessary to support combustion, or keeping the combustible substance below its kindling temperature either by cooling or removing the heat producing agent.

These same general principles of prevention apply in extinguishing fires—elimination of oxygen, cooling the combustible substance and/or removing the heat producing agent.

In aircraft engine fires, the heat reflecting agent can be cooled by airflow or by the use of fire extinguisher chemicals. The heat source can be removed by shutting down the engine and by shutting off fuel to remove low kindling temperature material from hot surfaces. Electrical power can be shut off, also, to eliminate another possible heat source.

Generally, smoke and fire conditions occurring in engine operation can be classified as: fuel smoke, oil smoke, fuel fire, oil fire and magnesium and metal fire.

Fuel or oil smoke usually originates from some minor fuel or oil leak onto a hot surface. This condition may vary from a light colored



smoke to a heavy dark colored smoke. Smoke in small quantities is generally not too dangerous; however, this condition requires close surveillance. When the smoke from an engine becomes dense and heavy, a fire probably exists.

Fuel Fires

Fuel fires are extremely dangerous and can cause severe damage. However, when the source of fuel is shut off, the fire is usually extinguished.

Oil fires present an entirely different situation from those fed by fuel, because a desirable characteristic of all lubricating oil is that it possesses a high flash point which in turn means it must possess a high kindling temperature. Because the kindling temperature for oil is so much higher than gasoline, all surfaces must be so hot, in fact, that it is almost impossible to cool them sufficiently to extinguish the fire. Therefore, if you have oil burning, you have an almost uncontrollable fire. In the B-29, an oil fire is even more critical because there are no oil shut-off valves to shut off the oil supply. Because of the extreme temperature necessary to initiate and support combustion of oil, an oil fire will burn through almost any part of an aircraft engine or wing.

The most hazardous fire in an aircraft is a magnesium fire. An aircraft engine, to achieve the desired light weight, is constructed with considerable magnesium alloy. Enough, in fact, to provide fuel to support a large fire for a long time. Magnesium is a combustible substance which has the property of readily oxidizing and producing terrific heat accompanied by a piercing white light. A magnesium fire is extremely dangerous and almost impossible to extinguish.

Included in the abbreviated checklist are two normal situations seen only at night and a third condition caused by rich mixture or primer leak. Sharp bluish grey flames, turning to a light orange at the tips, coming from the exhaust tailpipe and turbo hood, constitute a normal desirable condition indicating proper engine operation. Small, intermittent streams of tiny sparks coming from the exhaust are also normal. The tiny sparks are incandescent particles of carbon. No remedial action is required in either case.

Thin, black smoke from the exhaust will indicate a rich mixture or primer leak, and is generally noted at high power settings in the air or when idling on the ground. All instrument indications will be normal, except that fuel flow may read slightly higher than normal. There is no remedial action required in flight for this condition. It should be recorded on the Form 1, and a comparison made with fuel flow on the affected engine in all power settings with the other engines.

Each combat crewman must know the different sections of an aircraft engine nacelle to properly evaluate types of engine fires. A most important factor in analyzing fires is to know where the fire starts. An engine nacelle is divided into three sections:

Zone 1—Power section includes engine forward of the fireseal and blower case or induction system. Fires occuring in this region are usually caused by engine failures. These fires develop from split cylinder heads, ruptured exhaust headers and other failures that result in oil or fuel being sprayed on hot exhaust stacks. Fires in "*Zone 1A*" are those that occur within blower case or induction system and are usually caused by backfiring or by valve failure.

Zone 2—Accessory section between fireseal and firewall. These fires are usually caused by a leaking fuel or oil line, a malfunction of an engine accessory or, on occasion, a severe backfire that may rupture induction system between turbosupercharger and the carburetor and ignite flammable material in the accessory section.

Zone 3—Area aft or firewall including wing and wheel well. Fires in this area are extremely rare and almost always occur in the wheel well. They are usually caused by an electrical short circuit igniting fuel or oil.

In the event of an electrical fire, all sources of electrical power should be turned off. Electric propellers will go into fixed pitch when a power failure occurs, and, as a precaution, propeller selector switches should be placed in the fixed pitch position, also. Caution should be used in tracing the origin of an electrical fire, since the cause of the malfunction may be several feet from the place smoke appears.

When an engine fire cannot be readily extinguished in flight, the aircraft commander is faced with an extremely important decision — whether to bring the aircraft down for an emergency landing or bail out his crew. In the past, several aircraft commanders have wisely chosen to abandon. In other cases, it appears quite conclusively that decisions to abandon aircraft have been made prematurely, before an accurate evaluation of the fire's severity, type and location have been made and all possible steps to extinguish it had been taken.

This point recently was brought up by a wing commander reporting on a B-29 accident in which the aircraft commander started bailing his crew out at 20,000 feet.

After climbing to 25,000 feet for an RBS run, a normal cruise condition was re-established. Some difficulty was experienced in getting No. 3 propeller to synchronize. No. 3 then backfired three or four times

(Continued on page 11)

Progression of a combination gasoline and oil fire is shown in photographs at left and below of final B-29 test conducted by CAA. Fuel flowed for 40 seconds before being ignited. After 20 seconds of unabated burning, engine was cut but the propeller feathering was not begun until one minute had elapsed. Propeller was completely feathered 1½ minutes after the start of fire. During 30 seconds required to feather, fire steadily diminished and 10 seconds later fire was completely out.

CAUSE

ACTION

Detonation, afterfire and/or backfire. Also fouled plugs or failing valves. Occasionally, injector nozzles sticking in open position, give similar indication. If fuel pump drive shaft is broken, engine gets insufficient fuel and mixture leans excessively. Indicated generally by high CHT, high CAT, fluctuating MAP, fuel flow and in some cases fluctuating cabin airflow. Lean mixtures cause high CHT. High CAT, about 40° C., produces detonation. Fluctuation in MAP, fuel flow, cabin airflow will result from violent backfire. If detonation continues, engine failure and fire is imminent.

1. Puffs of black smoke from exhaust.

Decrease CAT and CHT and enrich mixture, checking for proper RPM and MAP correlation. Increase airspeed.

Oil leaking onto exhaust stacks and vaporizing. Not a dangerous condition providing oil leak is not excessive. In some cases, leaking oil in turbo shrouds and turbosupercharger area will ignite. Oil leak in supercharger area can cause fire along full length of nacelle. No instrument indications except for possible drop in oil quantity.

2. Thin wisps of bluish-grey smoke from exhaust and cowl flap area.

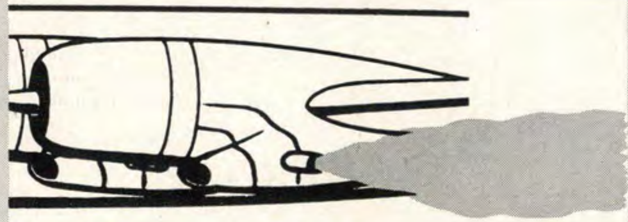
Normally, no action is necessary unless fire develops. If fire occurs, feather engine, removing source of heat and fuel, and fire should go out.

Cylinder failure, exhaust stack failure or broken injection line. If condition results in blown cylinder head or open exhaust stack, fire and black smoke will appear in exhaust stream.

3. Grey smoke coming from cowl flap of forward engine section.

During takeoff or when more than 3-engine power is required for safety, reduce power slightly and let engine operate until safe altitude and airspeed is attained, then feather engine.

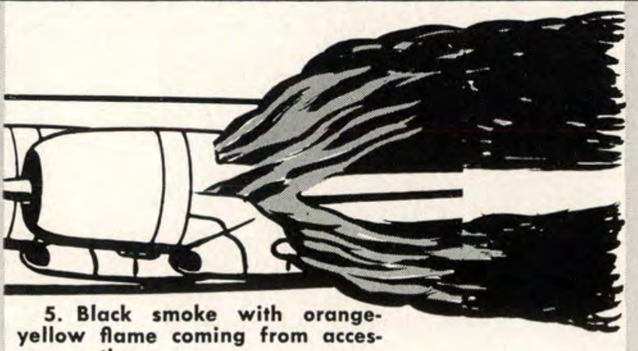
On ground at idling speeds, indicates mixture too rich. In flight, usually at high power settings, this can occur and indicates too rich mixture. There will be no instrument indications.



4. Light orange colored fire coming from exhaust.

On ground, increase throttle and blow fire out. In flight, move mixture control slightly to lean mixture.

Fuel fire in accessory section generally caused by broken fuel line. Low fuel pressure and abnormally high CHT are instrument indications. Fire warning lights will come on. Engine operation may be erratic, depending upon malfunction.



5. Black smoke with orange-yellow flame coming from accessory section.

Shut off fuel as quickly as possible and use feathering and fire procedures. Prepare to abandon aircraft if fire does not go out.

KEEP YOUR PLACE IN THE SUN . .

CAUSE

ACTION

Damaged or worn-out piston rings permitting cylinder to pump oil. Also caused by leaking impeller seal allowing oil to seep into induction system. At night, this condition appears as fire, however, it is only hot oil burning in exhaust stack and exhaust stream. No instrument indication, but slight power loss will usually occur.

6. Bluish smoke coming from exhaust.

No in-flight action possible. Record in Form 1 and monitor condition.

Induction fire (not generally encountered in late B-29s with fuel injection system). Instruments will indicate sudden drop of MAP and RPM. This loss will be regained due to action of automatic controls on prop and turbosupercharger, but definite power loss occurs. This could be mistaken for power or turbo surge. CAT is not reliable indicator because instrument records temperature of air flowing through carburetor, not induction system heat.

7. Black smoke coming from exhaust.

Close throttle, shut off fuel, feather engine and fire should burn itself out without damaging engine.

Induction fire in advanced stages. Very dangerous condition. Magnesium accessory section has probably ignited. CAT will rise rapidly to maximum reading.

