AEROSPACE SAFETY

UNITED STATES AIR FORCE

MARCH 1963

SWEPT WING SAVVY

★ DIG SAFETY REORGANIZED ★

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Deputy The Inspector General, USAF

Brigadier General
Henry C. Newcomer
Director of Inspection

Colonel
Charles B. Stewart
Director of
Nuclear Safety

Brigadier General
Jay T. Robbins
Director of
Aerospace Safety

AS OF 7 JANUARY 1963, the office of the Deputy Inspector General for Safety underwent a change in organization and designation. This is part of a general reorganization of The Inspector General's office concerning the staffs of Deputy Inspector General for Inspection and Deputy Inspector General for Safety. These activities are now placed under one head, the newly established Deputy The Inspector General with offices at Norton AFB. The DIG/Inspection and DIG/Safety designations no longer apply. Three Directorates have been established under the Deputy The Inspector General. These are the Directorate of Inspection, the Directorate of Nuclear Safety and the Directorate of Aerospace Safety. The Directorate of Nuclear Safety is located at Kirtland AFB, New Mexico.

Three Divisions and three Groups are organized under the Director of Aerospace Safety. These are the Flight Safety Division, the Ground Safety Division and the Missile Safety Division supported by the Education & Training Group, the Life Sciences Group and the Records & Statistics Group.

Major General Charles W. Schott was assigned as the Deputy The Inspector General on 8 January 1963. He retired from active duty on 31 January 1963. Deputy The Inspector General is now Brigadier General Bertram C. Harrison.

The Director of Inspection is Brigadier General Henry C. Newcomer; the Director of Aerospace Safety, Brigadier General Jay T. Robbins; the Director of Nuclear Safety is Colonel Charles B. Stewart.

Under the Director of Aerospace Safety, Colonel Charles L. Wimberly heads the Flight Safety Division; Colonel Earl S. Howarth, the Ground Safety Division; and Colonel George T. Buck, the Missile Safety Division. Colonel Jerome I. Steeves is Chief of the Education & Training Group; Colonel Emmert C. Lentz, Chief of the Life Sciences Group; and Mr William Russler, Chief of the Records & Statistics Group. ★

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Aerospace Safety

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Col Emmert C. Lentz
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Mr. William Russler
Chief, Records &
Statistics Group

IN THIS ISSUE

FALLOUT

T-Bird Talk

Rex Riley's Cross-Country Notes usually afford us T-33 drivers several items of unusual interest and the November issue was no exception. However, I believe that to be of greater value, the paragraph "T-Bird Talk" might be expounded upon.

After reading the cited incident of static port icing, I checked the Dash One for information that would be a help if our pilots were faced with a similar situation. There wasn't much help there, nor did Rex Riley offer any advice except, "Give it some thought when you are faced with a low speed radar approach during icing conditions."

The story didn't elaborate as to whether night or daylight conditions prevailed, if the pilots noticed any ice on the aircraft, or what the fuel load was. It would seem that in icing conditions (to include runway ice), a pilot would not be wise to maintain much more than 130 knots, unless he was near stall conditions, if he expected to stop on the runway.

So, what is the answer to the problem? The first answer would be: don't file into freezing rain conditions unless the mission absolutely requires that such a flight be made. Secondly, the Dash One (page 3-33) gives an alternative: "If rime ice is present (or presumably clear ice also), use power rather than airspeed as a reference while flying the landing pattern."

But—isn't this statement a little nebulous? All solutions seem to boil down to judgment and technique during a critical phase of flight such as this. Pilots of all types of aircraft must depend on experience, judgment and technique in such instances.

Maj James P. McMullen
Director of Safety
Bolling AFB, 25, D. C.

Major, you said it all in the last paragraph.

Feather Inboard Props

After a careful scrutiny of the cover pic on the October 1962 issue, this question has occurred to me:

"Wouldn't it have been possible for the pilot to feather the props on the two inboard engines, rotate the engines with the starters until the propeller blades were in the 12, 4 and 8 o'clock positions, then complete the landing (with the retracted nose gear) *without* the inboard propellers contacting the runway?"

The brief description of the accident does not list all facts that could very well have dictated that full power be available for approach and landing. But it does appear that damage to the inboard propellers and engines could have been prevented by the above technique, which was once used by a C-47 pilot who feathered and positioned both props on final approach and made a wheels-up landing without damaging props or engines (except for oil coolers).

Maj Howard L. Rose
98 BW, Quality Control Div
Lincoln AFB, Nebraska

According to the copilot of this RC-121, the crew did consider feathering the inboard props just prior to touchdown but did not want to commit themselves to landing on the first approach. Also by positioning the inboard props at 12, 4 and 8 positions, a scanner would have been required in the rear—immediately prior to touchdown. And being there, he couldn't have been in his crash/ditching position upon ground contact.

Colonel Yeager

Colonel Yeager's article (December 1962 issue) is a good example of philosophy based on a lot of experience—plus a great deal of common sense.

Lt Col Rayburn D. Lancaster
Hq 5AF, APO 925 San Francisco, Calif.

Call the Shots

Our Engineering and Air Safety Department brought to our attention your interesting article "Call The Shots" appearing in the August 1962 issue of Aerospace Safety. We think this subject would be of interest to commercial pilots and would like your permission to reprint it in The Air Line Pilot magazine.

Thank you for your cooperation.
David L. Ferrell, ALPA

Happy to oblige!

Chief, Education and Training Group
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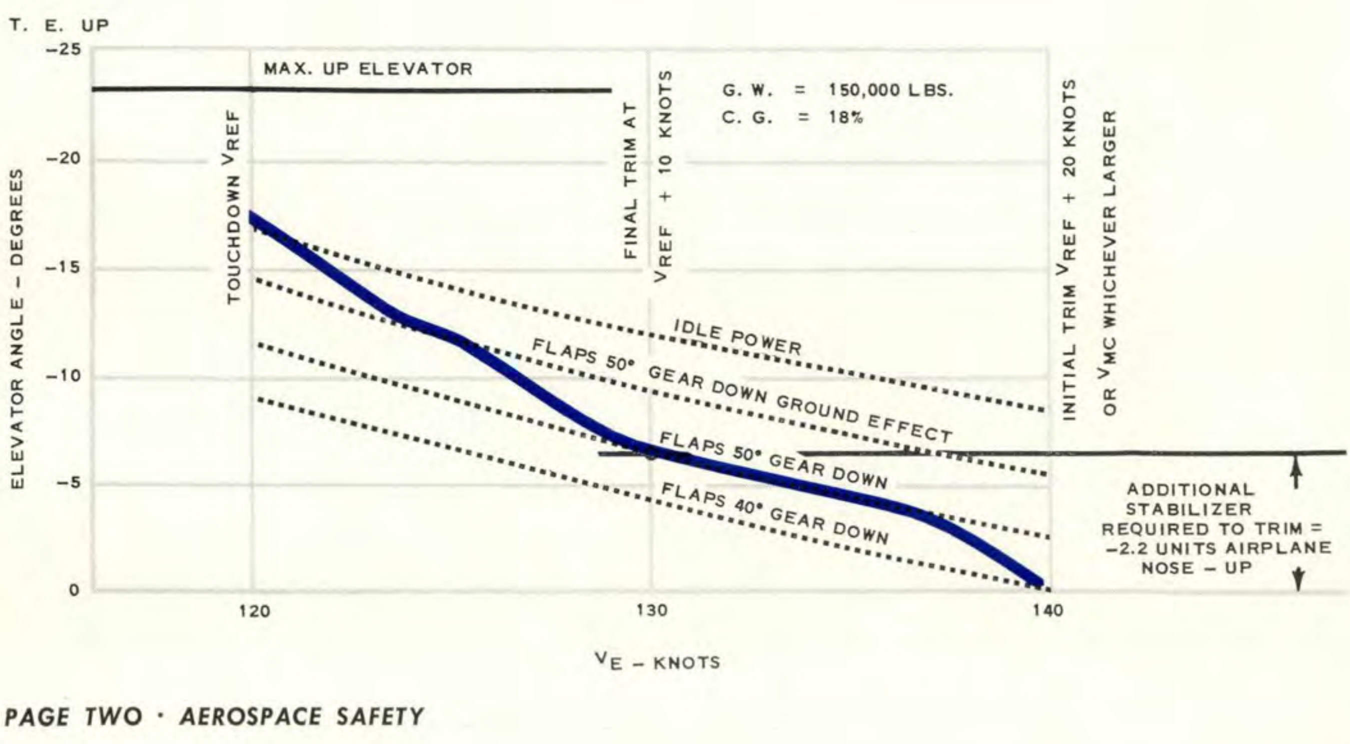
SWEPT WING Savvy

Donald C. Knutson,
The Boeing Company, Renton, Washington

THE SAYING, "What you don't know doesn't hurt you," may apply to certain limited situations in life, but certainly does not apply to the safe operation of aircraft. The KC-135 is no exception. The radical change from straight wing, propeller powered airplanes to the swept wing, high performance jet powered airplanes requires a complete understanding of the new airplane characteristics involved and the new flight conditions encountered. For the most part, these are quite well understood as the safety records show. But some of the incidents, near accidents, and accidents indicate that airplane characteristics can be better understood.

This article is an attempt to present these basic swept wing jet airplane characteristics in simplified manner to refresh the memory of the few who may have missed a point the first time around. It is not intended to suggest that all the incidents, near accidents and accidents are caused by inadequate knowledge of airplane characteristics. However, there is evidence that the cause or part of the cause of some can be attributed to lack of understanding these swept wing airplane characteristics. The author believes that safety is a continual educational process to combat the complacency that can come with

Figure One



familiarity with the airplane and mission.

How safe is the KC-135A airplane? Here is an airplane that first flew on August 31, 1956, and the fleet has accumulated over 800,000 hours and has achieved one of the best safety and reliability records in the Air Force. This record is the result of the Air Force's commendable training and operational effort as well as the safety and reliability designed into the airframe, systems and power plants. A gigantic step was taken by all parties involved when the move was made from the propeller type operation to the new high altitude, high speed, and high performance jet. The move was made with a minimum of incidents and accidents considering the large number of pilots involved, the large number of hours flown, the variety of weather and field conditions encountered, and the type of maximum performance missions being flown.

However, there have been some mishaps. Some can be attributed to not fully understanding one or more of the five new characteristics inherent in this type airplane which are not peculiar to the KC-135A alone, but are present in most similar swept wing, high performance, jet type aircraft. These are as follows:

1. Movable stabilizer-elevator combination.
2. Turbo-Jet power.
3. Swept wing.
4. High speed capability.
5. The *tuck* or the change in pitch stability at high Mach numbers.

These characteristics are basic with this type of airplane design and should be as thoroughly understood by the pilots as the very basic characteristic that any airplane will stall if you bank too steeply while turning on final approach. Even this error is still being committed!

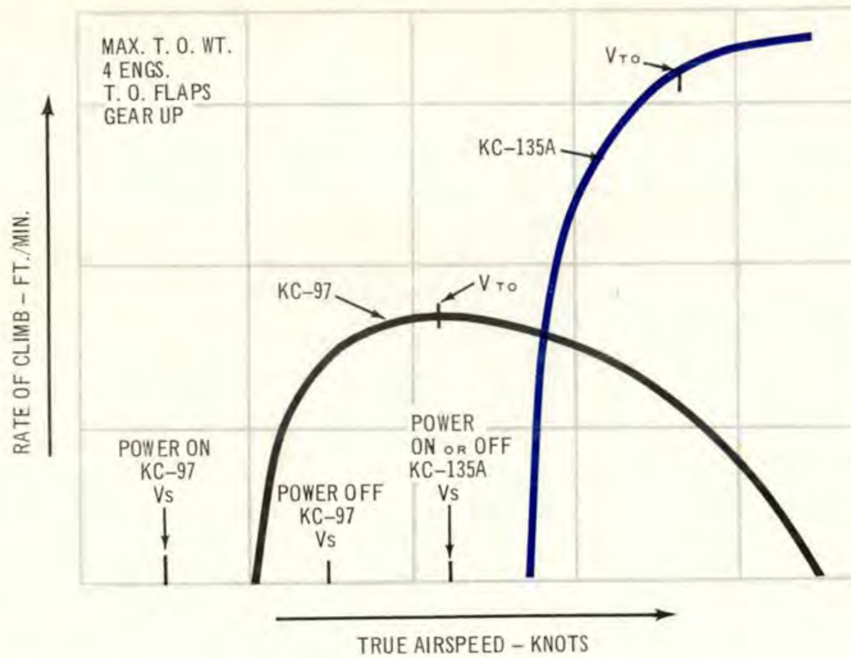


Figure Two

MOVABLE STABILIZER-ELEVATOR COMBINATION

Let's analyze these characteristics. For some pilots this may be the first time that they do not have all of the pitch control available by just moving the "stick." If a pilot has been in the habit of holding back pressure on the stick and not trimming while making the approach for landing, he could run out of available up elevator and not have the ability to properly flare the airplane for landing.

There are five airplane pitchup increments required to land the KC-135 airplane. If the first two (airspeed reduction and flap extension) are not trimmed out, there may not be enough elevator left to flare. Figure One shows an example of the up elevator requirements for a typical approach, flare and touchdown.

During the approach and landing a nose-up pitch increment is required for the following:

1. A reduction in airspeed.
2. Lowering flaps.
3. Ground effect.
4. Thrust reduction.
5. Flare.

It can be seen on Figure One that airspeed changes require the greatest changes in trim. The example shown demonstrates that if no trimming is accomplished after stabilizing on approach speed, the airplane will be 2.2 units out of trim at the start of flare. Due to the stabilizer actuated anti-balance tab, the elevator can control only about six units of stabilizer trim. It is obvious then, that less than ⅔ of the available pitch control is left to flare and control the additional nose down pitching moment resulting from thrust reduction and ground effect. To avoid this problem it is recommended that the airplane be trimmed out to zero stick force at the flare point as well as being stabilized on airspeed, rate of descent and power.

