AEROSPACE

SAFETY

UNITED STATES AIR FORCE

JUNE
1962

• • • HERE'S THE F-110

THE GREATEST CHALLENGE

Major General Perry B. Griffith, Deputy Inspector General for Safety, USAF

The greatest single safety challenge to those of us in the safety business is, believe it or not, the private motor vehicle. This piece of equipment costs the Air Force more lives each year than all aircraft, missile, nuclear and conventional weapon accidents combined. Last year we averaged more than one fatality a day from this cause—a total of 377 for the year.

We know *how* these accidents occurred. Such things as speeding, driving too fast for road conditions, trying to drive when under the influence of alcohol, crossing center lines, passing on hills and driving when fatigued have long been documented in the Records and Statistics Branch.

What we don't know is *why* Air Force people persist in killing themselves in this manner. Surely every individual in the Air Force has been advised of causes of PMV accidents. No single segment of the accident prevention program has received more attention. Posters, commander's calls, pre-holiday briefings, printed material—virtually every communications media known has been used to bring this hazard to the attention of everyone in uniform. Some progress has been realized, thanks to a ground safety program that stresses such proven accident preventatives as: command interest, driver improvement courses, travel limitations, seat belts—there are many others. Still, there continues to be room for improvement.

A man will go out to his aircraft, look it over carefully in accordance with Dash One checklist procedures, and turn it down if he finds discrepancies. But this same man will jump into his car with worn tires, brakes that have to be pumped, a faulty muffler, then exceed a safe speed limit to hurry to a destination.

Try as we will, we have never been able to understand what makes a man abide by rules of society and common sense except when he gets behind the wheel of his own automobile and automatically becomes maniacal. The same individual who wouldn't put on a uniform and play against the Green Bay Packers for any amount of money thinks nothing of exposing himself to much greater risk by driving 100 miles per hour to get to the game. The individual who locks the door at night for family protection more than offsets his concern for their safety when he demonstrates high-speed cornering capability of the family sedan during a vacation trip to the mountains. The individual who becomes ineffective when he has to work overtime on Saturday or at night would never admit he also becomes less effective when he continues to drive on when fatigued.

Nor are we so vain as to think this entreaty will markedly reduce the PMV accident rate. We've tried every approach from the shocking to the subtle. Still, the lives-saved statistics are not nearly as impressive as the lives-lost statistics.

And the future doesn't look bright. More cars are being manufactured than are being worn out and wrecked. All are capable of going much faster than they can be safely driven on the highway. There appears to be an endless supply of alcohol, and drivers who are keeping the distilleries working overtime.

When we look at PMV safety in this light it is easy to become discouraged. Can we justify this magazine space for a subject in which progress is so agonizingly slow?

We think so. So long as the Air Force continues to lose more personnel from this than any other single cause factor, there can be no letup from using every means available to try and combat it. This is a function of command and requires constant pressure from supervisors.

Next time you drive test your skill in road rally fashion—make it a point to drive at the legal speed, adjusted downward as necessary by road and traffic conditions. Chances of your arriving at destination sooner will not improve, but chances of your arriving will. So start a bit ahead of when you planned to, and be courteous on the road; let the hog have his way. He'll become a statistic quite soon. ★

IN THIS ISSUE

FALLOUT

Dear Editor—

Every month I read your magazine (I get it free) and I have some questions maybe you could answer for me.

You are always telling of ways to prevent accidents. Most of the information seems to make sense.

Question 1. How come the accident rate was up last year? You write stuff about all kinds of airplanes but I only fly a U-3. You don't hardly ever write about a U-3.

Question 2. If I had an accident, would you write about a U-3? Should I, so you could? (I could figure it was the stall warning horn and land gear up?

Question 3. Is Tex Riley real? I get the impression that being in the "field" as I am is a subordinate type assignment, like rank and file. Still, guys like me are supposed to keep you informed of everything that is going on so you'll know how to tell us to not have accidents.

Question 4. Why don't you ever get out where things happen, to find out for yourselves?

About this life sciences—sounds like a career field I'd like to do research in. Question 5. Is it what I think it is?

Question 6. How come pilots keep having the same kind of accidents, like landing gear up?

Question 7. Are there other accident cause factors than "pilot error?" If so, give me an example.

Question 8. What is most interesting about your job? Most difficult?

Question 9. Would you say which you think would be safer: flying with an old colonel or a young lieutenant?

Question 10. I think I'd like something a bit more stable than the U-3, do you have any suggestions?

2d Lt Johnny Doe, USAF
APO 022.

Dear Lt. Doe:

In reply to your letter of the 12th, I submit the following:

Question 1. We know the accident rate was up because of a greater number of accidents per hours flown. We don't know all we'd like to know as to why there were more accidents. Please be alert to hazards and let us know of any you find.

Question 2. Possibly. Please don't.

Question 3. He says he likes to think he is . . . and it's Rex, not Tex.

Question 4. I referred this question to a survey team member who had spent 234 days TDY last year. Sorry, his answer is not printable.

Question 5. No, it's not what you think it is; at least it's not what I think you think it is.

Question 6. Because they keep making the same mistakes, like forgetting to put the gear handle in the down position before landing.

Question 7. Some; most missile accidents are not charged to "pilot error."

Question 8. Letters to the editor; answering same.

Question 9. No, I wouldn't say.

Question 10. How'd you like to swap that U-3 for a nice stable desk?

Editor

Change It!

The reflection given by the picture on the cover of the April issue is not one of safety, especially in stormy weather. Notice the static ground wire on the nose landing gear. Let's hope one of the airmen was preparing to change it.