8. Dense white smoke coming from exhaust.

Action in (7) above should have been taken to extinguish fire before it reaches this stage. Use fire procedure and feather prop. Alert crew for bailout. If fire does not go out within 30 seconds it may be best to order crew to bail out as fire will probably cause explosion in wing.

Indicates induction fire has burned through intake pipe and it is possible engine may fall off its mounts.

9. Dense white smoke coming from cowl flap areas.

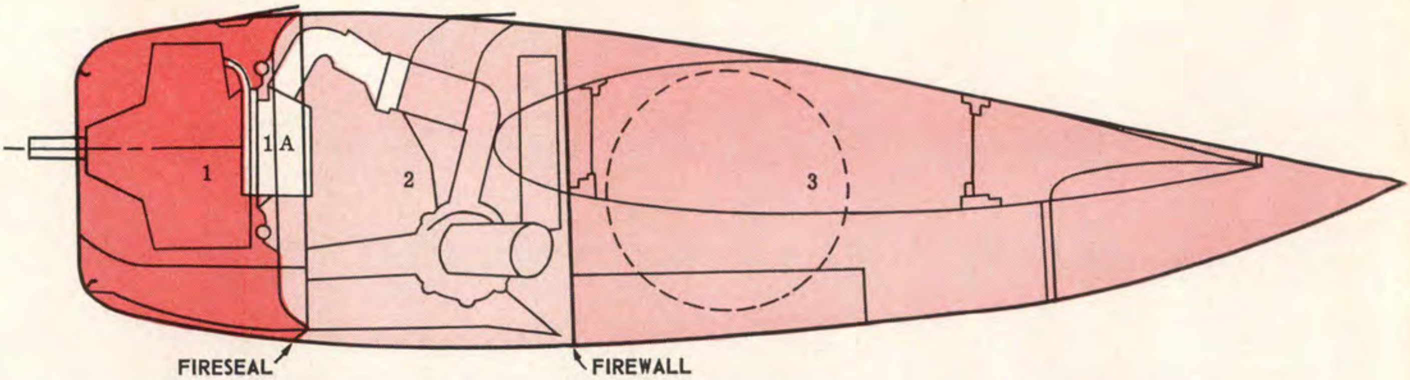
Fire has progressed to extremely dangerous stage. There is no remedial action. Prepare to abandon aircraft.

Oil fire in accessory section. Fire detector lights should come on for area affected. CAT will be abnormally high, accompanied by loss of power. If fire has burned through intercooler, smoke will come out of intercooler flaps.

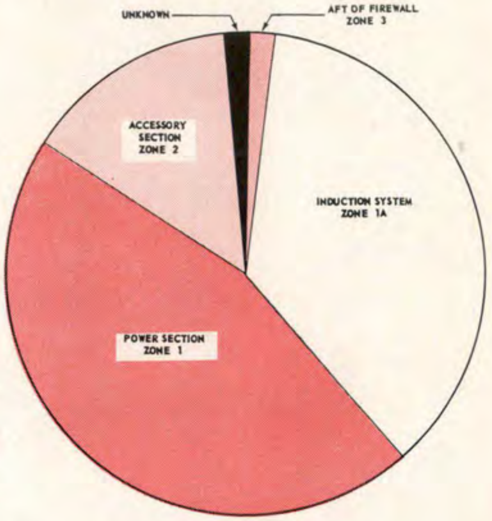
10. Black smoke coming from accessory section.

Use nacelle fire and feathering procedures.

. KNOW YOUR "SMOKE SIGNALS".



The majority of engine fires occur in the power section (Zone 1), with Zone 1-A, the induction system a close second. Fewest engine fires come from Zone 3, which is aft of the aircraft firewall.



and manifold pressure dropped from 31 to 25 inches. The pilot felt a yaw, which he believed to be the result of complete power failure on No. 3 He then advised the flight engineer and actuated the feathering switch. The prop approached the feathered position momentarily, then immediately surged to an overspeed condition of approximately 4000 RPM.

The crew was alerted for possible bailout as the right scanner reported a large amount of sparks coming from No. 3 engine. This was followed by more smoke and a short burst of flames.

An unsuccessful attempt was again made to feather the engine.

The pilot reduced manifold pressure to 17 inches on the other three engines and slowed the B-29 to 160 MPH. This caused the No. 3 RPM to decrease to 3700. A third unsuccessful attempt was then made to feather.

While the aircraft was being descended to 20,000 feet at 170 MPH, the pilot ordered the crew on oxygen and pulled the emergency cabin pressure release handle and actuated the emergency bomb door release. At 20,000 feet, the crew was ordered to bail out.

At no time did the warning lights on the aircraft commander's and flight engineer's panels indicate fire. The fire extinguisher system had no effect on the fire.

After ascertaining that all compartments were clear and that the B-29 was over a sparsely populated area, the aircraft commander put the ship on auto-pilot, with the turn control knob on a maximum turn to the left and nosedown trim. The aircraft continued to descend in a turn until it struck the ground, disintegrated and burned.

Since the fire, in this case, was in the front of the engine there was little danger of an explosion or structural failure. This is further evidenced by the fact that the B-29 continued to descend and exploded only after contacting the ground. Had this same situation arisen on a commercial airline, the aircraft probably would have been landed and required only an engine change. Investigators believe the aircraft commander chose a greater risk for his crew by bailing them out at 20,000 feet than would have been involved in making an emergency landing.

Extensive tests of B-29 power plant fires in flight conducted by the Civil Aeronautics Administration Technical Development and Evaluation Center at Indianapolis, reveal some significant conclusions:

- The B-29 fire accident record revealed that the chief source of trouble is the exhaust system.
- Stopping the flow of flammable fluids to the power section (Zone 1) by feathering the engine frequently is sufficient to extinguish a fire which has not spread beyond this zone.
- Fires which originate far forward in the engine and enter the exhaust stack shroud may escape detection by thermocouples located near the cowl flaps.
- Failure of the exhaust stack can cause a dangerously high temperature inside the accessory section near the region where the failure occurs.
- Gasoline and oil leaking from a source far forward in the power section are not readily ignited.

The CAA center at Indianapolis is

Type of Fire or Smoke
Bluish Flames (Night)
Sparks (Night)
Black Smoke
Black Smoke
Bluish-Grey Smoke
Grey Smoke
Bluish Smoke
Black Smoke
White Smoke
White Smoke
Light Orange Flame
Black Smoke
Black Smoke and Orange Flame

currently conducting similar tests with a B-36 power plant installation for the Strategic Air Command. Tests conducted have three objectives: Prevention of fire through design changes and maintenance; control of fires through operational procedures, and detection of fires by means of instruments or observation.

Since the alternator and constant speed drive has been responsible for a large portion of B-36 nacelle fires, this system is being installed in the CAA's test nacelle. In addition, the tests will evaluate fire detector systems.

SAC aircraft accident reports, together with studies made by Lt. Col. John A. Robertson of Rapid City Air Force Base, and CAA, indicate that fire producing conditions can exist in flight for a considerable period of time without an actual fire being encountered. Flame-up appears most likely when the throttle is retarded, as when leveling off at the end of a climb, beginning letdown or, primarily, on flare-out when landing.

In MATS positive training is given transport aircraft commanders and first pilots at intervals of 90 days during required local base and route line checks. At least once during each of these checks emergency fire conditions are simulated by instructor pilots.

These simulated fire-in-flight conditions are varied on each occasion, in order to cover different situations. The pilot's reaction and procedures followed to combat the emergency are closely monitored in order to assure proper action and standardization of procedures for the particular aircraft being flown. Hasty, improper action, stemming from panic or lack of knowledge, is not tolerated. Emphasis is placed on isolating fires quickly and conclusively. With respect to engine fires, fuel, oil and hydraulic sources are cut off permanently to preclude the recurrence of the emeregncy conditions.

In addition, MATS considers the following procedures more than normally important:

- The aircraft commander is personally responsible for ascertaining that fire detecting and extinguishing equipment is available and operational prior to takeoff.
- Passengers are briefed with regard to smoking in aircraft consistent with established policies.
- Passengers are briefed concerning fire hazards in flight and are required to sign statements to the effect that personal baggage does not include inflammable and/or explosive material.

MATS feels that the very routineness of these policies and precedures and the frequency of simulated fire-in-flight conditions for air crewmembers assists in the actual prevention of emergencies of this nature and serves to prevent simple fires from being aggravated into a disaster.

The problem of engine fires can be broken into three phases: prevention, detection, and extinguishment.

All are dependent upon quality maintenance plus combat crews who are alert, possess thorough knowledge of the different type engine fires, the indications, causes and danger, and use of proper procedures for isolating and extinguishing them. Cleanliness of the power section is of prime importance in preventing engine fires. If oil and grease is removed frequently the possibility of fire is considerably reduced. Prompt, accurate reporting by scanners of visible smoke and flames is extremely important. Scanners must report what they see — not flames if they only see smoke.

If this is done, the hazard of an engine fire in flight will be reduced and the safety of each aircraft and crew increased greatly. ●

SMOKE AND FIRE ABBREVIATED CHECKLIST

Visual Indication	Instrument Ind.	Possible Cause	Danger	Remedial Action
From exhaust tail pipe at night	Normal Cruise	Normal cruise	None	None
Tiny sparks from exhaust at night	Normal Cruise	Normal cruise	None	None
Thin trails from exhaust	High fuel flow possible low CHT	Rich mixture Primer leak	Wasted fuel Fouled plugs	None in flight Note on Form 1
Puffs from exhaust	High CHT & CAT Fluctuating MP & F/F	Detonation, afterfire or backfire	Loss of power Engine failure	Enrich mixture Reduce power—Temp.
Thin wisps from cowl flaps	Possible drop in oil quantity	Slight oil leak	None	Watch closely
Variable quantity from cowl flap	High CHT Fluctuating MP	Cylinder head or exhaust stack failure	Engine failure & fire	Feather
From exhaust excessive sparks (Night)	High CHT Loss of power	Worn rings Piston failure	Engine failure	Watch closely Feather to save engine
Heavy—from exhaust	Sudden drop MP & RPM High CHT	Induction fire	Uncontrolled fire	Fire & feather procedure
Dense—from exhaust	Very high CHT, CAT & oil temp.	Induction casting	Uncontrolled fire	Fire & feather procedure
Dense—from cowl flap	Very high CHT, CAT & oil temp.	Induction casting burned through	Uncontrolled fire	Fire & feather procedure
From exhaust	Slightly high F/F	Rich mixture or oil fire exhaust area	Rich mixture—none. Oil on re-burnt fairing	Check mixture control Oil fire—feather
From accessory section	Var. fuel press, high CAT, fire lights	Oil leak and oil fire	Uncontrolled fire	Fire & feather procedure
From accessory section	Var. fuel pressure, CAT, fire lights	Fuel leak & gasoline fire	Uncontrolled fire	Fire & feather procedure

Indoor FOG

Visibility: Eight miles outside the cockpit.