TURBO-JET POWER

What does jet power do for you? You may say it's a wonderfully reliable power plant and hope you never have to fly another propeller. I couldn't agree with you more; but you must realize that you have lost part of your "prop" ability to save one of those sinking landings with a "blast of power." The clean jet wing responds only to proper airspeed and when you give a power blast to save a sinker, you must wait for the speed to build before the wing will respond. At light weights this is usually quite rapid; but at heavier landing weights, and if starting from idle power, the response is not so rapid. In the past a "prop" blast would give an immediate increase in lift by cleaning

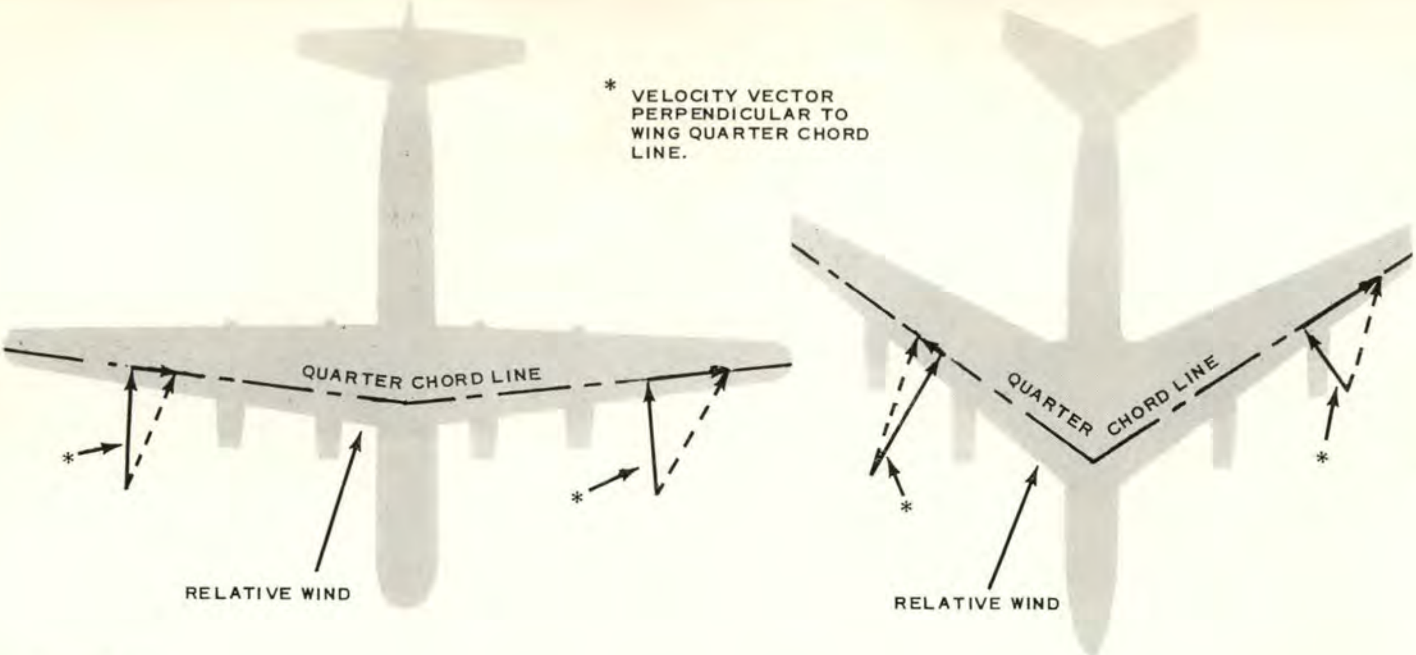


Figure Three

up the wing with the increased airflow.

The "prop" effect also lowers the power-on stall speed. This gives you extra speed margin on takeoff where propeller takeoff speeds are calculated on power-off stall speeds to assure adequate margin of performance in the event of an engine failure. Therefore, with the "prop" you could pull the airplane off on takeoff, "hang it on the prop" and get away with it, as long as an engine didn't quit. However, the jet stall speeds are about the same, power on or off, (see Figure Two) and the jet wing responds only to the proper airspeed on both takeoff and landing. So be sure the speed is correct for the weight on either takeoff or landing.

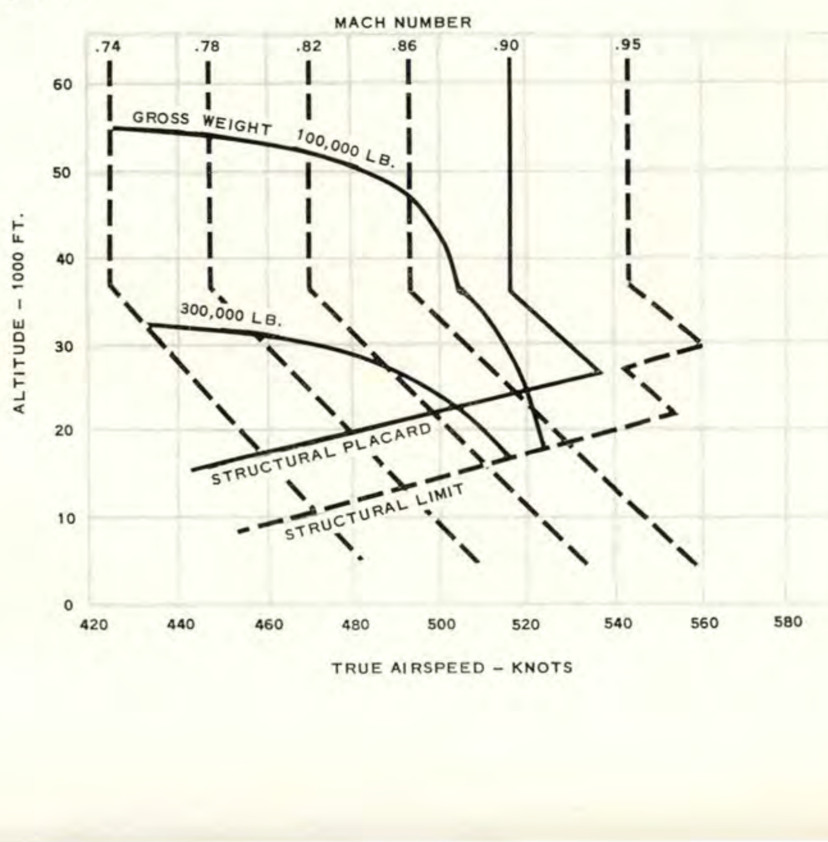
SWEPT WING

Now, how does a swept wing affect airplane characteristics? First, it allows the airplane to go to a higher speed at altitude before the formation of shock waves on the wing causes the excessive increase in drag. Secondly, for equal dihedral angles any swept wing has more roll from a given sideslip than a straight wing. Figure Three shows a comparison of a straight wing and a swept wing airplane and illustrates how the lift is affected by sideslip. Since the lift on a wing varies with the velocity vector perpendicular to the wing quarter chord line it can be seen from Figure Three, that for the same sideslip angle, the swept wing has a greater change in the total lift on each wing. The wing will roll faster for the same sideslip angle.

It is important that asymmetric power conditions be corrected with the rudder for directional control with roll control applied only as necessary to hold the wings level. Excessive use of lateral control in place of rudder when controlling an engine failure on takeoff will give excessive spoiler drag and compromise the three-engine takeoff and climbout capability.

You may ask, "What is the correct amount of rudder and aileron required to control an engine failure?" Proper rudder control means centering the needle and ball then holding the wings level with aileron. However, this requires some up spoiler to counteract the rolling moment of the rudder. The easiest and recommended method is to simply use enough rudder so that the control wheel is centered. To center the wheel, use coordinated rud-

Figure Four



der in the direction the aileron control wheel is held. The ball will be slightly out of center and only rudder trim will be necessary. This avoids the more sensitive partial up spoiler condition. It also provides the pilot with a simple and quick method of determining the correct control without referring to the turn and bank instrument which is not a primary reference under instrument conditions. The rudder should be applied and held steady, for a given speed and thrust, without "hunting" or "walking." No rudder should be used to turn; just bank with the control wheel.

Third, on landing approach a more nose-up body attitude is required for a swept wing airplane. Previously the pilot's perspective was that of pointing the airplane's nose towards the touchdown point of the runway. Because of this difference it is not always readily apparent that the actual flight path intersects with the ground at a point short of where the airplane's nose is pointing. This characteristic can cause some pilots to drop the nose and set up a dangerous rate of descent too close to the ground. I would recommend that any time the rate of descent is as high as 1000 feet per minute during the last part of the approach, that proper consideration be given to being in trim, having adequate airspeed, and starting the flare early or to making a go-around. If the rate of descent is as high as 1200 feet per minute, *go around!* You can fly this airplane more skillfully than that. Any pilot who is too proud to go around when he has messed up an approach will be sorry some day.

HIGH SPEED CAPABILITY

How fast will this big heavy jet go? The answer is, too fast if you don't watch it, especially at low altitude. Here is a clean powerful airplane that can accelerate beyond its structural placard and limit in level flight. To exceed limits, all a pilot has to do is to leave climb power on and level out at low altitude as directed by departure control. In the short time of about one minute (depending on the starting speed) the airplane will quickly accelerate into the danger area even if at maximum gross weight.

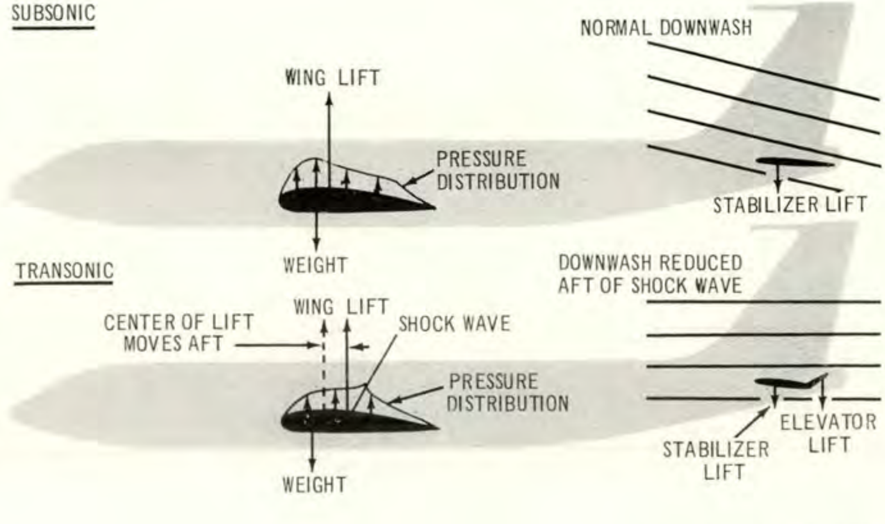
In Figure Four the speed performance capability is shown at minimum and maximum gross weight with normal rated thrust on a standard day. You can see that below about 22,500 feet altitude at maximum gross weight the airplane can exceed the structural placard speed in level flight. Also, below about 16,000 feet altitude at any gross weight the airplane can exceed the recommended speed in level flight. This Figure also shows the structural dotted limit line up to which the airplane has been successfully demonstrated during the Boeing structural integrity and flutter flight test programs.

THE TUCK

One other characteristic of high speed flight with which the pilot should be familiar is the pitch down or "tuck" tendency which begins at approximately 0.86 Mach number. It is the result of a rearward shift in the center of lift on the wing, and to the reduction in downwash at the tail. This sudden shift is caused by the formation of local shock waves over portions of the wing. The shift is rather rapid for a small change in Mach number and it is a little harder to maintain a trim setting when flying in this region. As can be seen from Figure Five, the shift in the center of lift is to the rear and this causes the airplane to nose down with an increase in speed. This, of course, is the reverse effect from increasing airspeed at any lower speed where positive stability exists. The airplane can be flown in the "tuck" region with elevator alone and with no trimming of the stabilizer, but it is always advisable to stay in trim at all times. The "tuck" characteristic should not be forgotten if turbulent air conditions are encountered at high altitude, such as inadvertently entering the top of a thunderstorm.

In final analysis, it should be remembered that safe operation of the KC-135 is really not different from that of other airplanes, if you know the airplane, understand its characteristics and follow normal safe piloting techniques. ★

Figure Five



IF YOU FLY AT NIGHT

PHOTO: COURTESY WALT DISNEY PRODUCTIONS

PROBABLY THE OWLS who lived on the mountain and reputedly can see in the dark, and certainly the crew who just missed the mountain and couldn't see very well in the dark got quite a scare out of this:

The aircraft entered the low level route during night VFR conditions. Entry was at proper altitude and airspeed. The flight continued along the route, making scheduled descents. After passing turning point number four the aircraft was established on heading and interval descents were made from 12,800 to 10,200, 9000 and 7500 feet. Suddenly, a third pilot, sitting in the IP position, noted a snowy mountain peak that covered three-fourths of the cockpit windshield directly ahead and yelled, "Pull up! Pull up!" The pilot immediately pulled the aircraft into a steep climb, narrowly missing the peak. Post flight inspection of the radar scope film indicated that the aircraft was 20 miles north of course and was headed directly toward an 8340-foot mountain. It was also determined that the aircraft was approximately 20 miles off course on the last three legs of the route.

This is not an isolated case. "Black is Black," in the February issue, Aerospace Safety magazine, recounted three cases in which B-47s crashed during VFR, night, low level operations. Two of these were in known VFR conditions.

Here's another case, and, tragically, it has been duplicated. The pilot, while making a hooded night VFR VOR approach, misinterpreted the altimeter reading, descended below the minimum altitude and crashed short of the runway. The safety pilot, flying in the front cockpit, allowed himself to become distracted to the point that he failed to monitor the altimeter and allowed the aircraft to fly into the ground.

A few years ago, the crew of an Air Force transport, on a VFR night local flight, left closed traffic to avoid conflict with a jet recovery operation. Flight conditions were VFR, with a high overcast. The aircraft proceeded toward uninhabited, rising, hilly terrain where there were no lights on the ground and struck trees. An emergency was declared and an immediate return to base attempted. The aircraft was damaged to the extent that power was lost on one side. An inflight fire occurred and the aircraft crashed.

There have been many others.

* * *

During taxi on an unlighted taxiway, the student, under supervision of the instructor, misjudged the distance to the edge of an intersecting runway and taxied into newly installed and unmarked curbing with resultant damage to the landing gear assembly.

* * *

The landing was made after dark and, immediately upon touchdown, the gear broke through crusted snow and the aircraft nosed over. Investigation disclosed that the field was closed, and so noted in the Airman's Guide.

* * *

The pilot reported that he had been taxiing on an unlighted taxi strip, using the aircraft nose wheel taxi light, when suddenly he saw the fence. He couldn't stop before hitting the fence.

* * *

A night landing was attempted on a snow covered runway that was unlighted except for threshold lights. The aircraft touched down long and on the extreme side of the runway. After a short roll the aircraft hit a snowdrift and the nose gear failed. The fact that the windshield was frosted over is considered contributory.