CANOPY fogging is a problem that will continue to confront jet aircraft pilots as long as they are unfamiliar with the operation of the aircraft's auxiliary equipment, and the limitations of its capabilities in clearing "indoor" fog and frost from the canopy and windshield.

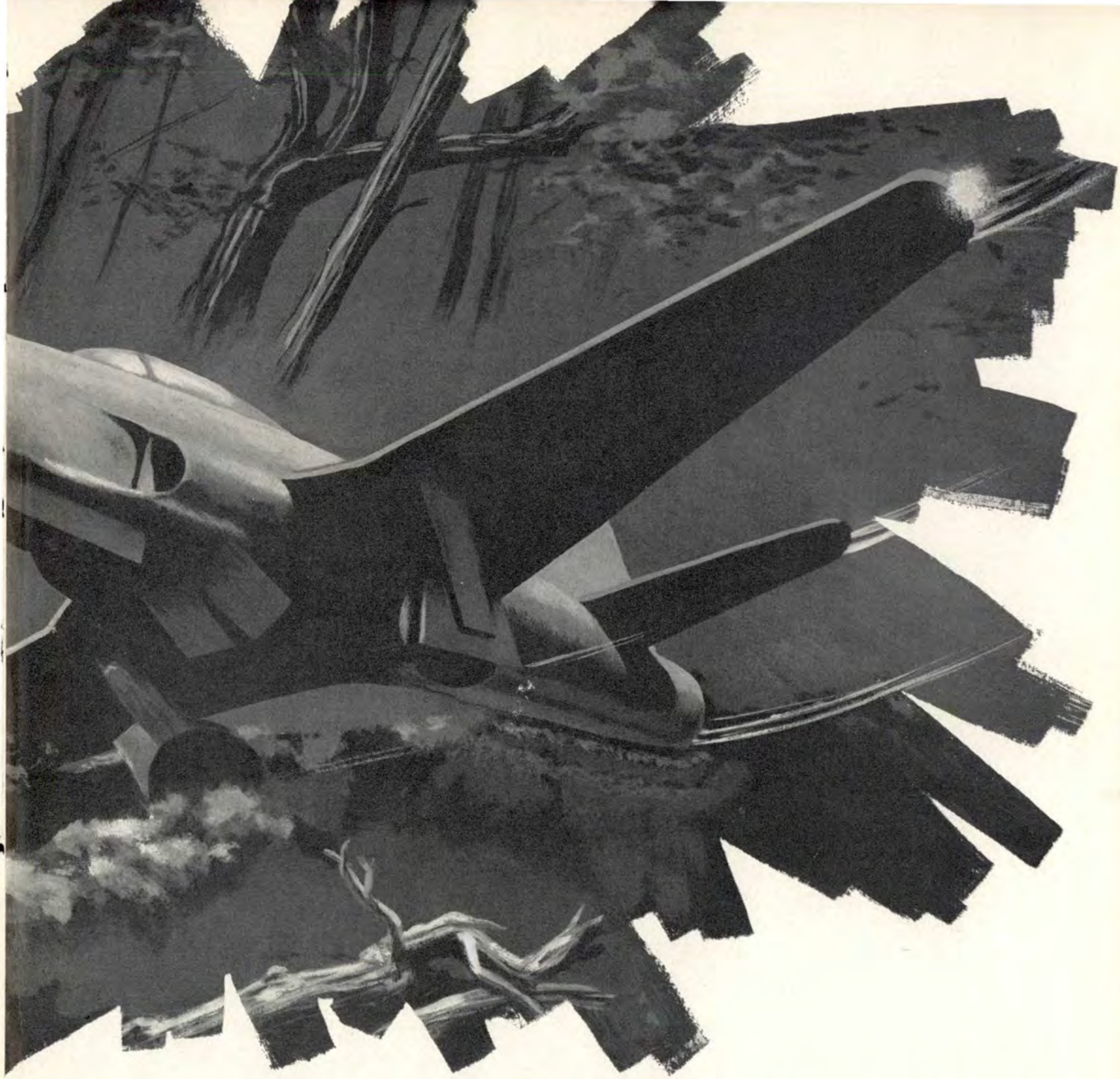
An F-94-B pilot was cruising at 20,000 feet when smoke from a shorted C-4 lamp filled the cockpit. He immediately de-pressurized in order to clear the smoke from the interior of the aircraft. When the smoke cleared, the cabin was again pressurized, but 20 minutes later the smoke re-appeared. At this time the pilot decided to make an immediate landing. As he started his descent he turned on the auxiliary defrosting unit and windshield de-icing.

When the aircraft reached pattern altitude, the interior of the cockpit was badly fogged, and restricted the pilot's visibility to such an extent that a hard landing was made, with resultant damage to the aircraft.

T. O. 00-75FAB-1 explains F-94-B cockpit pressurization and windshield defrosting operations. When the cockpit pressurization is turned to the "off" position, no defrosting air is available from the pressurization system. However, there is an auxiliary defrosting unit that supplies defrosting air to the windshield.

Maximum defrosting can be obtained from the use of both systems *only* if the windshield de-icing is used simultaneously with the auxiliary defroster. However, it must be remembered that the defrosting control knob must be pulled out, thus shutting off pressurized air to the defroster ducts in order to operate the auxiliary defroster.

In the F-94-B, hot air for defrosting the windshield and canopy is taken from the cabin pressurization system. The temperature of this air



is dependent upon the position of the temperature selector, and the quantity is dependent upon the positions of the cockpit pressure air inlet grille dampers.

Heater Unit

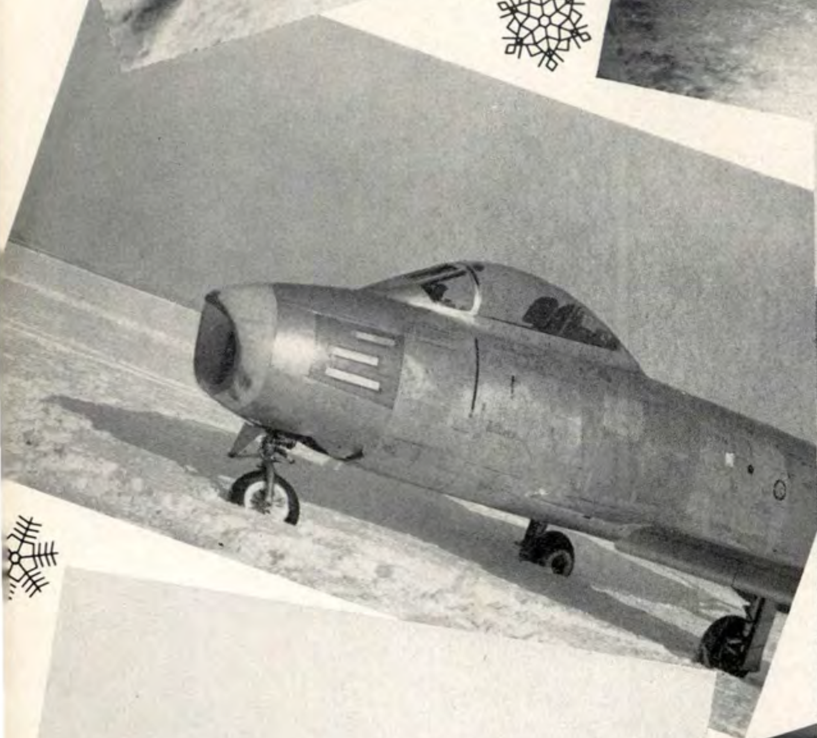
The auxiliary windshield and canopy defrosting system consists of an electric fan and heater unit, which provides an alternate source of heated air for defrosting while descending from altitude with the engine inoperative, at low RPM, or while heated air from the cabin pressurization system is being diverted from windshield de-icing.

The defrosting control mechanically positions the defroster valve. Defrosting air is not available from the cabin pressurization system when the windshield de-icer is turned on.

When the auxiliary windshield defroster is on, the fan and heater provides hot air to the windshield, provided the primary defrosting control is pulled out.

In climates where relative humidity is excessively high, it should be realized that after descent to traffic altitude, it may take a minute or two for the defrosters to do a complete job. The outside humidity must be more-or-less equalized with the cabin humidity, in order to obtain complete defrosting. In instances such as this, a circuit or two of the field slightly above traffic altitude would allow the defrosting system, when operated correctly, to do a thorough job of clarifying pilot vision through the windshield and canopy. ●

dashi



ng through the snow!

The one-hoss open sleigh worked okay on snowy surfaces . . . not so the airplane!

EVERY year about this time, when the frost is on the punkin and the fodder's in the shock, the "snowbank" TWX's start dribbling in, and the investigating officers start digging out their snowshoes.

The pattern of these accidents is strictly standard, "taxied into snowbank," "slid into snowbank," "rolled into snowbank." Inasmuch as a snowbank presents approximately the same density as a pile of sand, damage to the aircraft can be, and usually is, of major proportions.

During four winter months of last year there were twelve major aircraft accidents charged to "Condition 13" — which in statistical palaver means "Collision with object (snowbank)."

Snowbanks are no respecter of aircraft. Airplanes coming into contact with Jack Frost's handiwork ranged from B-29's to F-86's. However, it seems that fighter pilots had the greatest affinity for this type of accident, being credited with eight out of twelve engagements with piles of snow and ice.

Pilot Error

Seven of the twelve "snowbank" collisions were pure pilot error, caused by lack of judgment, planning and flying technique; four of the seven being "short landings" in the deep, deep snow beyond the overruns. One accident was caused by loss of braking action on a slick runway, one was due to improper marking of the runway, and one by the failure of the snow-clearance supervisor to remove snow from the over-run. (The pilot landed long and rolled into the over-run.)

A re-cap of these accidents shows that the blame is pretty evenly divided between the pilots and operations supervision . . . but in every case, the accident was the result of poor planning on someone's part.

Let's take a look at some of the accidents:

A senior pilot with 2800 hours flying time landed at a civilian airport on an uncleared runway, eight inches deep with snow. Came time to take off, our friend called the State Highway Department, and asked them to come out and plow the snow. The plow cleared the snow for 5000 feet, in a swath 41 feet wide, but left about three inches of packed snow on the runway. The four-engine bomber took an 1800-foot ground roll, dropped a wheel in a soft spot, and because the lateral clearance was so marginal, swerved, sheared the nosegear and then dug the right main gear into the snowbank. Verdict: 100 per cent pilot error in attempting to take off from such a narrowly plowed strip.

Landed Short

A new pilot with 27 hours of flying time since graduation from fly-

Here is a gaggle of accidents caused by pilots' failure to keep sharp lookout when landing on snowy surfaces.

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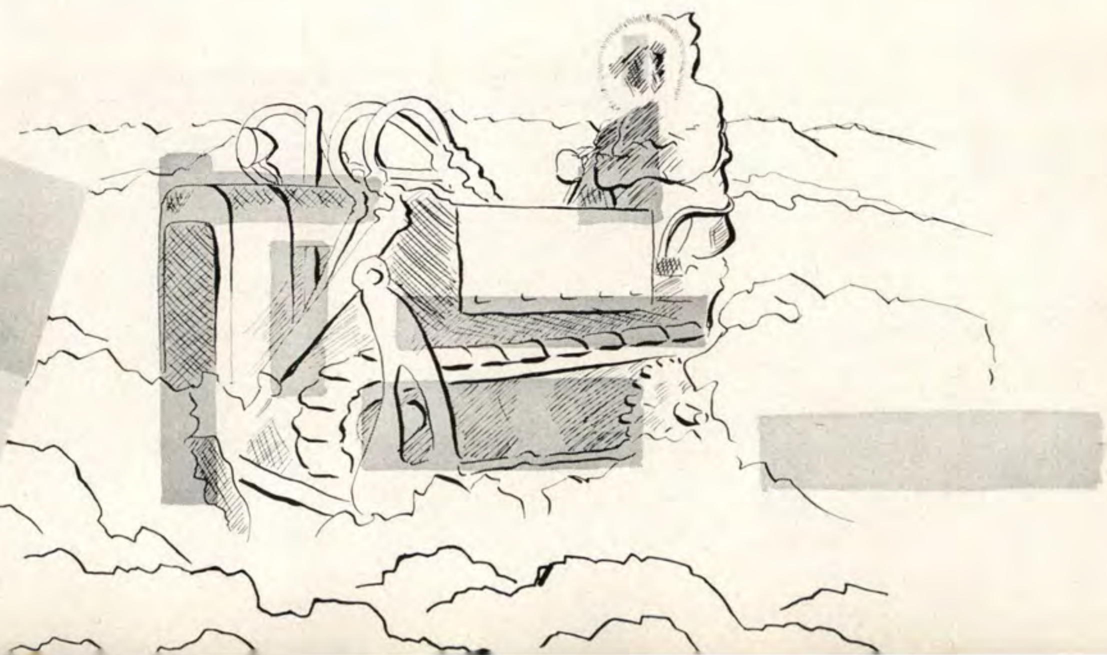


ing school undershot a landing on a flame-out. He landed 800 feet short of the cleared portion of the runway, which was inadequately marked. Because the runway end was not clearly defined, the pilot mistook the overrun area for the runway end. This accident can be chalked up to supervisory error.

Another pilot, flying an F-80-C, had 8000 feet of cleared runway ahead of him, yet misjudged his final approach and landed 300 feet short, meeting a three-foot snowbank located 50 feet from the end of the runway. This air field was located in Alaska where surrounding terrain precluded clearing the overruns . . . but with 8000 feet ahead of him, there was little or no excuse for a short landing.

Another pilot, flying a B-25, after having been duly cautioned about snowbanks at the ends of the runways, tried to "land on the number," and in doing so, hit 150 feet short of the runway, in a three-foot snowbank. However, over-run had not been snow-cleared. This base was located in flat country with adequate approaches which puts part of the blame on snow-clearance methods.

In all too many of the accidents reviewed, the pilots failed to note that the snowbanks were windrowed from 15 to 25 feet beyond the edge of the runway, a narrow margin of safety any way you look at it.

Another thing to remember: Snowbanks are not confined to the runway areas. Pilots should note carefully snow-clearance margins on taxi-ways and in parking areas. Accidents also lurk in the parking ramps. At one air base in the mid-west snow had been windrowed into 18-inch-high banks, spaced about 30 feet apart. These parallel rows of packed snow presented a series of small barriers, over which an aircraft had to taxi, in order to reach the proper parking spot. The snow had frozen hard, and presented a real hazard to the nosewheels of tricycle aircraft. Operations officers should work closely with the installations personnel to insure that snow is so cleared from the parking ramps, that aircraft can have free access to and from the runways without crossing any snowbanks.

Mark the Runway

In snow country, runway outlines should be clearly marked with seamarker dye, ashes, or small evergreen trees set at intervals along the runway. If possible, the over-runs should be cleared, but the runway should be outlined, exclusive of the over-runs. The ends of the runways in particular should be marked, with the threshold clearly delineated.

Use of sand on icy surfaces is a must, especially with jet operations. However, the sand should be evenly distributed and compacted with a multi-wheel rubber-tired roller. Use of cinders should be carefully weighed in connection with jet operation, as compressor damage could conceivably occur.

Safe snow and ice conditions on airfields is a four-way parlay . . . the pilot, the supervisor, the weatherman and the installations officer.

Safe landing, taxi and parking clearances should be closely observed in the planning stage of snow clearance for any airfield. The fact that snow is cleared from the runway surface itself is important, but it is equally important that the snow is cleared far enough back to preclude wingtips striking the edge of a snowbank, or an aircraft rolling into a snowbank at the end of a cleared runway. It is obvious, of course, that terrain limitations come into the picture, but close coordination with the installations people can help this situation in many ways.

Another point to take into consideration is the possibility of drainage ditches or other natural obstructions being covered with snowfall, and remaining unmarked to the detriment of the pilot.

An additional and important item in safe operation under winter conditions is a fool-proof system of incident and near-accident reports which require all pilots taking off or landing at your base, to report surface conditions of runways, ramps and taxiways. You cannot always depend on weather reports or NOTAMS. Operations should keep a blackboard in the dispatch section, on which ground conditions are logged hourly, with the time of last entry noted.

This information should be closely coordinated with the control tower, as the controller can and will be of substantial aid in advising pilots of current surface conditions, from the time of landing roll to final parking on the ramp.

However, this one point should be emphasized. Unless the man in the control tower cab is given up-to-the-minute information on ground conditions during weather that results in snow, slush, or ice on the runways, taxiways and parking areas, he cannot pass the information on to the pilot in the most efficient manner, especially if there has been a marked change in field conditions. ●

A snow removal "team," perfectly coordinated for accelerated runway clearance. Efficient snow removal is the result of coordination between operations and facilities.

LEAVE THAT TOGGLE DOWN!

A tiny thing like a toggle switch can wash out a B-29.

DURING the past year there have been a series of landing gear retraction accidents on B-29's that follow a distinct pattern.

Everything is apparently set up for the landing, cockpit check has been run through, lights indicate that all is in the green. The big bird flares out, touches down, and slowly sinks to the runway like a wounded duck. Verdict, gear not fully lowered, or gear not locked. Result, one major accident chalked up to the command.

Post-Mortem

Here is the post-mortem on four major accidents of this kind.

After touching down, the left landing gear slowly collapsed into the wheel-well, and the aircraft gradually ground looped. The copilot stated that he placed the gear switch in down position, waited until the green light came on, then placed the gear switch in neutral and put the switch cover down. What the copilot probably saw was the nosegear light. In this instance, T.O. 01-20EJA-1 was violated, in that the landing gear switch must be left in the down position until the aircraft is parked. What happened was that the copilot neutralized the landing gear switch before the main landing gear was fully extended.

The second of these four accidents occurred when the B-29 had landed and was rolling down the runway. At a point some 7,000 feet from the point of landing, the main gear collapsed. It was evident that power had been applied to the control circuit, either through a short circuit, or by placing the landing gear switch in the "up" position. Inasmuch as no electrical shorts could be located, it is safe to assume that the switch had been placed in the "up" position before the main gear was fully down and locked. The landing gear safety switch, which normally would have prevented retraction of the gear, does not, under certain load conditions, cut in until the aircraft has decelerated to a speed of 60 mph.

The third accident occurred after the aircraft had made a normal landing, and had rolled approximately 3000 feet down the runway. Brakes were not used and props not reversed. When the nosewheel was lowered, the nose kept coming down until it touched the runway surface. The accident board decided that the probable cause of the accident was the returning of the gear switch to the "off" position before the nose gear was fully extended.