* * *

During the approach for a VFR night landing the nose gear struck a powerline which caused the aircraft to crash.

* * *

The pilot made an approach for a night landing on a runway that was unlighted and covered by a light snowfall. He said the night was a bright moonlit one and he had no difficulty distinguishing the runway until the last portion of the final approach. Difficulty at this time resulted in touchdown on the extreme left side of the runway. The left wheel went off the edge, struck rough terrain and the aircraft nosed over.

* * *

The night approach was too low. The aircraft struck treetops, a powerline and a television antenna on the roof of a house and crashed one-half mile short of the field.

* * *

The approach was made at dusk in light snow and rain and over a body of water, the surface of which was glassy. During a turn the aircraft descended and struck the water.

* * *

During a night cross country the pilot initiated an approach at a large municipal airport. During the right turn from downwind the aircraft struck the ground. The accident occurred during clear weather with 15 miles visibility. The pilot stated later that he had erred in reading the altimeter.

RECOMMENDATIONS

Since mission requirements are such that night flights be conducted, the obvious requirement is that precautions be taken to make such flights as safe as possible.

Safety pilots in dual control aircraft must recognize their responsibility and take necessary action in sufficient time to insure the safety of the flight.

Pilots must be repeatedly reminded of the dangers of complacency and the feeling of well being that can occur at the end of a "routine" flight.

When at low level and doubt exists as to exact location, climb to a safe altitude.

Crew coordination must be especially emphasized during low level operations.

Dead reckoning must be a primary method of navigation on short low level flights and inflight conflicts between DR and other navigation methods should be immediately investigated.

Navigators must realize that any extended shadow behind a ridge on the radar scope indicates that the aircraft is below the ridge and positive action must be taken.

The importance of outside observance during VFR low level flight deserves special emphasis. Cockpit lighting should be turned down as low as possible to aid in seeing outside the aircraft.

All crewmembers must be well aware of the safety hazards inherent in reading altimeters.

All checklist items possible should be completed prior to entry into a low level route to allow maximum time for attention to navigational instruments and outside scanning.

Vision, particularly near vision, deteriorates with age and cockpit activities require more time and light (or glasses) to correct this deficiency. One of the most difficult tasks is reading of fine print, as on a facility chart, under red light. General health and the amount of recent rest also have considerable bearing on the ability to see near objects.

Distant vision, if below par, also presents a hazard to the aircrewman. For example, an object such as an aircraft that can be seen at four miles with 20/20 vision would not be seen until two miles with 20/40 vision.

In flying, as in other hazard-associated activities, a basic safety concept is to recognize limitations, understand dangers of the particular task, then take every precaution possible to minimize the hazards. This mode of operation is absolutely mandatory during low level, night flight. ★

THE HOT SEAT

Robert H. Shannon, Safety Officer, Life Sciences Group

IN A RECENT F-100D LANDING ACCIDENT, a rare but significant condition occurred that should be brought to the attention of all crash rescue personnel. The pilot was on final approach when the engine failed. The aircraft landed short, skidded over the ground shedding parts and finally came to a stop in a semi-inverted position. While skidding, the left side of the fuselage was damaged and the left side of the cockpit buckled inward displacing the left ejection seat trigger linkage sufficiently to cause the initiator to fire. This immediately fired the seat catapult, but because of the partially inverted position of the fuselage, the ejection seat was held in an almost stowed position. The pilot's helmet and the upper left portion of seat were dragged on the ground as the aircraft skidded in the semi-inverted position.

Crash rescue units arrived on the scene within 30 seconds, extinguished the fire and cut the seat and canopy initiator hoses prior to rescue attempt. When the seat initiator hose was cut, a loud report was heard indicating there was pressure in the hose. The significance of this was not recognized by crash personnel because both ejection handles were in the stowed position and the canopy frame was still on the aircraft in its normal position.

In order to remove the pilot, fire fighters raised the nose of the aircraft to gain access. The fact that every sequence necessary for ejection had already taken place was unknown to the rescue personnel.

As the forward section of the fuselage was lifted and rotated, the highly compressed gas that had been generated and retained in the catapult column when the charge fired was released. The seat and pilot were forced out of the cockpit approximately three feet. Two firemen were struck by the seat, one of whom sustained a bruised right knee, the other a fractured right kneecap, right shin and right forearm lacerations.

Pathological analysis disclosed that the pilot was dead prior to ejection of the seat. Because of the design of the system, once the catapult charge has fired, the high pressure gas will remain in the catapult column unless the seat is fully launched. Cutting the initiator will not relieve the pressure in the catapult column.

It has been recommended that AFLC initiate corrective action for this condition and that crash rescue personnel be made cognizant of this hazard. ★

WHEN A PROP RUNS AWAY ➔

LATE IN 1962 a C-47 crash landed and a DC-7 ditched after each had experienced a runaway prop. These are but two more occurrences in a sizeable list of spectacular aircraft accidents that have stemmed from this problem. They are also indicative that, although refinements such as pitch locks, mechanical low pitch stops and negative torque control devices have been developed and installed, the problem still exists. Indications are that, so long as we operate aircraft with propellers, knowledge of what action to take when a propeller malfunctions is mandatory. Admittedly, true runaways are rare. But so are inflight fires and structural failures. In such cases it is the seriousness of the emergency that makes prompt, knowledgeable action so important.

Let's break this malfunction down, identify it in its various forms and consider action to be taken.

One of the first clues that a propeller has exceeded allowable RPM limits is sound. If an out-of-sync beat develops at maximum power on takeoff, abort! Something is wrong. Get the airplane stopped and check it out.

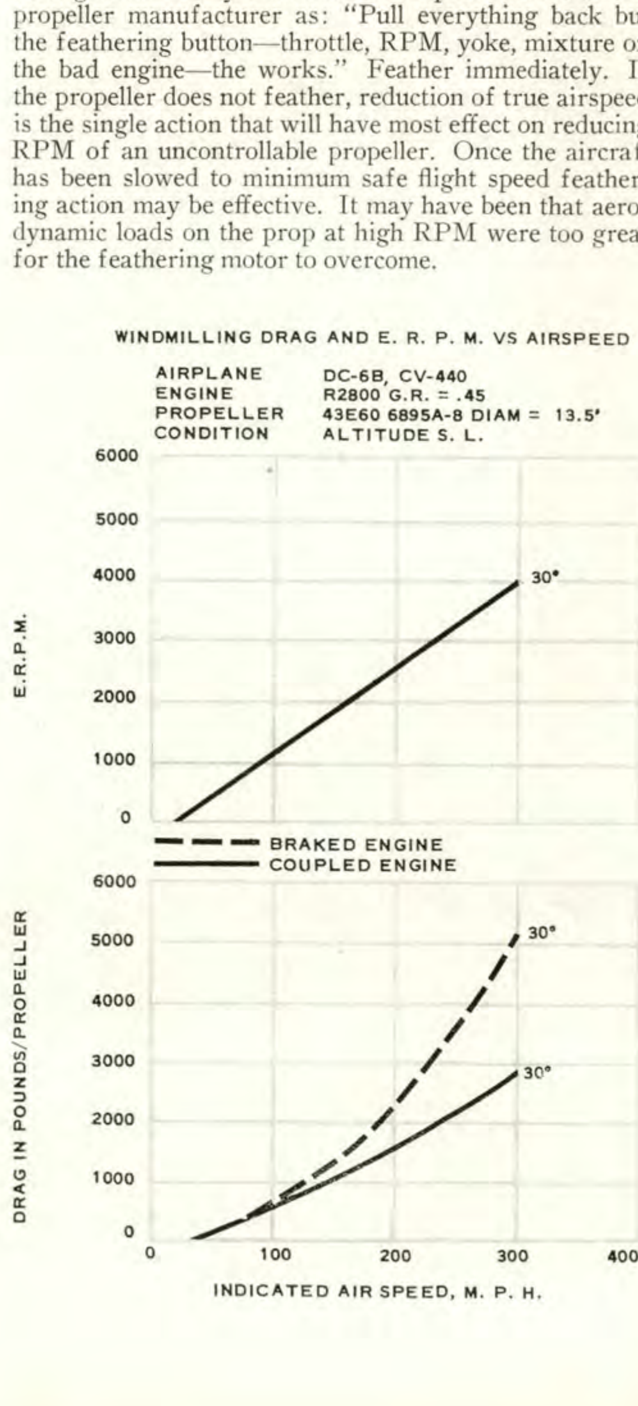
If airborne, or too late to abort, first attempt to bring RPM within limits by moving the prop control toward decrease RPM. (It is not uncommon for RPM to surge if power application has been rapid. Also, the governor control could be out of adjustment.) If this has no effect, partial reduction of power may. Provided airspeed is held constant or reduced to minimum safe limits, power reduction will be the most effective method of reducing RPM when prop control is ineffective. Feather the propeller as soon as terrain clearance permits safe flight without power from the engine concerned. If the propeller will not feather, fly the aircraft at minimum safe speed and use power on the engine up to maximum continuous RPM. Land on the nearest suitable runway.

In cruise, RPM fluctuations can occur from sudden power changes applied to the engine or air loads applied to the propeller. For example, should an engine stop firing because of fuel starvation and then fuel be resupplied, an overspeed and possibly a runaway will result. The same potential exists when a propeller is feathered, then unfeathered without the precaution of selecting high pitch and a low airspeed. Pitch hunting can stem from poor fuel vaporization if cylinder head temperatures are allowed to drop well below normal limits, as on letdown or during flight at reduced speed through heavy rain. Pitch hunting may also occur at high altitude if boost pumps are not turned on to supply continuous pressure to the carburetors. Minor RPM fluctuations from causes such as these pose no great threat and can be avoided or promptly corrected by the aircrew.

Overspeeds can occur at altitude if large power advances are made rapidly, particularly if airloads are also changed as would be the case during stall practice. Again, RPM changes from such causes can normally be either avoided or controlled by the aircrew.

There is no mistaking the true runaway when it occurs at normal cruise airspeed. There is no other sound quite like it. The high-pitched, penetrating whine will easily make itself heard throughout the best insulated flight decks. A check of the tachometers will disclose which prop is running away. If the malfunction occurs suddenly, as is usually the case, the RPM will increase from cruise setting to the vicinity of 4000 RPM or more almost instantaneously. The procedure in this case has been generalized by a field service representative of one propeller manufacturer as: "Pull everything back but the feathering button—throttle, RPM, yoke, mixture on the bad engine—the works." Feather immediately. If the propeller does not feather, reduction of true airspeed is the single action that will have most effect on reducing RPM of an uncontrollable propeller. Once the aircraft has been slowed to minimum safe flight speed feathering action may be effective. It may have been that aerodynamic loads on the prop at high RPM were too great for the feathering motor to overcome.

WINDMILLING DRAG AND E. R. P. M. VS AIRSPEED



Major T. J. Slaybaugh

Should feathering attempts not be successful an uncontrollable runaway propeller condition exists. You may find that:

Level flight may not be possible even with maximum power on the remaining engines.

Drag of the runaway propeller increases approximately as the square of the velocity. For this reason the slower the aircraft can be flown, the better. For most aircraft there is a takeoff flap setting according to gross weight. Essentially, this is a flap configuration that provides the most favorable lift/drag relationship. Don't be reluctant to go to this setting as a means of reducing true airspeed and, at the same time, drag from a windmilling propeller. Over most land areas the fuel problem is seldom a critical factor. Even should it be, fuel conservation resulting from reduced drag once an uncontrollable prop has been brought into normal RPM range will probably more than offset the loss in aircraft speed.

If the engine is frozen and the prop stops, drag will probably be *increased.* Normally when a prop runs away, particularly on aircraft with low pitch mechanical stops on the props, the blade angle will not be less than the angle at which the mechanical stop is located. Since this is at a degree setting above the crossover point (figure below), drag will be less windmilling than frozen.

If the engine freezes and the prop decouples, drag will be decreased considerably. However, friction generated by the spinning prop shaft stub will cause heat, possible fire and separation of the prop and engine nose case from the aircraft. Should decoupling occur it is generally agreed that, aircraft control permitting, the adjacent engine should be shut down if the nose section is seen to discolor. This is a precautionary measure in case damage to the good prop occurs when the malfunctioning propeller separates from the aircraft. Particularly in this case, and normally in any case of a runaway, passengers should be removed from the prop line and the aircraft depressurized.

On a four engine aircraft, if the runaway occurs on an outboard engine full rudder and aileron trim will be required along with full or nearly full rudder and aileron deflection to maintain heading. Even this may not do the trick and it may be necessary to reduce power on the opposite side to prevent a turn into the bad engine.

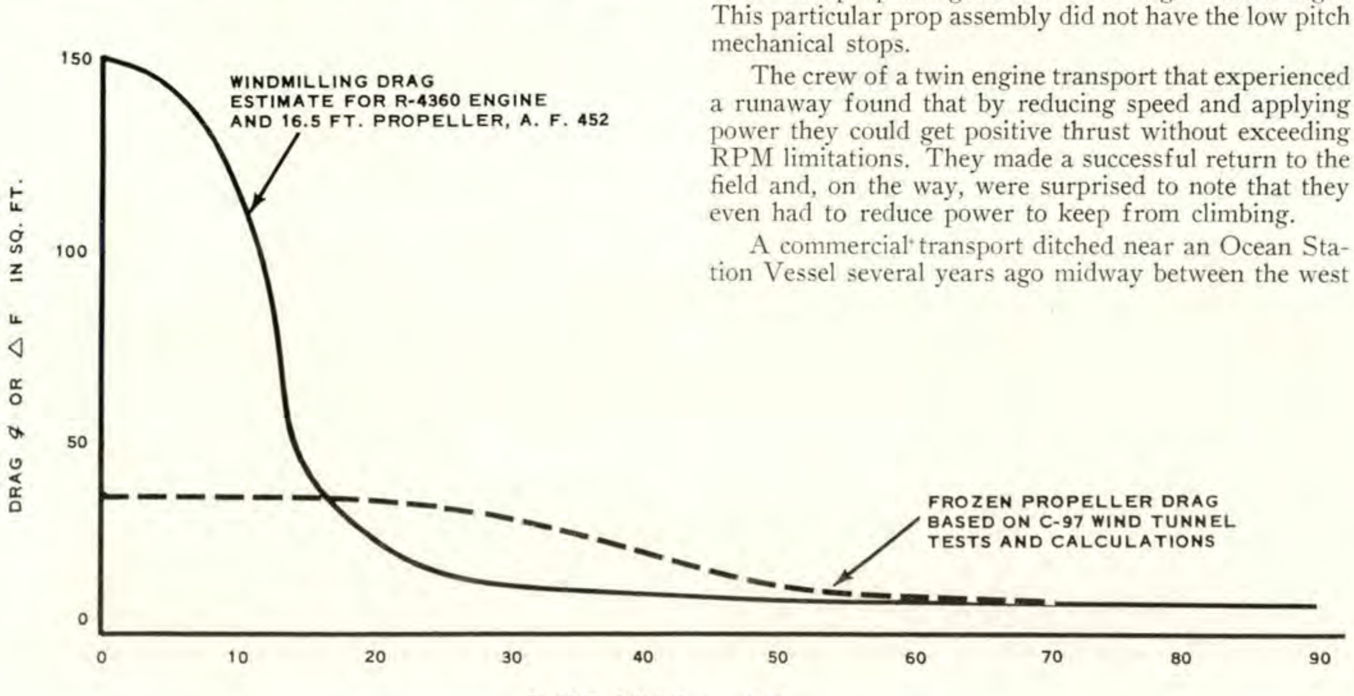
Flight experience has proven the points made above. To recount a few:

The aircraft was empty and had been airborne for over two hours on a pilot proficiency check mission. As power was advanced for a missed approach an outboard propeller ran away. Since the aircraft was low, slow, and in a high drag configuration, immediate action was mandatory. Minimum safe flying speed was maintained and drag reduced to the minimum. Still the aircraft would not hold altitude and, with full power on the three good engines, a continuous turn was being made into the runaway propeller, even with full trim and full control deflection by both pilots. The first emergency landing area selected had to be changed due to inability to stop the turn. A second was chosen and a successful crash landing executed. Just before touchdown a wings level attitude was attained by reducing power of the two good engines on the opposite wing. An improper part had been installed in the propeller and it had gone to an aerodynamic low pitch blade angle.

In a somewhat similar case the prop control began to malfunction by increments on a trans-Pacific cargo flight. In spite of all remedial efforts of the crew the RPM would sporadically increase every few minutes. Again feathering action was ineffective and finally descent was stopped 500 feet above the water after 24,-000 pounds of cargo had been jettisoned and with max power on the three remaining engines. A successful return was made with a landing at the nearest available field. The prop had gone to the five-degree blade angle. This particular prop assembly did not have the low pitch mechanical stops.

The crew of a twin engine transport that experienced a runaway found that by reducing speed and applying power they could get positive thrust without exceeding RPM limitations. They made a successful return to the field and, on the way, were surprised to note that they even had to reduce power to keep from climbing.

A commercial transport ditched near an Ocean Station Vessel several years ago midway between the west



coast and Hawaii. A controlled ditching was decided upon by the pilot after he had experienced a runaway propeller.

In some cases loss of the propeller may occur, even though the crew attempts to prevent this. In one case in which this happened, controls to the adjacent engine were cut and a 20-foot slice torn in the fuselage when the propeller left the aircraft. Fuselage damage included cutting of several control cables. The crew, using power and controls remaining, made a semi-controlled night ditching.

If fire occurs, or vibrations increase to the point that structural damage is feared, intentional freezing is probably the more recommended of two bad choices. In one case, wherein vibrations became extremely severe, intentional freezing was initiated by oil starvation and when the bearings froze the prop separated and embedded itself in the fuselage. The adjacent prop had been feathered during the freezing process. After the prop came off, this engine was restarted and a successful three-engine flight made to a suitable field. A lesson learned in this case was that severe vibrations had made the gyro stabilized compass system unreliable and the aircraft had reversed course. This the crew discovered when they broke out of clouds and noticed the moon to be on the opposite side.

WHEN A PROP RUNS AWAY

In yet another case a runaway propeller was frozen and when the prop came off it damaged the adjacent propeller to the extent that two engines were then useless. Far at sea, with fuel now a critical problem due to the high power settings required on the two remaining engines and the drag of the damaged nacelles on the opposite wing, the crew found it necessary to descend close to the surface and take advantage of ground affect. At approximately 100 feet it was found that power could be reduced and airspeed maintained. With reduced fuel flows obtained as a result of this power reduction, and near superhuman effort in controlling their out-of-trim transport, the 10-man crew flew six hours to a safe landing at Hilo.

Normally, if freezing is decided upon, the thinking is that pulling the oil shutoff valve out and leaving it out until the engine freezes is preferable to intermittent shutting off of the oil. This recommendation is based on the possibility of intermittent friction heating followed by lubrication resulting in gradual washing away of the bearings until tolerances are so great that freezing cannot be effected. In at least one installation, reportedly due to the weight of the prop and therefore the expectation that it would separate if stopped suddenly, intermittent freezing is preferable. For specific aircraft consult the Dash One.

To recap, first attempt to bring the RPM down to the desired setting by use of the RPM control. If this is ineffective, reduce power and airspeed, terrain permitting. If the high RPM limit is being exceeded at part throttle and minimum safe flight speed, try intermittent feathering as long as some power is needed from this engine to sustain flight. Feathering, if effective, is an emergency means of increasing prop pitch in this case. As RPM drops within limits, unfeather. Repeat as necessary. As soon as adequate terrain clearance can be maintained on the remaining engines, feather.

Following an aircraft ditching, power requirements to offset propeller drag were computed as:

Uncoupled	275 BHP
Windmilling	1060 BHP
Frozen	1380 BHP

In case of a runaway propeller that will not feather:

- Slow the aircraft to minimum safe flight speed.
- Fly at a low altitude where increased air density reduces true airspeed.

Don't freeze the engine unless you fear structural failure from vibration or fire. Chances are the drag will be increased and, if the propeller decouples, subsequent separation and possible fire and structural damage will result. If the decision is made to freeze, consider shutting down the adjacent engine during the process and keep trying to feather as the RPM decreases. As the RPM decreases the feathering motor may be able to overcome the centrifugal turning moment acting on the blades.

To fly slower you may be able to: jettison fuel and cargo and extend flaps to takeoff setting.

Notice the RPM. If RPM is below max allowable at minimum safe flight speed the propeller will probably be against the low pitch stop. If this is the case, advance power to not exceed maximum continuous allowable RPM. This will result in a decrease in drag and, at low true airspeeds, a positive thrust condition will likely result.

Land at the nearest suitable field. If you have resolved this emergency and have a flyable aircraft don't expose yourself to the possibility of compounding such a serious emergency by flight any longer than absolutely necessary.

One more point: The information presented in this article is of general nature. This it must be if the principles are to apply to all propeller driven aircraft. In some cases procedures may differ for specific aircraft. Should such conflict exist, Dash One procedures must always be followed. It would be well to reiterate that completely uncontrollable, high speed runaways are comparatively rare. Admittedly, modifications in recent years have reduced the frequency of this emergency, or at least minimized it by limiting propeller blade angles to approximate low pitch positions in most cases. Still, as noted in the opening sentence, runaway propeller induced accidents still occur. It is conceivable that the high pitched scream of a runaway, the near-uncontrollability and the fear that a prop might slice through the fuselage or tear an adjacent engine loose is conducive to panic, particularly during instrument or night conditions. Knowledge of what is happening, what can be done, and the proper sequence of corrective steps will allow the crew to most successfully cope with this, or any other emergency. ★

LIGHTNING PROTECTION

E. R. Roth, Missile Safety Division

Lightning, the spark to end all sparks, is more than an interesting weather phenomenon; it is a potential hazard to contend with in the missile business. Some of our operational missile systems including the Atlas, Titan, Jupiter and Mace have experienced lightning damage. The brief description below might explain why and how lightning can affect missile system circuitry and components.

THE FAMILIAR THUNDERCLOUD is nature's warning of the possibility of a lightning strike. In its formation, the storm cloud builds up a tremendous electric charge differential between cloud and earth or between cloud and cloud. The way this occurs is not clearly understood, but it is suspected that the negative charges in the lower layers of the storm cloud result from frictional reaction between air currents and rain droplets. The charge buildup imposes an increasing difference of electric potential until, eventually, the dielectric strength of the insulating air is broken down and the static potential is discharged through the resulting lightning.

The difference of electric potential between the cloud and ground may be measured in millions of volts, and the discharging current may reach values of tens of thousands of amperes within a few millionths of a second. Accompanying the discharge current is a rapidly expanding electromagnetic field which collapses at the completion of the lightning. This changing electromagnetic field is sufficient to induce several thousands of amperes of electric current in conductors in the proximity of the lightning occurrence. Also accompanying the lightning strike are electric currents within the earth itself. Very little is known regarding the nature of these earth currents.

lightning protection

continued

A single, typical lightning strike may represent 40 billion watts of electric power. This amount of power represents nearly one-fourth of the total power capacity of all the electric generators within the United States. More vividly, the energy released during the timespan of a lightning occurrence can equal that which would be required to lift Hoover Dam approximately six inches.

The purpose of lightning protection is to safeguard personnel and system components by providing a path of low resistance for the discharge of electrical current caused by storms.

Inadequate protection systems will allow induced and direct current flows of a large magnitude to pervade missile systems circuits. This can cause the failure of electronic components and result in extensive damage and missile down time. For example:

• At an Atlas D site two lightning strikes damaged amplifiers, fuses, diodes, power transistors and relay coils at different complexes.

• A tactical missile wing reported that lightning struck on or near one launch pad then jumped to two adjoining pads. Hydraulic and temperature control hoses separated from the missiles. Investigation revealed that explosive squibs in the hoses had detonated. Lightning protection, not installed at the time of the incident, is currently installed.

• Titan sites have experienced lightning damage on two occasions. In both cases the strike current traveled along exposed cable at ground level before it entered the complex. Action is being taken to shield, bury and ground this cable to prevent recurrence. The following components were damaged: 200 and 400 amp fuses, mercury vapor lights, an RF test set, eight guidance panels, a 35.5 KVA transformer, TV camera and monitor.

• During test operations at Cape Canaveral a Minuteman complex suffered some damage during a heavy thunderstorm. It was apparent that the lightning entered the launch area equipment through the AC power system. Switches, relays, current monitors, various panels in the control racks, diodes, relays, filters and resistors were damaged.

A good lightning protection system will prevent or minimize the damage from direct strikes of lightning; it will assure that the lightning finds a safe path to ground. Air terminals (metal rods topped with non-corrosive metal caps) are placed on top of a building or around the building. The top of the terminals should be at least one and one-half to three times as high as the building they protect. The bases of the masts should be secured in concrete and the grounding terminal connections and girdle components welded to the bottom of each mast. The ground terminal may be a copper plate surrounded by charcoal and buried in the ground below the water level. The connecting girdle consists of copper cable which encircles the building and insures effective grounding and uniform potential. These conductors connect the air terminals with each other and with the ground terminals. All metal or electrical equipment within the building should be copper wire interconnected, with a single connection to the grounding girdle. This insures a minimum of ground loop induced voltage (by maintaining a uniform potential) and provides a very satisfactory grounding of static electric charges as they accumulate. Details for different configurations of lightning protection systems can be found in TO 31-10-24.

The resistance of the lightning protection system should not exceed 10 ohms. To obtain continuous and reliable protection, the system should be maintained so it will function efficiently. If any of the parts of the system are corroded, broken or poorly installed, the resistance of the system could increase immeasurably. Under these conditions, the electrical current from the lightning discharge could take a more favorable path through the building or its contents causing fires, burning out components or initiating explosive devices.

During periodic inspections particular attention should be given to conductors which enter the ground, since experience shows that deterioration is most active at these locations. Testing consists of placing one lead of the test equipment, an ohmmeter, to a known ground (a ground rod sufficiently sunk into the ground to insure good contact with permanently moist earth) and a second lead to each of the air terminals in turn. The metallic surface forming each electrical contact should be carefully scraped to remove any paint or oxide film. The provisions of AFM 32-6 and TO 31-10-24 concerning the inspection and maintenance of installed lightning protection systems should be used as guidance.

Personnel hazards created by lightning strikes on or near a missile system could be any of the following or combinations thereof:

- Electric shock ranging in magnitude from mild to fatal.
- Injuries from pyrotechnic devices exploded by the strike or induced currents.
- Injuries from flying objects from buildings, towers, etc., hit by the strike.

Some suggetions for personnel behavior just prior to a storm and during a storm are as follows:

Approach of Storm:

- Suspend work involving hazardous materials such as pyrotechnics, flammable liquid and gases.
- In buildings where lightning protection is available, it is unnecessary to evacuate the building; however, operations should be discontinued. A potentially explosive process, such as a propellant loading, should not be started if a storm is pending.

During a Storm:

- If outside and a choice of a metal building or a wood building is offered, choose the metal building.
- If inside a building equipped with lightning protection, remain there.
- If inside a building, keep away from metal objects.
- If it is necessary to remain outside during a thunderstorm, stay away from isolated small shelters, isolated trees, wire fences and wide open spaces. Seek shelter in a cave, a depression in the ground, deep valley or canyon, the foot of a steep or overhanging cliff, within dense woods or a grove of trees, provided one does not stand directly against or beneath large trees.

Electrical storm warning devices were installed at Patrick Air Force Base to provide warning of possible lightning strikes for Cape activities. This permits the breaking off of any hazardous operations (for example, fuel loadings), moving of fuel supplies to safe locations, checking the grounding system and leaving the danger area. If proven effective, the lightning alert system might also be installed at missile sites throughout the country.

In addition to the personnel hazards which accompany a lightning strike, the missile system itself (see examples above) can suffer substantial component damage as a result of the direct, induced or branch currents generated by the strike. As mentioned above, past damage has involved the firing of squibs, shorted diodes, blown fuses, and shorted amplifiers, all of which required trouble shooting and replacement.

This type of lightning damage is difficult to eliminate, but it can be reduced to a minimum by providing a good grounding circuit for the various facilities and by connecting the missile components to a common ground point. All ground connections should be connected in as straight a line as possible in order to minimize the magnitude of earth currents induced by the lightning strike in metallic structures and electrical circuits.

The Missile Safety Division of the Directorate of Aerospace Safety, USAF, evaluated the existing lightning protection systems for surface launched missiles. Results were published in a technical safety review No. 14-62. The review pointed out that missile damage to date was caused by induced or branch currents generated by the direct strike either during or after it contacted the surface of the earth. Several recommendations were made to improve the grounding of missile systems. The review concluded that damage to missile systems cannot be entirely eliminated, but specialized research in such areas as induction effects and earth current, protective devices, and site grounding will provide information needed to reduce lightning damage. An Air Force contract with the General Electric Company has since been negotiated by AF Systems Command to answer some of these questions. In the meantime, concerned personnel must insure that their grounding systems are in good condition and that all components which can be a source of connection to the complex are also adequately grounded. Remember, lightning seeks a good ground. If on the other hand, good grounds are not provided, the lightning strike will find another path through or adjacent to missile circuitry, and when this happens, we can expect lightning damage.