Don't Trust "Feel"

The fourth of this series of landing gear accidents was caused by the pilot, while *still reading off the check-list,* reaching over to retract the flaps, and retracting the landing gear by mistake. This pilot trusted *all* to "feel" and nothing to "see," when he should have made both a visual and physical check before flipping the switch.

Important:

- Leave the gear switch in DOWN position until you have parked the aircraft.

- Don't trust to memory, or to "feel." *Look* first, *then* actuate the switch.

All four of these accidents were caused by ignorance of the T.O., or by careless procedures. Four more major accidents were chalked up to "pilot error." ●

The big bird flares out, touches down, and slowly sinks to the ground. Verdict, premature gear retraction, or gear not completely locked. Read the "post mortem" on four recent major accidents of this kind, and you may draw your own conclusions.

EVEN YOUR BEST FRIENDS...

If you know the difference between safe and unsafe aircraft odors, you may save yourself a bailout . . . and the USAF an aircraft.

In August, 1952, FLYING SAFETY *Magazine published a short "Crossfeed" article, outlining the methods employed by the 4400th Combat Crew training group to teach proper detection of fume and smoke odors in aircraft.*

The editors of FLYING SAFETY *think that the efforts of other units along the same lines are worthy of note, in that proper training on the identification of what may be termed "safe" and "unsafe" fumes could, under certain conditions, reduce the possibility of a needless bailout or crash landing.*

MARK TWAIN wrote about the river boat skippers who plowed up the muddy stretches of the Mississippi on "actual instruments," gauging to a foot their distance from the shore by the echo of the steam whistle. These old timers, under forced draft with the safety valve tied down, could also tell by the hot smell of the stacks when the boilers were just about to let go.

The steam boat pilots "knew their craft," and just how much they could take before slacking off on the throttles.

Today's pilots don't fly by sound, or smell, or feel, but knowing the difference between "safe" and "unsafe" sounds, odors and fumes may mean the difference between a right and a wrong decision, and the saving of one of "Uncle Sierra's" (Sugar, to you) flying machines.

If you smell fuel fumes, or detect smoke in the cockpit, the situation *can* be very serious, but knowing the exact origin can help you to make the proper decision on what procedures to use.

Electrical Fumes

Conversely, the situation may seem more serious than it actually is. Take the case of the F-51 pilot who failed to disengage his starter switch. Twenty minutes after he was airborne, the starter burned out, filling the cockpit with smoke. Not realizing that the odor was electrical, he assumed that his engine was on fire, and without further ado, hit for the deck, and landed wheels-up in a plowed field.

In another instance, the crew of an F-94 failed to recognize the odors from a short in the radar equipment. The pilot shut down the engine and crash landed in an open field.

Air Defense Command realized that there was a definite need for an aircrew training program which covered the proper identification of "safe" and "unsafe" fumes. A comprehensive program has been worked out which should definitely reduce the possibilities of pilots mistaking the source of an odor.

The 4708th Defense Wing at Stewart Air Force Base, has set up and is operating a program for teaching personnel how to distinguish various odors emanating from fuel, oil, electrical shorts, and other critical sources in the aircraft they fly.

The odor of an electrical fire has been created by causing a short circuit in a direct current circuit and allowing the insulation to burn. This circuit is mounted on a board, well insulated against fire, and heavy battery cables are used for the hot leads to and from two copper busses. A solenoid switch relay is mounted in the circuit in conjunction with an "on" "off" switch. Power is supplied by an auxiliary power unit.

Creating Fumes

To simulate hydraulic and fuel fumes, liquids are allowed to drip on to a pan heated by an electric hotplate, housed in a metal container. An external fan blowing into the container forces the smoke and fumes out the spout at the opposite end of the container.

Hamilton AFB has developed an ingenious method of burning an electrical wire with a hot soldering iron and dispensing the smoke through a vacuum cleaner.

Another unit at Hamilton continued a little further and demonstrated to its personnel odors from burning lubricating oil, paint and coolant.

Students were given tests after exposing them to various odors. It was found that after three indoctrinations, 90 per cent of the aircrews could distinguish between all of the various fumes.

The 109th Fighter-Interceptor Squadron used a metal drum approximately one foot in diameter and two feet in height, with several slots about one inch by two inches near the bottom. This drum was placed in the front of a classroom with an electric fan directed toward it. Samples of phenolic plastic, lubricating oil, hydraulic fluid, JP fuel and 100/130 octane gasoline were ignited by means of a blow torch. The pilots then moved into effective range of the smoke and fumes and noted the identifying characteristics. Fumes and vapor caused by a ruptured hydraulic line were simulated by spraying a small amount of hydraulic fluid from a paint spray gun.

At Scott AFB, another squadron demonstrated to its personnel the odors of liquids common to aircraft (oil, hydraulic fluid, coolant, gasoline) by immersing a red hot section of tubing into a liquid-filled container. This method simulated the liquid passing over a heated aircraft part rather than the fluid itself burning.

No matter how it's done, proper precaution should be taken to insure that all safety fire prevention methods are being utilized. The program must be coordinated with the Base Fire Chief.

Every organization in the Air Force should make an effort to develop a smoke and odor indoctrination program. Air Defense Command has found that an ounce of prevention is easily worth the thousands of dollars worth of airplane going *down* in smoke every year. ●

Students learn to distinguish "danger" odors from "safe" odors by smelling substances ignited in laboratory tests.

A NEW AFR 62-14

A complete revision of AF Regulation 62-14, the directive covering the investigation and reporting of aircraft accidents, is now being published, and will become effective around the first of the coming year.

Substantial changes have been made from the existing directive.

Here are the major differences between the old and the new Regulation:

• The definition of an Air Force aircraft accident has been revised. Accidents will comprise only such occurrences as result in damage to aircraft while incident to flight.

• The criteria by which damage is classified substantial or minor have been changed. USAF aircraft have been grouped in six classes and the number of direct manhours required to repair damage in each class will determine whether the damage is substantial or minor.

• A new concept has been introduced calling for reporting of certain types of incidents. These include death or injury to personnel not coincident with damage to aircraft; damage from bird strikes, lightning, or hail; loss in flight of propellers, canopies, etc., when no further damage is incurred; damage on the ground while engines are running without intent for flight, or damage resulting from fire or explosion while engines are not running.

• Guided missile accidents and incidents will be reported.

• Certain engine data are required on the preliminary report when engine failure or malfunction is a factor.

• The Director of Flight Safety Research may direct all investigative efforts on an accident or incident and may conduct independent investigations.

• Certain changes have been made in the routing of crash, preliminary, and accident reports.

• Aircraft wreckage will not be removed from the scene for at least 24 hours unless the wreckage interferes with operations or civil functions.

Pitot Icing ...and how to cope with it

THERE I was at 38,000 feet in my F-94 and everything was fine. All instruments were indicating normal and the weather was CAVU. The airspeed was indicating about 20 knots below the limiting mach. It seemed that everything was operating perfectly.

Well, the mission is about over. Guess I'll go down and land. Sure could use a cup of coffee and a sinker.

The dive flaps are extended—now to reduce power and begin the descent. Whoa, what's wrong here? The airspeed is increasing. Better ease off—it's gone beyond the red line. With this power setting and dive flaps extended I know I'm descending; yet, my altitude still indicates 38,000 feet and my rate-of-climb indicates zero.

I'll pull the nose up and slow down. Hmmmm, this plane is near the stalling point and yet the airspeed indicates 680 knots. The altimeter still indicates 38,000 feet. I don't know what's wrong so best I turn off my fuel and make my descent without power.

I'm sure I'm below 10,000 feet. Now to complete an airstart. Got her started OK. With this high indicated airspeed, I'll just use 75 per cent rpm. That altimeter still indicates 38,000 feet.

Approximately 10 minutes later: Look at that altimeter unwind! It stopped at 6000 feet; that appears to me to be approximately the altitude at which I am flying. Best I get into the traffic pattern and get this plane on the ground.

"Tower from AF 1234, request landing instructions. . . . Roger, entering traffic for runway 23."

In the Pattern

I'm in the pattern now and I think I can land this plane without the airspeed. Wait a minute. The airspeed is indicating 220 knots. That's about what it should be indicating at this power setting. The airspeed was indicating right on the approach and touchdown. What caused the difficulty?

These are the thoughts of an F-94 pilot on a flight when his instruments acted in the manner described. Do you know what caused the difficulty? Would you know how to correct it in flight?

The static pressure lines of the pitot static system had iced up during the flight at altitude. This prevented any increase in static pressure during the descent. The air trapped in the system was thin air at 38,000 feet. The rate of climb indicated zero for the same reason. No change in static pressure.

The airspeed indicator is a pressure differential instrument which utilizes both static and impact pressure. When the static pressure line iced up at 38,000 feet the difference between the static and impact pressure was normal. The airspeed indication was normal. As soon as the pilot began to descend, the impact pressure increased due to the greater density of air. The static pressure remained the same. This less dense static air allowed the diaphragm in the airspeed indicator to expand more than normal which caused the indicated airspeed to read high.

Ice Melted

After the pilot had flown at low altitude the ice in the static pressure melted and the altimeter, rate-of-climb and then the airspeed indicator operated normally again.

Many aircraft have a selector for the static pressure source and it is possible to select an alternate source if the primary source becomes clogged for some reason. Because of the venturi effect of the flow of air over openings in the aircraft, this alternate static pressure is usually lower than the pressure provided by the pitot static tube.

This is important to remember because of the resultant effect upon the instruments when the alternate static source is used. The alternate source should be checked in flight when possible before flying into instrument flight conditions. When the alternate static source switch is used the altimeter usually reads higher than normal, the indicated airspeed is greater and the vertical-speed indicator momentarily indicates a climb. ●

Do It Right . . . the first time!

A Lesson in Adjustable Chute Harnesses

AMONG THE different types of chute harnesses in use today is the new class III adjustable type. This latest type of harness was made to be put on and quickly adjusted by the wearer. No tacking is necessary. The harness is completely adjustable and will fit men from 5′2″ tall and 110 pounds in weight to men 6′4″ tall weighing 240 pounds, wearing any type of flying clothing.