References:

AFM 32-6 — Explosive Safety Manual, Section 0616, Requirement for Lightning Protection.

TO 31-10-24, formerly TO 31-1-79 — Theory, Principles and Practices of Grounding Procedures and Lightning Protection for C-E Equipment Facilities and Systems.

AFIMS study No. 14-62, Lightning Protection for Surface Launched Missiles, 25 Jan 1961. ★

MISSILE
SAFETY
DIVISION

ZERO SECOND LANYARD

Grasp the fabric webbing of the lanyard immediately below the lanyard hook with the little finger and ring finger. The nose of hook is pointing at the thumb, the middle and index fingers are cradling the upper half of the hook, and the thumb is free and open.

AERONAUTICAL SYSTEMS DIVISION recognizes the overall problem with the zero second lanyard and is engaged in a project to develop a special "coupler" type ripcord "T" handle to eliminate the zero lanyard hook. This will provide the pilot with a facility to simply shift a button (integrated into the handle) from side to side to accomplish the same affect as engaging and disengaging the "zero" hook. The coupler is in experimental prototype test status; however, there is reason to believe that it will look and work very much like that described and depicted in Figure One.

Figure One—A special design of emergency parachute ripcord ("T" type) grip with built-in facility for semi-automatic coupling and uncoupling of the low altitude lanyard. The round serrated button flush mounted in the oval slot on the face of the device can be depressed and slid from side to side to effectively engage and disengage the ring-shaped terminal attached to the zero lanyard. When in use the button would be slid to the zero ("O") position (such as on takeoff and during landing) to interlock the lanyard to the ripcord. Sliding the button to the one ("1") position unlocks the lanyard from the ripcord although no physical separation of parts (to be reassembled) occurs, i.e., the lanyard is retained to the ripcord with only enough force to hold it in position for relocking when required.

Every effort to expedite development of the coupler will be made; however, an optimistic availability date would be one year from now, considering procurement lag time and assuming retrofit action is approved by the prime AMA. Much can be done by the aircrews to reduce the present difficulties in using the present zero lanyard hook. Outlined in accompanying photos is a procedure which greatly simplifies the act of engaging and disengaging the zero lanyard hook. This procedure is particularly helpful if the "T" handle type ripcord grip is installed as on the latest parachutes. This "T" handle provides greater assurance against premature release due to windblast and is free-swiveling to reduce friction of withdrawal during the critical man-seat separation process; however, these features tend to make the engagement of the zero hook more difficult if the ordinary procedure is used, i.e., the grip tends to swing away from the hook as engagement is attempted without support of the thumb.

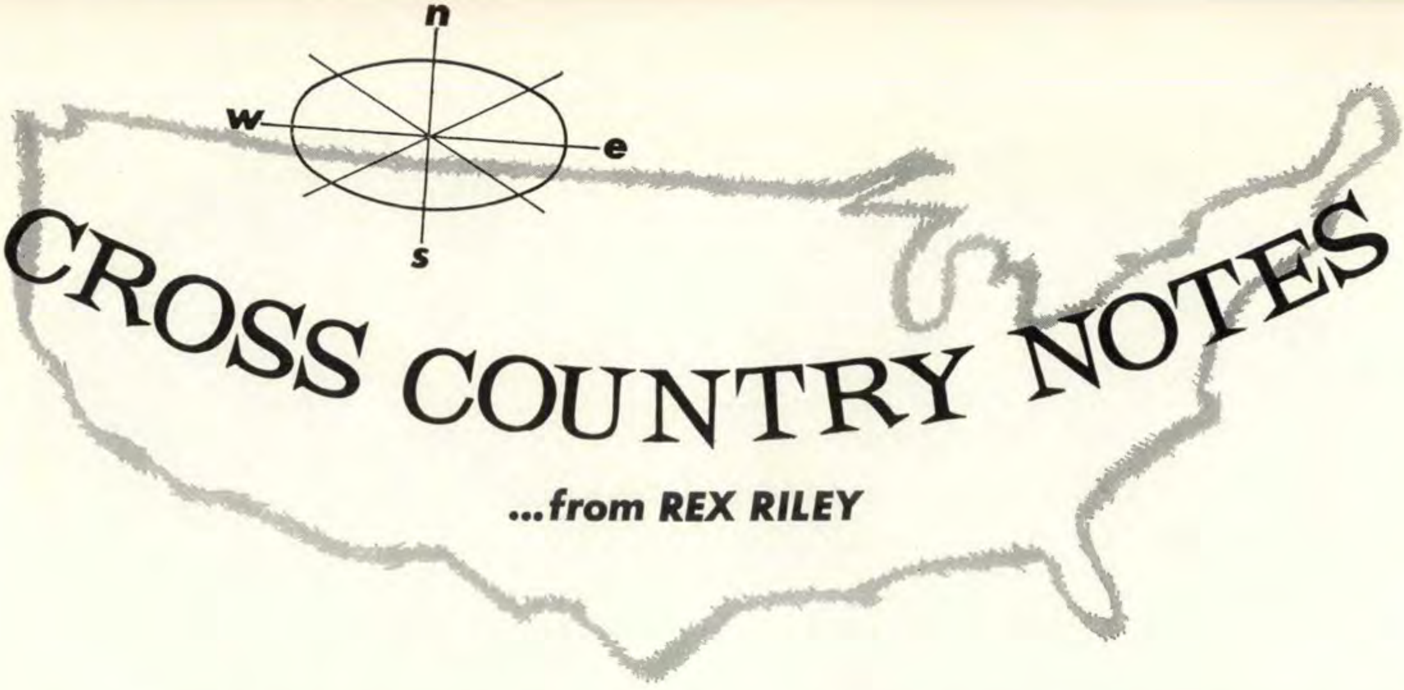
Use of the zero second lanyard in accordance with applicable Dash One instructions cannot be overemphasized. Success of ejection escape has shown marked improvement with introduction and use of this equipment. The record could have been even better. Many fatalities have occurred because crewmembers failed to use the zero second lanyard during low level operations. ★

Charles E. Carroll, Aeronautical Systems Division

Move the hand toward the ripcord grip ("T" handle), leading with the thumb, placing it under the nearest corner of the generally triangular shape of the grip.

Now, move the index finger toward the thumb, trapping the grip between the flared nose of the hook and the thumb.

Below, last step is to pull down on the trigger of the hook while supporting the grip with the thumb, causing the hook guard to open and the hook to engage the grip. TO 14D1-2-1, Sec III, par 4-14d through f, outlines a slight variation on the method of accomplishing this step wherein the hook is squeezed into engagement by the thumb and index finger without the downward pull on the trigger. Use either method; the important thing is to practice for a few minutes. Photos at right: same procedure with gloves on.



CROSS COUNTRY NOTES

...from REX RILEY

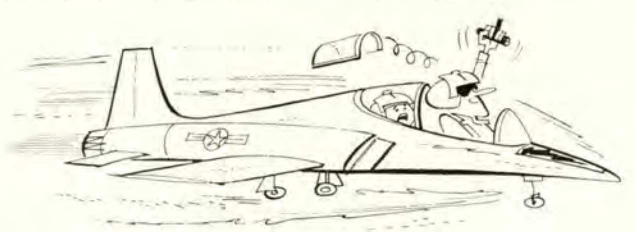
T-BIRD TRASH— Take a look at the photo showing flashlights, wrenches, screwdrivers, etc. All these items came from six T-33s that were *flown* to an overseas TCTO facility. Is it any wonder we have foreign object damage, binding or stuck controls, etc? This doesn't look so good for pilots or maintenance people. If you lose something in the cockpit while flying and can't find it after landing, write it up in the 781.

SMART THINKING AND A CAUTION NOTE— Shortly after takeoff an F-102 pilot found his cockpit full of smoke. An area under the left armrest seemed to be the source. The pilot declared an emergency and prepared to land right quick but when the gear was lowered, the nose gear showed an unsafe condition. Even after he used the emergency gear system, the pilot still had a nose gear unlocked indication. A chase pilot at first reported all gear appeared to be down and locked, but a few minutes later saw the nose gear retract about halfway. Under the direction of the Flying Safety Officer and a Convair tech rep, the pilot recycled the gear several times using both the normal and emergency systems. Eventually all three gear retracted which told them that electrical power was continuous to the "gear up" solenoids. The pilot was then told to turn the master switch to "trip," then "off." When the master switch was turned off, the gear dropped down and locked. An uneventful landing was made. Good job for everybody. One slight hitch developed though: As the '102 stopped, the pilot turned the master switch "on" to advise the tower he was in good shape. As the switch hit "on" the nose gear retracted and the main gear unlocked. The unit is recommending the above procedure be added to the Dash One, except they caution not to turn the master switch back on.

WORRIED—about whether or not both tiptanks (T-33, that is) will jettison if you should have to punch them off? Records show that less than two per cent of tiptank jettisons have been unsuccessful. There were at least six major accidents last year involving T-33s with a heavy fuel configuration. In one accident the pilot stated he didn't punch the tips off for fear only one would go. So, if you find yourself in a bind and the tiptanks would be better off than on, have at it—with confidence!

SAY AGAIN—Instructor pilots had better speak clearly and distinctly. And, pilots and student pilots, give a look at what you're pulling, pushing, actuating, etc. The following is an account of a T-38A incident that occurred when a student pilot misconstrued words from his instructor pilot in the rear seat:

After 15 minutes in the local area, the aircraft returned to the traffic pattern, and two closed circuits were made. On the pullup for the third go-around, the student was told by the IP that the pattern would be left engine-out, simulated single engine pattern. Then he was reminded to stow fully the gear alternate release T-handle after actuation. As the aircraft progressed on the downwind, the instructor told him he'd better get to that lanyard. Instead, he reached over and pulled the canopy jettison T-handle. Canopy separation was clean and didn't strike any part of the aircraft. The windscreen provided protection so the windblast in the front cockpit was mild, although some dust was blown into the student's eyes. His visor was down. The IP experienced nothing more serious than very slight airflow around the shoulders and neck. Interphone communication was ruffled because of the noise, however, the IP took the controls and landed the aircraft all right.



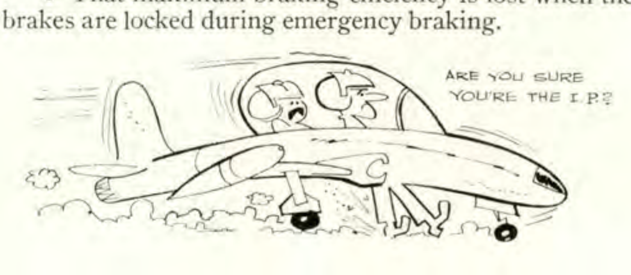
T-33 ABORT—"During a demonstration instrument takeoff the Instructor Pilot became confused as to his position on the runway and aborted takeoff when the aircraft was accelerating normally."

This was listed as the primary cause of a major accident. But the contributing causes and recommendations are the ones that we should read and heed. Take a look:

Contributing Cause: Pilot factor in that the pilot inadvertently extended the speed brakes when the throttle was stopcocked, thus greatly reducing the possibility of a successful barrier engagement. Second, he did not follow correct abort procedures in that he did not raise the wing flaps or open the canopy to decrease the stopping distance. Third, he used poor braking technique by locking the brakes, sliding the tires and, therefore, decreasing optimum braking efficiency.

It is recommended that T-33 pilots be briefed on the following:

- Inherent hazards involved when the Instructor Pilot has his attention divided during ITO demonstrations.
- The possibility of extending the two-position speed brake switch when the throttle is stopcocked in an emergency.
- The importance of following correct abort procedures to insure a successful abort and subsequent barrier engagement, should it become necessary.
- That maximum braking efficiency is lost when the brakes are locked during emergency braking.



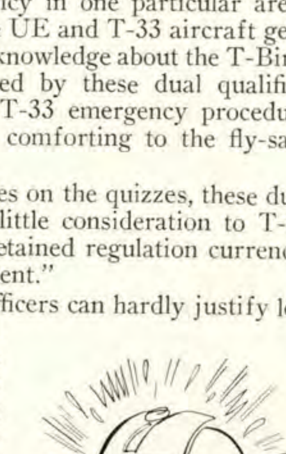
GOOD GUY—his name is Roger W. Mead, Jr., A2C, Det 5, 35 Weather Sq, Paine Field, Washington. Airman Mead is a weather observer and was on duty at the observation station at the north end of the field when he noticed a small civil plane (no lights on) land on runway 16. Instead of just sitting on his duff like a lot of us would, he called the tower real quick. And a good thing too. A C-130 had just been cleared to take off on Runway 34. Airman Mead probably saved some lives and a couple of airplanes by noticing, thinking and doing. It's nice to have him around.

SURPRISE—Certain statements in AFR 55-42 dated 4 Jan 1962 caught a lot of troops by surprise. Major Terry Lee, Flying Safety Officer at Norton AFB, brought it to our attention. The reg, in part, states: "All jet trainer and fighter aircraft . . . will land and take off toward an available arresting system during normal operations;" also, "that the pilot assumes responsibility for requesting that the barrier is raised/lowered," and, "that each pilot, prior to takeoff, makes his barrier position request before he changes from tower control to departure frequency."

DUAL QUALIFIED PILOTS—Flight Safety Surveys often reveal a deficiency in one particular area: unit aircrews flying both the UE and T-33 aircraft generally demonstrated limited knowledge about the T-Bird. The average scores obtained by these dual qualified pilots on relatively simple T-33 emergency procedure quizzes were certainly not comforting to the fly-safe officers.

In addition to poor grades on the quizzes, these dual qualified pilots often gave little consideration to T-33 currency. They generally retained regulation currency, but are "dangerously proficient."

Commanders and Ops officers can hardly justify letting pilots fly both UE and T-33 aircraft when records show infrequent T-33 flights, practically no night flying, and very little instrument or hooded time—especially when the quiz grades show that these pilots are not so hotsy-totsy on their emergency procedures.



Mr. Ops Officer, you might save your commander embarrassment more than somewhat if you look into the T-Bird qualifications of your dual qualified pilots.