The first step in adjustment of the harness is "pre-fit." As you can see in figure 1, the slings have numbers on them. Once you get properly fitted in a class III harness, you can always get a perfect fit in any other class III harness by setting the same number on the sling adjustment. This pre-fitting should be done before you put on the harness if you know your number.

If you have never been fitted for this type of harness, here's the way you adjust it. Loosen all the straps —back, chest and sling.

Put the harness on. Fasten the chest strap and check it for snugness. An adjustment can be made in a matter of seconds to either loosen or tighten the strap.

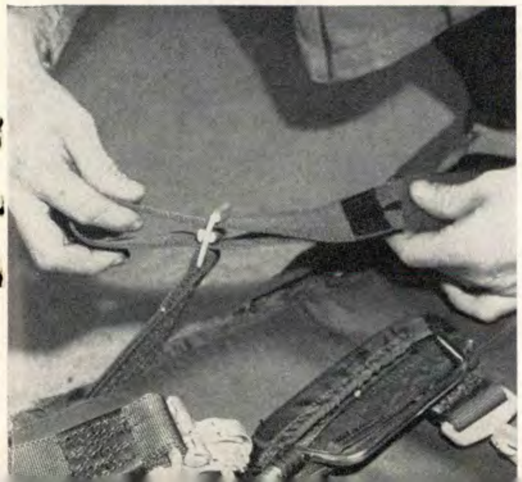
Next, check to see where the canopy release buckle lies in relation to your collarbone. The buckles on both sides should be in a position approximately two inches below the collarbone. If the buckle is too high, then the index sling must be adjusted. In this particular case, move the sling to a higher number. If the canopy release buckle is, for example, about one inch too high, adjust the sling to one index number higher.

After you've found your proper index number, then move the back harness sling under your buttocks. Then sit down and fasten the leg straps securely. Next, pull down on the back straps until the harness is snugly fitted to your body, and now you're in business. The final fit should be so tight that you are forced to bend slightly when walking.

When you get another class III harness, here is the proper step sequence to follow whenever you wear this harness:

- Pre-fit the harness to your index number before donning the harness.
- Loosen the back straps.
- Don the harness.
- Fasten chest and leg straps.
- Tighten leg straps.
- Tighten back straps.
- Adjust and tighten chest straps.

Now, just one final warning. Don't forget to first loosen and then adjust the *back straps*. Improper adjustment results in not being able to get into the seat when the canopy opens. ●



radar assist

Air Defense Radar Can Help Orient Lost or Distressed Aircraft by Use of a Unique Plan.

HAVE you ever considered the idea of being IFR and obligated to make an instrument letdown in mountainous terrain without the aid of radio range facilities? Believe it or not, such a letdown may be accomplished safely.

The 25th Air Division (Defense) at McChord Air Force Base, Washington, realizing the inherent capabilities of its air defense radar and communications facilities to assist lost or distressed aircraft during all periods of night and weather conditions, has established procedures for assisting distressed aircraft.

The question arises, "What can the radar system do to help emergency or distressed aircraft?" If the aircraft is in radio and radar contact, it can be directed to an area of VFR conditions, controlled to a safe letdown on an airfield of its choosing, provided ceiling and visibility permit, or controlled to a major airfield of its choosing, let down, and turned over to GCA for a landing.

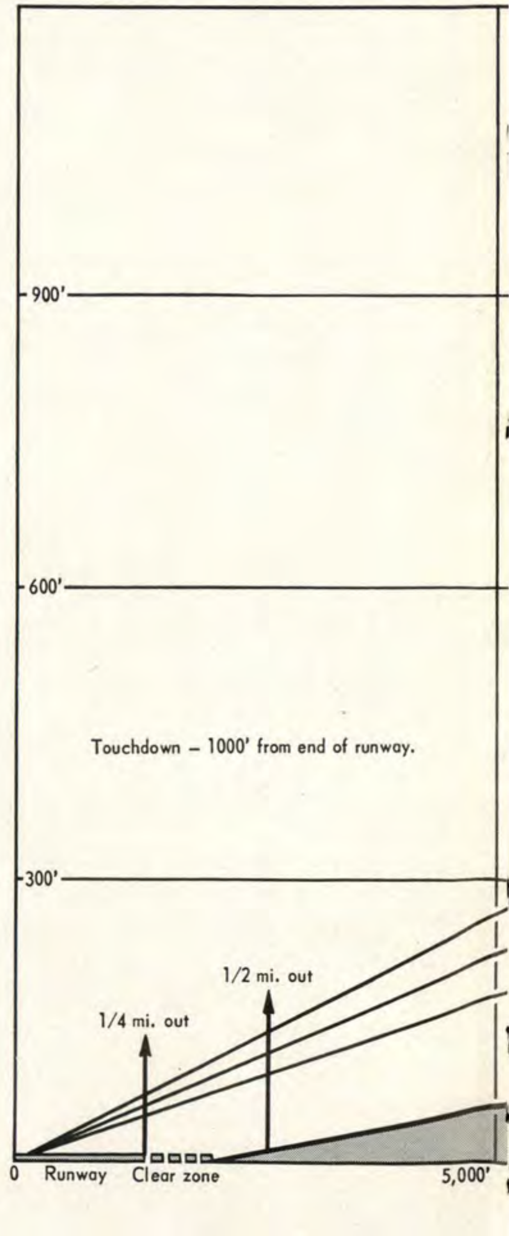
If the aircraft *is not* in radio contact with the CAA or the radar system, it is possible that the distress can be made evident to the radar system by flying a prescribed emergency pattern. In this case, it is possible that an interception can be made by a fighter or other type aircraft which can lead the distressed aircraft to a letdown on the air base selected by the agency having responsibility for its control.

With these thoughts in mind, representatives from all civil and military agencies and organizations concerned with flying in the Northwest attended a meeting at McChord Air Force Base. The purpose of the meeting was to establish definite procedures for utilizing the air defense radar nets as an assist for lost or distressed aircraft. The procedures outlined below are those that the representatives established and those that have been adopted for the Northwest area.

Contact Procedure

The radar system may be contacted in the following manner. If the distressed aircraft has radio contact, it may direct any CAA Range Station in the Northwest Sector to request radar assistance from the Air Defense System, or call "*Radar Control*" on VHF Channels "D" (121.50 mcs) or "G" (136.80 mcs) or UHF 243.0 mcs, and state the degree of emergency by using the distress calls "*Mayday*" or "*Pan.*"

If unable to make radio contact, and assistance is required, the distressed aircraft should fly a distress pattern, that is, a triangular pattern, to the right, of two-minute legs with half-needle width turns of 120°. If this system is used, remember that under ideal conditions at least twenty (20) minutes will elapse before airborne assistance can be directed to your locality. Attempt a *minimum* of two orbits prior to reassuming initial course. Resumption of course will not compromise this system as the aircraft will be tracked from the point of orbit as a distressed aircraft. Aid will be dependent upon the time required for recognition of the emergency pattern, and the distances of



distressed aircraft from the air base from which the assistance aircraft is dispatched.

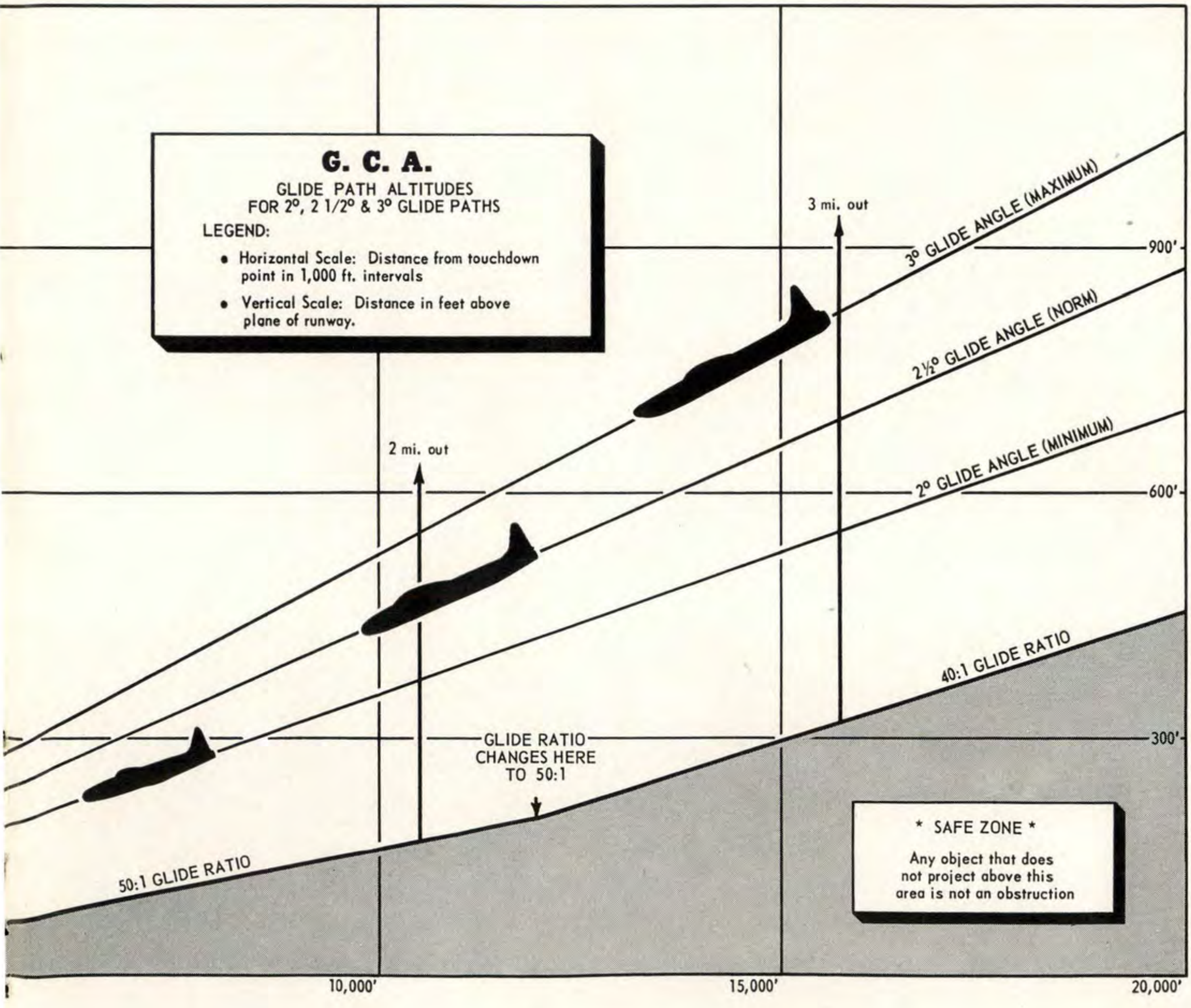
What must be done to assist the radar system? Remember that radar is restricted to line-of-sight coverage. If flying at the lower altitudes, and the distress is severe enough, attempt to climb to the emergency altitude for THE AREA (16,500′ MSL in the Northwest Sector). The higher the aircraft, the more chance radar has of "seeing" and recognizing the distress maneuver.