RIDE THE WILD HORSE · PART TWO

IMAGINE, IF YOU WILL, one of your troops hunting. He has been injured at the 8000-foot level in rugged, jagged mountainous country. Send for a chopper! It's that simple; the chopper goes up, retrieves your boy and safely brings him home.

Not so fast! Let's ride along and see what this chopper guy does. If he is on alert, gross weight, amount of fuel, temperature, local winds and the power to hover charts have already been studied and filled out as far as possible. The bird has already been preflighted. It's cocked and ready to go. When landing altitude is known, one more check of the charts to see power available at that altitude and you're on your way.

As the chopper starts its climb, you may wonder, why the climb now? He wants altitude before he gets there. Why is he looking and scanning continuously? May have an engine failure. The bird only has one, and its good to know the precise spot he will set it down in. Finally, you get there and spot the injured party. The chopper flies around and around. Why doesn't he just go in and land? There's a good spot! Could be that he is checking for wind, slope angle, escape routes (both for landing approach and takeoff paths), size of the area (bushes, trees, boulders, and canyon walls can tear the blades off), checking the temperature and altitude, and finally, he performs a power check.

When he starts his approach, he is nothing less than ready. He knows he can hack it. After landing, you notice a large hole, an animal hole nearby; your chopper pilot saw it from the air, old buddy. Why doesn't this yokel let down? We don't need all this altitude on the way back! Maybe not, friend, but the reason remains the same—time to auto-rotate and pick a landing spot just in case the engine does sputter and fizzle out. Finally the mission is over. Only the pilot knows how tired he is; no one else can appreciate how difficult a mission it really was.

Supervisor! Monitor your boys—get to know them, study with them, plan with them—they are a part of your success as a supervisor! The intent of this article is to give the supervisor an insight into the demanding and exacting work his crews are faced with. Perhaps it will serve as refresher training for some chopper pilots. At any rate, it should provide better understanding of the ways and means of helicopter mountain flying.

What we have learned from past experience has led to a course of instruction at Stead AFB, Nev., where, in the high Sierras, we teach what we practice and vice-versa. We don't have all the answers but we have quite a few. To avoid any conflict in basic concepts, the word helicopter will suffice. In some cases, H-19s require different techniques than the H-21, and they, in turn, differ from the H-43, it being turbine powered. Keep in mind, the H-19 is famous for blade stall as altitude, airspeed and turbulence increase. This can be very severe and if it is, the aircraft will pitch up and over to the left due to the retreating blade area being stalled. The H-21 is victim of blade stall too, but not to the extent of reacting like the H-19, no sharp rolling or pitching tendency. The blade stall problems in the H-21 are too vast (two rotors, counter rotation, differential collective pitch) to detail here.

We know that any airfoil can be stalled. However, the H-43 Dash One merely states that if the bird is flown as outlined in Section V, blade stall is no problem. At Stead AFB, in more than three years of operation, blade stall has not knowingly been encountered. The theory of why not is too long and detailed to get into at this time.

Mountainous areas are the breeding places for all sorts of phenomena. Of course, winds and turbulence can be generated in the plains areas or any other area for that matter by changing weather factors, fronts, squalls and build-ups. Rarely will they generate so quickly and ferociously that you cannot accomplish the famous "180" and scamper for home. No, only in

mountainous terrain can one valley be peaceful and offer no resistance while the next one offers so much in the testing of your skills and know-how and proof of the solidity of your aircraft and how well and how sturdy it has been built! I'm sure we are all familiar with the old expression, "Flying is hours and hours of utter boredom, punctuated by moments of stark, raving, terror." We know that *experience is a hard teacher* because she *generally gives the test first, the lesson afterwards.* How, then, can we prepare ourselves for these unexpected and unpredictable factors which involve the safety of our bird, our crew and our passengers? Unfortunately, there are no hard and fast rules to follow. The rules are as infinite as time or space. Each experience will probably never happen again in the same place, in the same sequence or to the same crew or to any other crew who comes rattling along.

A great difference exists between summer mountain flying and winter mountain flying. Let us look at the winter aspect first. In most respects it is the toughest. We have blowing snow from the ridge tops—this obstructs vision to flying, particularly if it's from the ridge where a landing must be made. In the valleys and on the soft slopes we encounter deep unknown depths of snow to land in, danger of tipping over, straddling a boulder or log, sinking in, lurching, never knowing which way the aircraft will settle when the blades lose all sustaining lift. White-outs during the last phase of an approach into a hover or a landing and blowing snow

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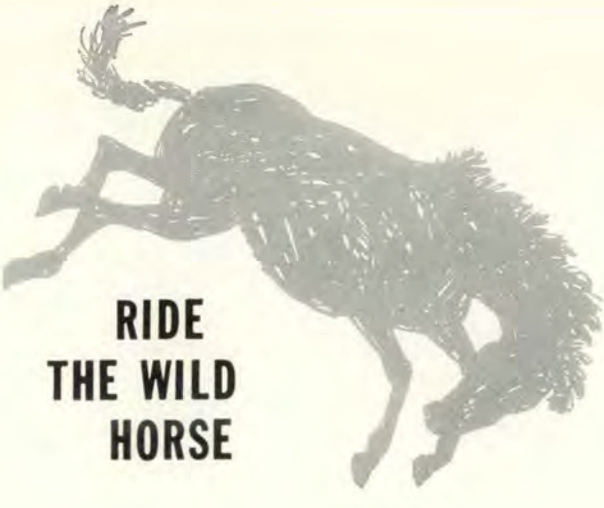
swirling around the cockpit from the rotor blast greatly reduce pilot vision. Same thing on takeoff until you're up and out. Above the timber line, no trees or rocks jutting up through the snow to provide a reference to the ground, depth perception nil, you cannot determine way of slope or angle of slope. Some ridges are completely covered with snow and a white overcast with no horizon to look at. Some ridges angle up and away from you, some angle down towards you. Soon you don't know what the true horizon is.

Suddenly the chopper shudders, you're out of airspeed, the vertical speed needle is up, the gyro shows you're not level! How can this happen when conditions are VFR? Simple, there is no natural horizon you can trust; you have encountered a form of spatial disorientation. Get airspeed, level the aircraft, resume climb until you are oriented. Then throw smoke, pick an object or toss something out of the aircraft that will scuffle or mark the snow where you want to land, anything to establish a reference point. As simple as this one seems, don't play tag with trying to get through the pass when there's a lot of snow on the ground and wisps of fog or clouds are obscuring your way. This is a real quick way to get the wife and kids a one-way ticket to their home town. There is one blessing to winter mountain flying—lower density altitude. A peak with a measured elevation of 8000 feet may register only 6000 on your density altitude chart during the cold months. Whereas in July or August it may be well over 10,000 or 11,000 feet. For you stiff wing type pilots, this



RIDE THE WILD HORSE

amounts to lengthening the runways in the winter and shortening them in the summer. The lower the density altitude, the more safety factor we have. Fly your marginal missions if possible in summer or winter with lightened aircraft at or before sunrise and at or after sunset. You would be surprised at the increased safety factor this will provide.

Take away the snow and most of the problems mentioned disappear. In the summer time, rain squalls are to be avoided, carburetor heat monitored and caution still exercised to the utmost. Wet grass, rocks and mud can cause wheel slippage, roll the bird over, or start an avalanche! Check slope limitations in the Dash One. Anything over 20 degrees is real hairy. You may have to hover with the nose wheel on the ground, forward rotor tips inches away from obstacles, the rear wheels eight feet up—still flying. Use the hoist for your transactions; don't be stubborn and try to continue a landing. For the more difficult mission, land downhill a couple thousand feet. Off-load anything you can then try again. For the impossible mission, land downhill somewhere where there is no sweat and let your work party climb up to where the job is. Bravery and determination are admirable traits but serve as lousy excuses for avoidable accidents!

Some pilots may like to stay within handshaking distance of the ground as they climb up through the valleys and slopes. The smart pilot will climb before he gets there. Cross the ridges high. If you get caught in a sudden downdraft, there is time to peel off one way or the other to gain airspeed; power alone, in most cases, is not sufficient. The only times you should be close (a minimum of 500 feet) to the ground is when you evaluate your intended landing area, power check it, approach it, land on it and depart it. At all other times, it is healthy to have altitude.

Get behind the speed curve on the approach or on the takeoff and, buddy, you had better have a patch selected where you can lower the nose and zoom away into translational lift. Settling with power can stain your aircraft with chlorophyll from the vegetation beneath you! Beware of the irregular and jagged peaks. They break up the wind flow and will hurl turbulence at you in a million pieces and from as many directions.

To develop your wind consciousness, you not only have to know how to hunt for wind, but also where to find it. An experienced quail hunter would not think of wasting his time and effort hunting where he knew there were no birds. The wind hunter knows that downdrafts are on the leeside of the slope. He also suspects wind currents to be down slope in the morning and up slope in the afternoon. Areas of sunlight and shade can be tricky. As you fly from a sunlit area into the shadow of a mountain, you can expect a burble of turbulence. I have observed as high as six degrees temperature change in going from one to the other. Cool air settles and slithers its way down slope. Warm air is displaced and rises in the same manner.

The smart pilot knows that the wind rolls and curls over the crest of ridges and creates a bubble or swirl that can snatch your aircraft and toss it up and down. Yes, this pilot is continuously scanning for wind indications, smoke, rippling grass, bushes, trees, water ripples on a lake, birds on the takeoff—I don't know of any that takeoff downwind. A continuous watch will keep you fairly informed. You can dogleg and check your drift. For high landings, smoke grenades provide the best wind indicator. Smoke will provide you with three essential bits of information—wind speed, amount of boil and velocity. But it has its drawbacks. Drop it inside the chopper and you're in real trouble. Tossed into weeds or a high and dry timber area, it can start forest fires.

We have already mentioned weight but keep in mind, the higher the landing, the less your gross weight should be. Years ago, the H-5 and even the H-19A Dash Ones outlined what we referred to as a diminishing gross weight factor—150 pounds for each 100 feet of altitude. For takeoff at sea level, you could fully gross the chopper, say at 7000 pounds. BUT for landing at a density altitude of 6000 feet, your gross had to be 5950 pounds. From rule of thumb procedures such as these, our performance charts have slowly gone through the process of evolution and are now trustworthy charts—use them!

Another thing we often overlook—straight wing pilots are cleared to cruise and maintain 10-11-12-15 thousand feet. They are required to use oxygen, which is not news to us. *BUT*, how many of you chopper people have a portable bottle with you when it's necessary to

work at 10,000 or over? With the coming of turbine powered choppers we can assume that helicopters will be called in to do jobs the piston engine choppers couldn't hack. A few years ago, I had occasion to work Mt. McKinley up to 16,500 feet. Our daily operations were from sea level to at least 12,000 feet. Who thought of using oxygen in a chopper during rescue missions? No one! I suspect that two fliers died on this mission due to no oxygen. Their Cessna 180 was last seen in a turn, then a plume of smoke, and all was quiet at 18,000 feet. We think, "Me need it? Don't be foolish, I'm climatized." Little do we realize that our reaction time is the first victim of this hallucination. We know who the second victim will be. I hope to see the day when our choppers have built-in oxygen systems. There's little room in the cockpit of today's helicopters to accommodate even a walk around bottle.

Obstacles to landing approaches and takeoff routes are always of the utmost concern to the chopper pilot. There are three items to be checked during landing site evaluation—the height of the obstacles, the size of the clearing and the loss of wind effect. The sharp pilot will not commit himself to landing until he has figured out whether and how a safe takeoff can be made. In most cases, the size and height of approach obstacles are closely related to the size area required to safely land and takeoff from. Too many times, pilots have landed in an area like the bottom of a barrel and, when takeoff time came, hit the first obstacle trying to climb, zoom or claw their way up and out. Sometimes, even a maximum performance takeoff is a feeble attempt to get airborne. Obstacles should be given all respect necessary. In some cases, 180-degree approaches and 90-degree approaches are necessary to avoid obstacles to landing.

Approaches should be made as nearly into the wind as possible and over the lowest obstacles. The same applies to takeoffs. Who can say whether for this particular takeoff the pilot should head into a 10-knot wind and attempt to clear a 100-foot obstacle in 50 to 75 feet? Would it be better to turn 20 degrees right and utilize 100 feet of run and then pull up over a 50-foot obstacle? Only the pilot can determine which method is the safest to attempt. There is a whale of a difference in whether the load is being carried into a particular clearing or out of it. Less room is required to carry the load in, more to lift it out. When the throttle is full open, the blades have maximum angle of attack and the manifold pressure needle is as high as it will go—you're not about to lift a load up over any obstacle! For the same reason, when carrying loads into high density altitude areas, a rate of descent of no more than 300 feet per minute is recommended. Anything higher than that can put you behind the power curve again. As you near the ground, sink rate may be so great that full power will not stop it. Settling to the ground and impacting on a ridge at 300 feet per minute can be a hairy situation. Only when you control airspeed, approach angle and rate of descent can you assure yourself that you have it made.

This is not the time to manhandle the controls. Gentle stick movements are necessary. You must be slow enough in the final stages of leaving translational lift behind you, at about 12-14 knots of airspeed, to allow the ground cushion to catch up to the aircraft and sustain it as you gently add what available power is left. At altitudes of 10,000 to 12,000 feet, a 100-foot per minute rate of descent during the approach is certainly the most desirable. The reason is simple—it doesn't take a sharp surge of horsepower to stop the rate of descent.

Even in the USAF Survival School here at Stead AFB, we teach the survival students a bit about helicopter operating conditions and limitations. In case of bailout or forced landing, chances are, rescue will be effected by helicopter. Too many times survivors have placed themselves in locations where a helicopter cannot get close enough to land or else a difficult hoisting job has to be accomplished. If you anticipate rescue by chopper, then there are three factors that you should consider. In helping the chopper pilot, you are certainly helping yourself. Consider the altitude of your location, the terrain and obstacles and the influence of the direction and velocity of the wind. These items will assist you in the selection of a suitable landing place where the pick-up can be accomplished. You will have done your part. The rest is up to the chopper man.

In the USAF Helicopter School, we teach the only sure method that has yet been devised to get in and out of mountainous confined areas of operation. If you cannot use these guides and if the power check doesn't give you the tolerance we recommend, then friend, you had better seek another line of business to get into! We stress landing site selection, landing site evaluation, high reconnaissance, low reconnaissance, power check, approaches, hovering and landings.

Next month we'll look into the details of each. ★

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" I must be in another blind spot."