When radio contact is established with the radar system, the pilot should give his estimated position, type aircraft, altitude, speed, direction of flight, endurance remaining, state of emergency, and assistance desired.

Once in radio contact with the radar system, comply precisely with the radar director's instructions. Fly VFR on top, if possible. Continue to monitor the radio frequency on which contact was established with the radar system until released by the director to change to another frequency.

What to do if not in radio contact, intercepted by a fighter, and desire to be led to a letdown and landing:

Attempt to contact the fighter pilot on 121.50 mcs and, if unsuccessful, attempt 136.80 mcs. (Contact may be possible due to proximity of aircraft.) If contact is made, describe the situation to the fighter pilot and indicate the assistance desired. If radio contact cannot be made with the fighter pilot, and the distressed aircraft desires to be led to a VFR area or a letdown and landing, the aircraft in distress will fly with its landing lights burning during IFR or night conditions, until intercepted. During all conditions of visibility, the distressed aircraft will distinctly *rock* its wings when in view of the interceptor. Assume a trail formation position with the escort aircraft. The intercepting aircraft will turn on its landinglights upon interception to acknowledge receipt of the distress signal and turn on its navigation and



formation lights to the steady position and decrease speed for formation flight. The escort aircraft will lead aircraft in accordance with the radar director's instructions.

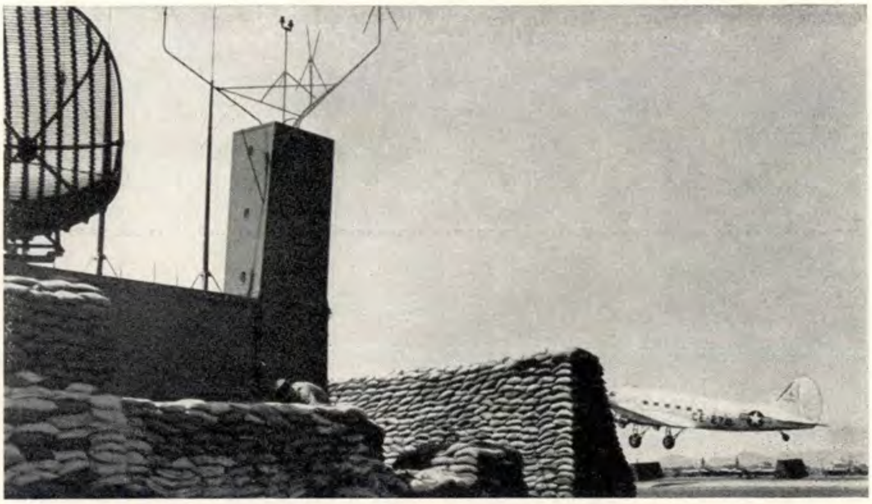
If, for any reason, the escort aircraft must break formation prior to reducing the emergency, and desires the distressed aircraft to continue the initial course indicated, the escort aircraft will switch its navigation and formation lights from steady to blinking for fifteen (15) seconds and again to steady prior to breaking formation.

If the escort aircraft requests the distressed aircraft to reassume the distress orbit, it will switch the navigation and formation lights from steady to blinking position, maintaining formation for a minimum of thirty (30) seconds prior to breaking formation. Breakoff, in this case, will be made with lights in the blinking position.

These procedures will be used, if the controlling agency has indicated the distressed aircraft has sufficient fuel for another fighter, Air Rescue Service B-17, or other aircraft to be vectored to it. It may also be used to pull it out of dangerous terrain or other hazardous situations or into an area of VFR weather conditions wherein the pilot may land at an airfield without further assistance.

The mentioned signaling procedures for breaking formation will be used under all conditions regardless of visibility, time of day or night.

Who is responsible for the control of lost or distressed aircraft? Except when necessary to divert the distressed aircraft from terrain above its flight altitude or to request identifying turns, the radar director will not assume control or direct a distressed aircraft in a manner different from the directions of the agency responsible for the aircraft. The radar station will maintain contact with that agency. In any case, flight paths will be flown in accordance with instructions from ARTC. If positive identification of the distressed aircraft cannot be made, directions to the radar director will be given by CAA. Under all circumstances of interception, the designation of the landing field selected by the controlling agency must be coordinated with the radar director, as he is limited by the range and endurance of the escort aircraft.

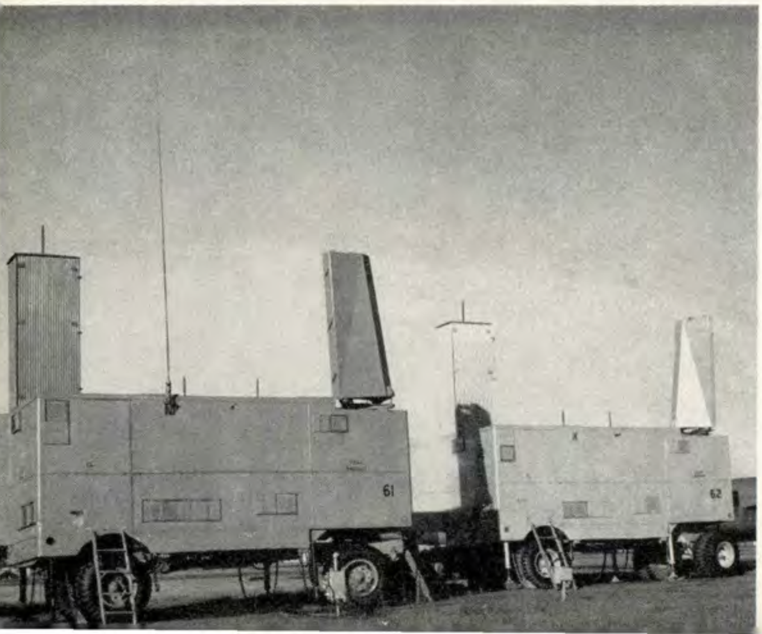


Just behind this sandbag-protected CPN-4 GCA Unit, a loaded C-47 takes off.

Some things to remember—

- This is an *emergency* use of the Air Defense System, only. It was not designed specifically for this purpose.
- Particularly, the interception procedures are a last chance attempt to avoid disaster.
- Remember, the endurance of jet aircraft is limited at best, and its best endurance is dependent upon altitude.
- This procedure will work only in the general areas of Washington and Oregon.
- The Air Defense System is not attempting in any way to take over the control of, or the responsibility for aircraft in an emergency.
- Always attempt to broadcast in

If identification of the distressed aircraft cannot be made, directions to the radar director will be given by C.A.A.



The escort aircraft will lead aircraft in accordance with the radar director's instructions, and by pre-arranged signals.

the blind, even though you believe your radio to be inoperative.

• Request for assistance can be made from the aircraft in distress; from the emergency flight pattern, from the controlling agency, or agencies. (It is very important that the controlling agency notify the radar system through MFS or CAA of possible emergencies or overdue aircraft.)

• Altitude is the most essential commodity in making these procedures work.

Use of the described procedures for testing purposes has been authorized, with the following stipulations:

• Prior contact must be made with Radar Control on 136.80, requesting use of the emergency orbit for training purposes, or

• Prior coordination with the Air Defense System by the aircraft's controlling agency through MFS or CAA.

In no case will fighter aircraft be vectored to aircraft utilizing this emergency maneuver for training purposes.

VHF frequency 121.50 mcs or UHF frequency 243.0 mcs will not be utilized except during actual emergency.

The procedures outlined are applicable to the Northwest sector of the United States, more specifically, the States of Washington and Oregon. However, the Air Defense Command is requiring that all Air Defense Divisions outline procedures of a similar nature.

All pilots should be aware of the assistance that is awaiting their call, should the occasion arise.

As we go to press, word comes from Headquarters, Air Defense Command, that a consolidated report on the general procedures outlined above has been completed. This report, "Emergency Procedures for Radar Assistance to Distressed Aircraft," in general, follows the same lines as the story received from the 25th Air Division (Defense).