. . . MISSILANEA

GAR-2A. During a practice intercept, the pilot of an F-101 attempted to clear an abort signal by going to the trigger salvo position on the armament selector panel with the trigger depressed. Two GAR missiles jettisoned unarmed into the ocean. Probable cause was that the pilot was a former F-102 pilot and through habit used the F-102 FCS procedure for clearing an abort in the F-101. As corrective action, it has been recommended that air crews be instructed to select the FCS position on the armament selector panel when attempting simulated GAR attacks. This allows the pilot to pull the trigger and eliminates the abort "A" signal.

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THE LOAD CREW was dispatched to download GARs from an F-102A. In attempting to open the doors the load chief was unable to get a reset light (no snubbing pressure). He then proceeded to use the emergency procedures as outlined in step 1-26(A), TO 1F-102A-2-12 to open the doors. Upon obtaining reset light and snubbing pressure, the doors were actuated to the open position. The doors opened and the aft launchers free fell (without pressure). The center missile in the aft bay caught in slots of the bay door, ripping the bottom stabilizers from the missile. The nirdomes on the missiles on rails 5 and 6 were scratched.

Probable cause: The aft launcher selector valve failed after the aircraft became airborne, causing the aft launchers to fall in flight. If the aft launchers were to fall after the forward launchers and doors were closed, this would not release snubbing pressure from the armament system that remained snubbed. When the aft interlock circuit is broken, (by launcher or launchers becoming unlatched) it is impossible to obtain reset by normal means. Prior to loading the aircraft, launchers and bay doors were operated through one complete cycle. Rigging of missile launchers was checked, after the incident, with negative results. Missile rails 2 and 3 were in correct adjustment in accordance with 1F-102-943. Missile rails 1, 3, 4, and 6 were in correct adjustment in accordance with 1F-102-2-12 with negative results. The armament system was also visually checked for moisture and dirt in the pneumatic lines with negative results. The aft missile launcher selector valve was removed and replaced with a new item which eliminated the malfunction. The removed selector valve was checked by all methods with no discrepancy noted.

Suspected causes: (1) Aft launcher rails not rigged in accordance with step 4-52, TO 1F-102A-2-12. This would allow the rails to become unlatched after snubbing air had been removed allowing the missile to free fall and ride on missile and bay doors. (The aircraft had flown just prior to download.) Rigging was checked with negative results. (2) Malfunction of the electrical portion of the armament pneumatic system which might cause missile rails to unlatch and free fall. If this was the cause then there would have been an unsnubbed extension; however, electrical checks were performed in accordance with TO 1F-102A-944 with negative results. Additionally, operational checks were performed, after the selector valve was replaced, in accordance with steps 3-25 and 3-30, TO 1F-102A-2-12. The system operated normally.

RECOMMENDATION: Emergency Action, AFTO Form 22, Technical Order System Publication Deficiency Report, RCS: AFLC-K114, was submitted recommending the following be entered in TO 1F-102A-2-12 after 1-26: Caution, whenever missiles are aboard aircraft the following procedure should be followed. (A) Disconnect the pneumatic actuators from right and left hand flipper doors by removing the four flush head bolts that hold each actuator. (B) Inspect and insure that the missiles are properly latched and locked. (C) In the event that missiles are not latched, every effort should be made to latch and lock missiles, prior to implementation of emergency procedures. (D) If the above step is not accomplished prior to implementation of emergency procedure, damage could be caused to missiles and the weapons system, providing missiles were not properly latched and locked.

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GAR CHECKLIST AGAIN. During downloading of an F-102A, the missile on rail Nr 2 slid forward, as the rail was being manually lowered, and struck the forward bulkhead damaging the missile radome and guidance unit. Damage was extensive enough to require depot repair. Apparently a crewmember failed to make sure the missile was locked to the rail. Also the GAR 1 and 2 loading checklists do not include a double check of missiles locked on launcher.

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A GAR-3A WAS LAUNCHED during a firing mission from an F-106 with the target below 500 feet. Missile preparations and launch sequences were normal. The missile launch and initial boost appeared to be normal. At approximately the termination of initial boost, the missile disintegrated with an explosion that was heard in both cockpits. Parts of the missile went over the launching aircraft. One piece of the missile, about two feet long and six to eight inches wide, passed within 10 feet of the canopy. The aircraft was not damaged but the aircrew members were slightly excited.

The cause was undetermined. Both the pilot involved and the pilot of the chase aircraft are of the opinion that the missile disintegration was caused by warhead detonation and not motor blow-up in flight. There was no recovery of missile parts or pieces from the water range. ★

Pistols Are Not Playthings

OUR TELEVISION SCREENS are littered nightly by a collection of corpses and sorely wounded as the good guys and the bad guys shoot it out. Meanwhile, back at the Air Force base, there are other shootings. These aren't shoot-outs between the goods and bads—they are unintentional shootings of fellows like you and me who are neither goodies nor baddies but just plain guys. What's going on here?

What's going on is that carelessness with firearms is costing the lives of some Air Force personnel and the wounding of others. These are the direct results. Who knows the other potential hazards when a weapon is accidentally discharged?

Through the first eight months of 1962, there were 122 wounded and nine killed from the accidental discharge of small arms. For example:

An airman was wounded when he failed to follow accepted safety procedures. After drawing a .45 caliber pistol he failed to let the slide go forward prior to inserting the clip and placed the weapon in his holster. Later he noticed that the slide of the weapon wasn't forward and drew the pistol from his holster. Holding the weapon with his left hand partially extended in front of the barrel, he allowed the slide to go forward, then pulled the trigger. The gun fired and the bullet grazed the fleshy part of his hand.

This airman had been an air policeman for more than two years, and was qualified as sharpshooter with the .45 and expert with the .38.

* * *

What could have resulted in a real disaster occurred when a guard accidentally discharged his weapon and the bullet punctured a B-47 fuel tank. The fire department was called immediately and firemen kept the ramp washed down while the tank was de-fueled.

Although the airman claimed that the weapon accidentally fired while he was clearing it, investigators concluded that he was practicing his quick draw. Other sentries reported they had observed the airman practicing the quick draw while walking his post on the day of the accident.

This airman was considered well qualified for his job and highly motivated. He admitted, however, that he became very restless during the long hours of walking his post with no one to talk to.

* * *

Weapon mishaps are not confined to duty hours. An officer accidentally shot and killed himself in his home. Apparently he was handling a .22 pistol which discharged, wounding him in the chest.

* * *

A small oversight can be extremely dangerous. An airman was posted in the alert area at which time he inserted the magazine into his pistol. He recalled later removing the pistol from the holster in preparation for an inspection. He did not take the magazine out and apparently jacked a round into the chamber. A few minutes later, as he moved the holster to a more comfortable position on his hip, he touched the trigger and the weapon discharged, wounding him in the leg.

* * *

This one involves two airmen, one armed with a .45 pistol, the other a .30 carbine. The men were on adjacent posts and got into a conversation on how fast they could draw. The man with the carbine asserted that he could get his carbine off his shoulder and jack a round into it before someone else could get a .45 clear of the holster.

When the man with the .45 went on a break, he removed the clip from his weapon and did not remember reinserting it. Later, as he walked toward the other airman, he saw him take the carbine off his shoulder and thought he was trying a fast draw. He pulled his pistol from the holster and pulled the slide back. The gun went off, wounding the other man in the leg.

Like many of our accidents, the accidental firing of weapons is totally inexcusable. Most of us receive a lifetime indoctrination in the hazards of firearms. By the time a man is old enough to carry a weapon on duty he should—unless he is a complete idiot—thoroughly understand the hazards of mishandling firearms and the proper procedures for handling the weapon assigned to him.

The above examples are just a few of many. They were selected because in every case the participants were thoroughly trained, had a lot of experience and were considered well qualified in the handling of firearms.

Horseplay and fast draws are for TV cowboys and small boys with toy pistols. These are not for adults with lethal weapons. One man we know recently shot himself in the leg while quick drawing a pistol. The bone was shattered and damage to nerve tissue cannot be completely repaired. He wears a steel brace and will never walk normally for the rest of his life. That's really learning the hard way.

The Air Force has detailed, written instructions on the handling of firearms; training is thorough; command and base SOPs cover every conceivable detail. Nevertheless, we will continue to have injuries and deaths, not to mention damage to equipment, as long as men fail to realize that they are men and not little boys with a fascinating plaything. ★

IS YOUR NOTAM SHOWING?

DID YOU EVER DRIVE miles out of the way because someone gave you the wrong directions? Or find out that the man at the gas station forgot to tell you about a long detour? If that has happened, you must have wished there was some way to get the right information soon enough to avoid all that trouble—detours, bridges out and other obstacles. Maybe you wished for a NOTAM system for automobile travelers: a good, accurate system, one that was speedy, too. Well, that's what every pilot wants: a good, accurate, speedy system that gives him the right information in time. For him the consequences are much more serious than for you on a vacation trip. Every time a pilot asks for flight information, he needs to be told the latest, and the most accurate information. If there's a NOTAM missing, or if there's an old NOTAM that should have been canceled, he can get into real trouble.

The purpose of this article is to clear up some of the misunderstandings about the NOTAM system, and invite your assistance in the new developments of the NOTAM system that are described in the new manual on NOTAMs (AFM 55-13, 15 Nov 62). (Since the old system was inadequate, we could only go one way with the new system. It could only be an improvement!)

Let's start with the duties of base operations personnel. When you're told that some of your facilities are on the "Fritz" you must decide whether to send a NOTAM. If you are not sure, look it up. It's in paragraph 1-2, Section B, of AFM 55-13. If a NOTAM is required, prepare it in the prescribed format (see Chapter 4) and deliver it to the base weather station who will send it to the Central NOTAM Facility (CNF), at Tinker AFB, Oklahoma.

Allow the CNF about 30 minutes to process the NOTAM and send it out to all stations. Then, check your incoming NOTAMS to see if it has been received. If it hasn't arrived within one hour, find out what happened. Depending on the urgency, either send the CNF a message or get on the phone and find out what happened. If the CNF is not going to process it, they will contact you. If the CNF duty officer and your Baseops people don't agree on whether the NOTAM should be published, your Baseops officer may over-ride the CNF duty officer and insist that the NOTAM be published, but he must give his name, rank and serial number.

He should remember, though, that sending nonessential information may defeat the whole NOTAM system. There is only a limited amount of circuit time available, and if it is exceeded, other information—more vital to safety—may be neglected. Review your manual thoroughly on this point, especially the illustrations. Most cases are easy to decide. Only a few in the gray area may have to be explained to the CNF. Remember, the CNF duty officer is wearing a blue suit too. He is a pilot as well as a qualified operations officer and he is trying to do what is best for the whole system.

When you receive a new NOTAM, don't wait for

other NOTAMs before posting it to your summary. We realize that there will be times when you are too busy to devote constant attention to your NOTAM display, but a little more effort from you makes a big difference in service to the pilot. In any event, be sure your summary is updated as often as possible, at least once an hour.

But the most important thing is accuracy. When you get a new summary, check it immediately to be sure the information about your base is accurate. Make sure that all active NOTAMs about your base are there and that the canceled NOTAMs on your base have all been deleted. If you find an error, notify the CNF immediately. They have no means of determining this type of accuracy except to depend on you.

After you have checked the summary thoroughly, make sure it is posted on the display board correctly. That is, post Part 1A in the first column, Part 1B under the Temporary Base NOTAMs columns, and all of Part II (A&B) under the "FLIP CHANGES" column. Next, destroy the old summary (the part it replaces) and all of the related individual NOTAMs. (You need not post a summary or individual NOTAMs on any overseas areas unless your base requires this information.)

The Air Force needs your best imagination and initiative to help the pilot. You might post a checklist near the NOTAM display, together with a list of all authorized abbreviations. Base operations officers should insure that all pilots are given an up-to-date briefing on the NOTAM system while they are in instrument ground school training.

Now let's look at NOTAMs from the pilot's standpoint. After you have determined the route of flight, destination, and alternate airfields, here is the way to check the NOTAMs on your flight:

- Check Part 1A for information on general areas.
- Check Part 1B for terminal information on your destination and alternate airfields; this covers both USAF and USN bases. If you are clearing for a civil airport (or using one as an alternate), request NOTAM information from the Baseops dispatcher who will obtain it from the nearest FAA Flight Service Station. Under the USAF/USN NOTAM System, you will get NOTAM info on terminal navigational aids, regardless of who operates or maintains the facility, that will affect terminal procedures at a USAF/USN installation. If you need en route NOTAMs, you obtain them from FAA Flight Service through the Baseops dispatcher.
- Check Part II, NOTAM Summary for any changes to the FLIP.
- When you are clearing from a civil airport, you can get USAF/USN NOTAM information by placing a collect telephone call to one of the six USAF Weather NOTAM briefing facilities. These are all listed under Weather/NOTAM Briefing Procedure in the En Route Supplement.
- If you need NOTAM information on USAF/USN facilities while airborne, call the nearest USAF/USN base. If you need information on civil terminal or en route facilities, call the nearest FSS.

There are two actions under way to ease your use of the system. Soon, the En Route Supplement will identify each location covered by the USAF/USN NOTAM System. Also, the abbreviations listed in the En Route Supplement are being expanded slightly and only those listed will be authorized for NOTAM use.

Now let's take a look in the crystal ball. You may be interested in knowing some of the changes that FAA is planning which will affect our system and help simplify your work.

- The Federal Aviation Agency has recently installed an electronic computer and associated automatic equipment which will make it possible to issue a daily civil NOTAM Summary, through a revised FAA NOTAM System similar to that of the Air Force and the Navy. This summary will be in clear text and will be available in most USAF/USN operations offices via FAA Communications System (Service "A"). When this summary becomes available, the Baseops people should post it with the standard NOTAM display—at the bottom of the first column. This summary will mean that the pilots will no longer need to request civil terminal and en route NOTAMs from the Flight Service Stations.

- Plans are also under way to dispatch the USAF/USN NOTAMs to the FAA Flight Service Stations for advisories in flight.

The USAF and USN are studying the possibility of processing another, separate, summary for en route NOTAMS. Several methods of publishing this information are under consideration; the most promising may be the arrangement of NOTAMs by navigation chart designation.

Soon the USAF/USN System will be standard, world-wide; the European-Mediterranean areas are well under way with the new plan, and the Pacific area will begin its modernization program early in 1963, so that wherever you are, the system will be standard. You'll see the same display at each USAF/USN airport, and know how to use it without additional instructions, or coding or decoding.