The Ten Commandments For An Instrument Pilot

"By This We Live"

- Set thyself well upon thy fifth vertebra; leaving not thy fingerprints on the controls, and chewing not on thy fingernails.
- Know thy instruments, for they are the true and appointed prophets.
- Follow the indications of thy instruments; and verily the airplane will follow along, even as the tail follows the sheep.
- Do not stick out thy neck a foot; stay within the confines of thy ability, and thou shalt live to a happy old age.
- Know the appointed words and approved methods so that if thy neck drapeth out, thou shalt be able even unto thyself to place same in its proper place—upon thy shoulders.
- Follow thy radio beam, for their ways are the happy ways and will lead to the promised land—ing.
- Listen carefully, yea verily, to the signal impinging on thy eardrums for sometimes they seem to have the tongues of snakes and will cross up thy orientation, to the sad state to where thou must ask Heaven for guidance.
- Assume not, neither shalt thou guess that thy position is such, but prove to thine own satisfaction that such is the case.
- Boast not, neither brag; for surely Ole' Devil Overcast shalt write such words in his book, and thou shalt, someday, be called for an accounting.
- Trust not thy seat (of thy pants) but follow thy instruments, read and truly interpret the words as given from thine instrument board, know that the responsibility lies not with the hand that rocks the control column, but in and with the mind that directs the hand, and thou shalt be blessed with a long and happy life.

More on "Dead Head"

The problem of dead cylinders on reciprocating engines is a scourge to all flight personnel and a disheartening factor in aircraft maintenance.

First indication was backfire on the downwind leg with no appreciable loss in power and no excessive vibration. Considering the procedures used in flying the pattern, the power setting to maintain the airspeed desired is comparatively low. This action will leave little for the power plant to do.

Second phase of malfunction was low cylinder head temperature 100° indicating a loss of the much needed heat to reach a simultaneous derivative in power from expanding gases. Of the fourteen cylinders on R-1830 engines, one of three cylinders may be used to transmit temperature indication. No. 1 cylinder in some power packs, is used to secure the temperature reading. The No. 1 cylinder is not the master cylinder. However, the thermocouple has been placed on that cylinder with the result that its baffling is restricted by the carburetor intake, thus limiting cooling of that cylinder. For informational purposes in this pilot's dilemma, Nos. 5 and 12 are the master cylinders on the R-1830-90D and 92 series engines.

Now we will take the cylinder with its two dead igniters. There will be a loss of approximately two inches of manifold pressure when a cylinder is inoperative. This is in excess as quoted in T.O. 02A-1-88, Step 10. Also T.O. 02A-1-29. Sec. IV, par. a and b, state maximum limits allowable in ignition checks. In short, a dead jug can be detected on the engine run-up check by evaluating tachometer and manifold pressure readings properly.

After consideration of the facts so stated, the maintenance and flight personnel who read your article might be given a bad lead in other incidents such as this. This condition brings to light the laxness shown by some flight personnel to familiarize themselves with the pertinent publications.

A good engine conditioning program is not only for the line mechanic but should be adhered to religiously by flight personnel. It is their lives and safety of the mission for which the procedures set forth in publications are initiated by the Air Force. Negligence of proper engine run-up at preflight and post-flight and improper maintenance are costly in respect of men's lives and equipment.

M/Sgt William E. Mitchell
Hq 6200th AB Wg, APO 74

Ed. Note: A very complete presentation of the problem.

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.

2/Lt Thomas A. Nelligan
3308 Trng. Sq.
Kinston Air Base, N.C.

Ed. Note: Read the November issue of FLYING SAFETY *Magazine on this subject!*

The Nation's Busiest

Attached is a picture from the September issue of FLYING SAFETY, with the caption describing National Airport as the nation's busiest.

According to CAA, Chicago Midway Airport has more traffic than any other with the next four berths going to Miami International, Denver, Norfolk, and Kirtland here at Albuquerque (Miami, Denver, and Norfolk not necessarily in numerical sequence). However, they list Chicago as No. 1, and Kirtland No. 5.

Can you explain then what your caption means, as CAA's record is based on traffic count?

WOJG Herbert R. Heath
93d Ftr-Intcp Sq
Kirtland AFB, New Mex.

Ed. Note: W/O Heath is correct! —our error!

A Warning Light

May I suggest an addition to instument panels for *all* Air Force aircraft. I have often thought that a practical aid to pilots would be an electrical or spring-loaded timer similar to those used on the modern cooking stove. Instead of a bell sound, a red light could be used to warn the pilot of any number of things that he normally trusts to his memory alone.

There have been times, especially when flying alone at night or during extremely poor weather conditions that I would like such an indication to warn me to

- Look for a VFR or radio checkpoint
- Make a procedure turn
- Check gas supply
- Perform complete check of instruments
- Fly a heading or range leg for a certain length of time
- Tune in WX broadcast
- Make a position report.

Of course, the timer itself could be located almost anywhere in the cockpit within the reach of the pilot. Only the light indicator need be located on the panel itself. From my experience I would say that this suggested timer need be calibrated for from one minute to thirty minutes.

Capt. Daniel R. Couch
AFAG Finance School, USA
Ft Benjamin Harrison, Ind.

Ed. Note: One pilot we know uses a folding travel-alarm clock; another an alarm wristwatch.

WELL DONE

To Lieutenant Thomas H. Temple of the 117th Tactical Reconnaissance Team, who guided his tunnel-blinded flight leader from 32,000 feet to a safe landing on the runway solely by inter-ship communication, goes the December Flying Safety Magazine "Well Done."

.... Col. Swartz became dizzy and unable to focus his eyes.

.... Lt. Temple literally flew the Colonel's aircraft through inter-ship communications.

... Aided by Temple the Colonel arrived over their destination with sufficient fuel for a normal landing.....

... Temple guided Col. Swartz to the runway, told him when to drop gear and flaps ... Mobile Control talked him in...

Lieutenant Temple's action under unusual conditions is proof of his sense of leadership, excellent planning ability, and quick thinking, as well as superior flying technique. Lieutenant Temple, already highly decorated in World War II, has been recommended for the award of the Distinguished Flying Cross for this outstanding performance.

Land by the Numbers

The "good book," in AFR 91-17 and ANC 1100, spells out the manner in which runways at military and civilian airports shall be marked. This system of runway numbering and marking serves one primary purpose, that of orienting the pilot.

If you will learn to use this information, which is painted in figures sixty feet high and twenty feet wide at the end of each runway, you will find that your landing pattern planning will be facilitated, particularly at strange fields.

Looking back through some recent aircraft accidents caused by pilots picking the wrong runway, after having been advised correctly by the control tower, it was clear that if the pilot had been familiar with runway markings, the accident might have been avoided.

The system is very simple. First and foremost is the number you see painted on the pavement. This number is *not* the runway "number," but the *magnetic heading* of the runway. Runway "3" heads thirty degrees magnetic, Runway "30" heads three hundred degrees magnetic (within plus or minus 5 degrees). Best way to remember your runway heading is to set the double needle of your remote indicating compass to the number the tower gives you. When the single needle of the remote indicating compass is parallel to it, you are on the proper runway heading. If you don't have a remote indicating compass, circle the field until your magnetic compass or gyro is on the same runway number the tower gives you.

Old pilots usually circle or "drag" a strange field, and brief themselves on the runway headings, direction of landing traffic, and length of runway. It's a good habit!

Runway lengths are shown by bars painted at the end of each runway. For instance, four long bars mean that the runway is 4000 to 4999 feet long. Four long bars and one short bar mean that the runway is 4500 to 4499 feet long.

On airfields with parallel runways, the letters "R" and "L" are painted below the runway heading number. This specifies "Right" or "Left" runway for a specific magnetic heading.

Learn to read the numbers, and you'll always be in line!

How High the Moon!

There you are at 350,000 feet, and Zuni Radio gives you an altimeter setting increase of six-tenths of an inch. What change will your dial indicator show in feet?

Air Research and Development Command engineers have already realized the shortcomings of today's aneroid type altimeter, which requires servo boost above 80,000 feet, and which is operable only to 150,000 feet. Two new altimeters are now in the experimental stage, and are expected to measure altitudes ranging from 25 to 95 miles in the upper atmosphere. One altimeter will operate between 150,000 and 300,000 feet; the other between 300,000 and 500,000 feet.

The altimeter designed for use at "lower" altitudes, (30 to 60 miles), consists of a glass tube, called a Pirani gage, which continuously samples the atmospheric air, and a cathode element, which is heated by an electrical current. The heat radiates from the cathode to a temperature-sensitive plate element in the tube. Heat radiation is directly proportionate to air density, so it is a comparatively simple matter to measure electronically and convert to a dial reading.

The other altimeter, for readings above 60 miles, is basically an ionization gage, and consists of three elements: a plate, a grid, and a filament. A glass tube continuously samples the air, as in the other upper-air altimeter. The filament, when heated by an electrical current, emits electrons which travel to and bombard the positively charged grid. These positively charged ions are attracted to the negative grid, and create a flow of current to the plate circuit. The ratio of the plate current to the grid current is proportional to the gas pressure in the tube, which is the same as the atmospheric pressure. This is translated into feet on the dial.

Check Your Stowage

The copilot was a camera bug. When he got into the cockpit he hung his camera on the selector handle, and his lightmeter from the metal hook that secures the upper bungee cord on the magnetic compass. Those thunderheads in the distance would make good shooting!

Some hours later the airplane entered actual instrument conditions; and in the course of flying the gages, the pilot reset his gyros several times. Thirty minutes after the last gyro setting the airplane entered a cloud that was obviously filled with large, solid rocks. The crew and passengers bought a half-acre of California mountainside, miles off the intended course.

Research discloses that varying degrees of deviation error will be induced in the magnetic compass in any type aircraft by placing a metal object near the compass. A photo lightmeter, for instance, can cause a swing of 180° in either direction, with no set pattern. Other objects that will cause compass deviation are cigarette lighters, cameras, small tools, and metal ash trays.

Vox Avis

"... and the voice of the birdman is heard through the land." Flying Safety Magazine is the voice of the flying man, be he pilot, radar operator, navigator, bombardier, flight engineer, crewman. Flying Safety is *your* magazine. It's written for you. We can best do the job if you tell us what you like to read. Send us your ideas, stories, and even your gripes. They help us, and they help every other rated man who reads Flying Safety.

Seasons Greetings!

LOOK SMART • STAY SMART • FLY SMART!

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