The NOTAM System of the future may, eventually, operate as a common system, integrated under a single agency, that will furnish both military and civil information. Under this system, NOTAM information would be stored in a central computer system and kept there. Then when you, the pilot, are ready to submit your flight plan, it will be fed into the computer. Then it will be returned with all the information needed for your flight.

However, that known ultimate will not be with us for a while. Advances in the NOTAM program are being made step by step. We must perfect the present system before we go on to the next phase of automated NOTAMs. In the meantime we are trying to get all of the bugs out of the present system. To do this we must have the pertinent NOTAMs quickly, accurately, and without unnecessary information.

Finally, if it takes us as long to perfect the new system as it did to get rid of the old one, your grandson will be getting a NOTAM that "the space platform between Mars and Venus has moved slightly out of position 2,000,000 miles to the apogee" (You tell me the direction 'cause I don't know which way is up.)! So, troops, let's get with the program. Isn't it time to go update that summary again? ★

Maj Charles H. Metzger, Hq USAF NOTAM Action Officer

AERO BITS

AT TAKEOFF for a routine transport mission, the gross weight of the C-124 was 180,910 pounds. Weather at takeoff was ceiling 1000 feet, visibility three miles in light snow, decreasing to one mile in snow showers in the approach zone. During the GCA monitored climbout and when the aircraft was one-half mile beyond the end of the runway, the pilot called GCA and requested a clearance to return for a landing. Immediately afterward, the GCA controller heard the pilot say, "Pull power on Number Two," a transmission apparently intended to be on interphone.

The aircraft climbed to 1800 feet msl, and the GCA controller vectored the aircraft into the pattern for landing. The GCA pattern was flown in a normal manner until the aircraft reached the glidepath on final approach. Three and one-half to two and one-half miles from touchdown, the GCA controller advised the pilot, "Forty feet low, one hundred feet low, dangerously low, and go around, acknowledge."

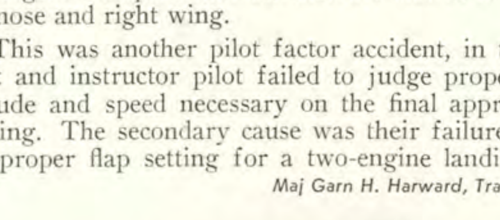
Ground witnesses first observed the aircraft approximately one and one-half miles from the approach end of the runway, at an altitude of 150 to 200 feet above a beach that bordered the airfield. At this altitude, the aircraft was 50 to 100 feet below runway elevation. One mile from the end of the runway, the aircraft was observed in a shallow right turn with a nose high attitude. At this time additional power was applied and the aircraft ascended briefly. It then stalled abruptly and the left wing dropped. The aircraft struck the ground left wing first and was destroyed by impact and subsequent fire. The eight crewmembers and three passengers were killed. Three passengers received major injuries and one received minor injuries. The pilot had a total of 5608 flying hours, of which 526 were flown in the C-124.

The primary cause of this accident was that the pilot did not maintain sufficient airspeed in turbulent air during final approach, and allowed the aircraft to stall while attempting a GCA with one engine inoperative. An area of extreme turbulence exists in the approach zone to the runway. The Nr 2 propeller had been feathered following failure of the Nr A-2 cylinder.

DURING A SIMULATED TWO-ENGINE APPROACH at night, the pilot and instructor pilot allowed the aircraft to sink too low on final approach. The C-124 hit the ground in a three-point attitude 879 feet short of the runway. Power was immediately applied to all four engines and the aircraft regained flying speed. The gear would not retract and upon inflight inspection, the nosewheel strut was discovered to be broken. A fuel leak was also detected in the Nr 2 main tank. Most of the fuel remaining in the damaged tank was transferred and the aircraft was flown until the tank was empty. When the tank was dry, a landing was made on the main gear with the nose gear being held off the runway. After rolling several hundred feet, the right main gear collapsed and the aircraft slid to a stop on the nose and right wing.

This was another pilot factor accident, in that the pilot and instructor pilot failed to judge properly the altitude and speed necessary on the final approach to landing. The secondary cause was their failure to use the proper flap setting for a two-engine landing.

Maj Garn H. Harward, Transport Br.



B-52 INFLIGHT FIRE incident reports and EURs continue to be received reporting inflight crew compartment fires in the B-52 aircraft resulting from personal equipment being placed on or in the vicinity of a heating duct.

The offending duct enters the upper compartment at the aft edge of the ladder hatch and runs aft on the EWO compartment floor. Numerous rubber mattresses and other items of personal equipment have been set afire by contact with this duct. Several organizations have installed locally devised shields to eliminate this hazard. AFLC has recognized the problem and issued TO 1B-52-1507. Prompt ordering and installation of kits by using organizations should eliminate this serious hazard.

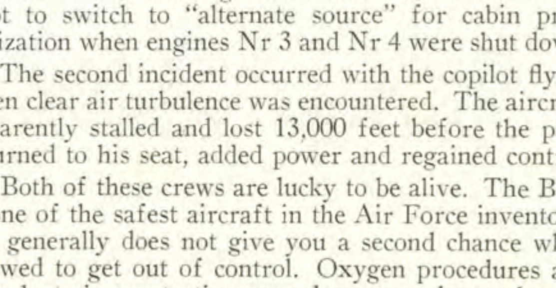
* * *

LOSS OF CONTROL — Over the years, loss of control resulting from poor pilot technique has been a major factor in B-52 accidents. Although we have not lost a B-52 from this cause since January 1961, two recent incidents point out the ever present danger. Both of these incidents occurred during Chrome Dome missions with only one pilot in the cockpit and both came very close to disaster. In one case the loss of control was due to lack of oxygen discipline and resultant hypoxia of the pilots. Structural damage to the aircraft was incurred before the aircraft was brought under control. A contributing factor here was failure of the pilot to switch to "alternate source" for cabin pressurization when engines Nr 3 and Nr 4 were shut down.

The second incident occurred with the copilot flying when clear air turbulence was encountered. The aircraft apparently stalled and lost 13,000 feet before the pilot returned to his seat, added power and regained control.

Both of these crews are lucky to be alive. The B-52 is one of the safest aircraft in the Air Force inventory, but generally does not give you a second chance when allowed to get out of control. Oxygen procedures and turbulent air penetration procedures are adequately covered by the Flight Handbook and Air Force Regulations.

Lt Col Robert P. Rothrock, Bomber Br.



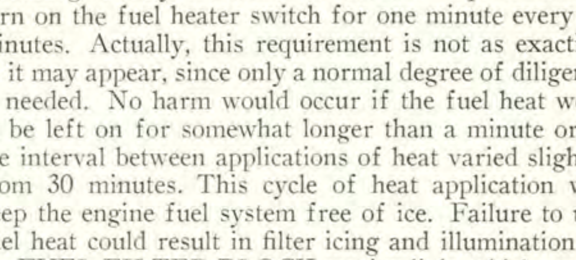
FUEL FILTER DEICING SYSTEM — A Safety of Flight Supplement, 1T-39A-(SF)1-29, was recently issued for T-39A and B airplanes. The purpose of this supplement is to provide additional instructions on the use of fuel heat during flight when flight is conducted in subfreezing temperatures. These instructions are as follows:

- BEFORE TAKEOFF: Turn the fuel heater switch ON for one minute just prior to takeoff. The fuel heater switch must be OFF during takeoff.
- INFLIGHT: The fuel heater switch should be turned on for one minute every 30 minutes.
- DURING LANDING: Turn the fuel heater switch on for one minute in the traffic pattern. The fuel heater switch must be turned off on final approach.

Since the issuance of the referenced Safety of Flight Supplement, reports indicate that some T-39 pilots are becoming unduly concerned about the requirement to turn on the fuel heater switch for one minute every 30 minutes. Actually, this requirement is not as exacting as it may appear, since only a normal degree of diligence is needed. No harm would occur if the fuel heat were to be left on for somewhat longer than a minute or if the interval between applications of heat varied slightly from 30 minutes. This cycle of heat application will keep the engine fuel system free of ice. Failure to use fuel heat could result in filter icing and illumination of the FUEL FILTER BLOCK caution light which would serve as a reminder to resume the use of fuel heat. However, on the other hand, too frequent or continuous use of the fuel heater could cause varnishing of the engine fuel system components, hastening the need for engine overhaul.

It is therefore preferable to restrict the use of the fuel heater to not more than a minute every half hour, although, as previously stated, this time cycle may be regarded as "approximate."

North American Aviation Operation & Service News



IN THE LAST NINE MONTHS of 1962 there were nine drag chute failures on B-66 aircraft. Five of the nine were the result of chutes being improperly installed by the pilot. Damage included blown tires and bent gears. One aircraft went off the runway.

All users of the B-66 should insure that pilots are made aware of the proper method of installing drag chutes since loss of a drag chute can be the cause of a major accident.

Lt Col Earl F. McKenny, Bomber Br.

DURING TAKEOFF the C-131 was lifted off at 104 knots, five knots below desired takeoff speed. The right engine failed and the propeller automatically feathered at liftoff. The gear was not retracted immediately which caused a reduction in airspeed. The climb toward power lines, 7000 feet beyond the end of the runway and 140 feet above airfield level, was probably made at about 96 to 100 knots, minimizing the rate of climb. The flaps were raised before the aircraft reached the power lines, causing a further loss of climb so that a zoom was necessary to clear the wires. The zoom further reduced the airspeed which caused the aircraft to stall and settle to the ground. Although none of the persons aboard was injured, the aircraft was destroyed.

This accident was caused by poor technique and lack of knowledge of aircraft performance on the part of the pilot in that the aircraft was forced off before takeoff speed was attained, late gear retraction and premature flap retraction.

Maj Garn H. Harward, Transport Br.

AN OHR WAS RECENTLY FILED by a slightly unhappy pilot who had his T-Bird liberally peppered with rocks and dirt thrown up by blast from the engines of a KC-135. It happened this way: A KC-135 was sitting on the runup strip next to the runway, waiting to cross.

"Behind him was our T-33 at the corner of the taxiway and at a 45-degree angle to the tail of the '135. Also behind the '135 were two Navy SNBs making runup. When the KC-135 received clearance to cross, he throttle-busted the outboard engines to what appeared to be 100 per cent power and showered the three aircraft behind him and completely littered the ramp. The rocks blown were up to the size of golf balls and hammered the side of the T-33 and went into the props of the SNBs."

To prevent future such incidents, tower operators should advise pilots when other aircraft are behind them. Furthermore, smaller aircraft should not taxi too close behind large aircraft, either jet or recip.

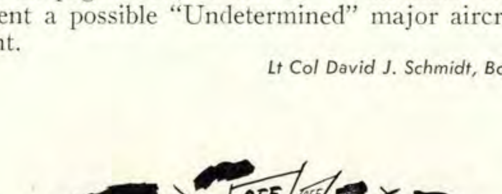
The Dash One procedure for the KC-135 is to use the outboard engines on the KC-135 to avoid pushing up foreign particles in the nose section. However, on a narrow hard surface, such as a taxiway, it may be better to use the inboard engines during taxiing.

ICED Q-SPRINGS — Throughout the cold season our B-47s are flying low as well as high altitude sorties with the ever-increasing chances of elevator Q springs icing up, causing loss of artificial feel.

Loss of feel can create some tricky manipulations of the rudder and elevators on a pop-up or low visibility approach for landing.

Nineteen cases of loss of feel in the B-47 were reported by the end of last October, so be prepared and don't get caught in a box. Review the procedures outlined on pages 3-87, 88 and 89 of the Dash One and prevent a possible "Undetermined" major aircraft accident.

Lt Col David J. Schmidt, Bomber Br.



OFF FLAGS—Ponder the hazard implications of this one. Preliminary investigation of a minor accident isolated the failure of the MM-4 attitude indicator to be an internal instrument malfunction. This failure was in the roll axis of the indicator with no "OFF" flag presentation. It is considered possible that internal failure of the instrument could also occur and still not give an "OFF" flag warning. The "OFF" flag monitors the power to the gyro and does not monitor the roll or pitch movement of the instrument.

Action is being taken to initiate a safety of flight supplement to warn that MM-4 malfunctions can exist that will not result in actuating the "OFF" flag. Further, it will advise that where dual equipment is installed, cross reference between pilots' and copilots' MM-4 attitude indicators should be effected before takeoff and during flight.

Lt Col H. D. Smithson, Transport Br.

What I Saw!

Lieutenant General
William H. Blanchard
The Inspector General, USAF

ALL BASES IN THE UNITED KINGDOM except Lakenheath were closed because of fog or construction in progress. Forty-five B-47s deploying from the States were inbound at close intervals. I okayed the letdown. The main gear collapsed on the fifth aircraft to land and it was burning in the middle of the only runway. Five more aircraft were already committed and fuel reserves were inadequate to get to the open alternates.

I saw this in a dream—thank the Lord—and it was a nightmare!

The next day it was still a nightmare. I could not get a burning B-47 off the runway in time, under these circumstances—nor had I the equipment or capability to do it in a war situation when gear failures from battle damage are frequent. You can't use a bulldozer on a conflagration of that sort without frying the operator.

In mulling this problem over in my mind I remembered a scheme which I had suggested years before. It was apparently considered too simple, however, and had been summarily rejected without test. That day, with my dream still vivid in my mind we went to work to see if the scheme was feasible. We fabricated and tested a simple net of meshed cable. One Coleman tractor, making a wide circle around the simulated burning B-47, positioned the dolly mounted net. Then two tractors, one at each end of the rig, pulled the net into the wreck and, working like a team of horses, *dragged* the wreck clear of the runway.

Following our initial success we did further testing with British tank retrievers. We found that for a skidding pull or drag, lightweight winches, tractors or loaded trucks could handle a B-52. With the gear prefabricated and a crash crew trained, ten minutes clears the runway.

We submitted drawings together with costs estimated to be about $5,000 a set. Being very wary of our bureaucratic system, I made my own.

I saw a burning wreck on a runway the other day and thought of the project Colonel Ray Dietzel worked out so thoroughly. I thought of the National Guard deployment to Europe and the ever-increasing flow of air traffic through our isolated island bases. Those stepping stones across the Atlantic and Pacific which have no alternate for hundreds of miles—those are the slabs that must be kept open constantly. A bulldozer or tractor with cable and hook will not handle the flaming wreckage of a large aircraft. It requires special equipment of the type I have described.

Safety officers, this is your business. Let's check now to assure that you have the equipment and the procedure for its use. ★ ★ ★

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