I believe that unnoticed items of this nature contribute to a large portion of ground and air accidents.

A1C Harold Hoeksema
1707 ATW Hq Sq Tinker AFB

We concur, "Let's hope one of the airmen was preparing to change it."

Controller Says—

As a regular reader of AEROSPACE SAFETY and other similar type publications, I am moved to reply to the frequent criticism aimed at FAA facilities transmitting on Guard channels.

The Controller isn't using these frequencies because it's Friday and Guard Day but is being forced into this situation because of poor flight planning (frequency-wise) of pilots making cross-country flights. Many pilots often attempt instrument flights without mini-

CONTINUED ON PAGE 29

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VOLUME EIGHTEEN NUMBER SIX — USAF RECURRING PUBLICATION 62-1

• HERE'S

Gordon Henderson, Managing Ed.
McDonnell Aircraft Corp.
Field Service Digest

For the past few months a pair of jet fighters new to the Air Force have been on an orientation and evaluation tour at several Air Force Bases. They are F-110s, and quite a few Air Force people have had occasion to fly or service them. Most of you, though, probably haven't. So here's some general information about the aircraft the Navy calls the F4H.

• WHAT DOES IT LOOK LIKE?

We've selected the pictures for this article to give you a good idea of what the 110 looks like from several angles. After examining them you may have another question. Why?

There really are good reasons for this bird's somewhat unusual appearance. First of all, the fuselage. The F-110 has the same type of keel structure, with the engines on each side of the keel and the fuel cells on top, that has proved so successful in the F-101 series. This makes the engines accessible for maintenance, removal and replacement without taking off the tail. The placement of the engine air intakes on the sides of the fuselage allows fairly straight, direct ducting and a clean wing-to-fuselage juncture.

The bulge and slight droop in the nose resulted from the adoption of a 32 inch radar dish after the aircraft was designed for a smaller dish. The performance degradation caused by the increased frontal area is slight, and is more than made up for by improved radar performance.

The wing, rather than being a modified delta as it appears at first glance, is better described as a very low aspect ratio sweepback. Between the wingfolds it is a wet-wing construction, with a heavy load-bearing skin and very few chord-wise structural members. There are only two spars; spanwise stiffeners are integrally milled into the upper and lower skins. This whole wing is internally sealed and acts as one big fuel tank. Structurally speaking, the fuselage sits on top of it, eliminating the need for heavy carry-throughs.

The wing is snagged forward at the wingfolds. This improves lateral stability; specifically, it is an anti-pitchup measure. There is also a marked dihedral outboard of the folds, which contributes to the airplane's very good lateral stability.

There are both leading and trailing edge flaps; speed brakes on the lower surface near the fuselage; spoilers on the upper surface, and ailerons. The main landing gears are mounted well outboard to give a wide tread, and the wheels retract into the wing. These efficient high-lift surfaces, together with boundary layer control, give the F-110 great speed versatility—from about 110 knots stall speed to over 2.5 mach in level flight.

This brings us to the tail. The fin-rudder combination is conventional. The stabilator, on the other hand, is set low and bent down in a sharp cathedral angle. This again is a measure to improve longitudinal stability and prevent pitchup. The low position and cathedral angle place the stabilator below the wing down-wash when the aircraft is at a high angle of attack; this eliminates one critical factor in pitchup. At first look the stabilator surfaces seem dangerously close to the jet exhaust; however, they are built of high temperature materials and protected by heat reflective paint. They are not protected from careless tug drivers; we'll have more to say about that later.

• POWER

Two General Electric J-79-8s with afterburner add up to 34,000 pounds of thrust. This is a good deal more push per pound than even the F-101 has. The airplane will fly and land safely with only one running; if there were such a thing as an emergency single-engine take-off, it could do that too. This has actually been demonstrated.

Use of all this power at very high mach numbers is made possible by the inlet air control system. A sliding bell-mouth regulates the ratio of by-pass and intake air, and a movable ramp in the front end of the duct throttles the incoming air and keeps shock waves out of the duct. The bell-mouth and ramp movements are scheduled automatically by a central air data computer, to give optimum air flow for all mach numbers and altitudes.

So much for appearance, structure, and power.

• HOW DOES IT FLY?

Modesty as well as security prevents a full discussion here of the F-110's flight performance. However, without going into a complete flight test report, we can say that it is outstanding. Versatility is the keynote. It has set official world records for speed in short straightaways at both high and low altitude, and tight closed courses. It has set zoom climb, sustained altitude, and time-to-climb marks. We'll avoid a long list of figures, which have been well publicized elsewhere; a few of the most notable ones are mach numbers above 2.5 at

THE F-110 •

altitude and 1.2 at 50 feet, and sustained altitudes above 66,000 feet.

As for handling characteristics, we'll have to let pilots report this in detail in future articles. In general, they seem impressed with the easy maneuverability and with the stability on all axes, especially at low speeds. The stall is preceded by an adequate buffet warning at all speeds. There are no pitchup or tuck-under tendencies. Spins are fairly straight forward, and are recoverable without use of a tail chute. Acceleration is very fast; at normal takeoff gross weight the aircraft is off the ground in less than 2000 feet, and has officially climbed to 49,200 feet in less than two minutes. Correspondingly, the slow and stable landing approach makes it possible to get stopped in well under 3000 feet. Nose gear steering and a drag chute make heavy braking unnecessary on normal landings. For clutch situations there's an extendable and retractable tail hook, Navy style.

• WHAT ARMAMENT DOES IT DELIVER?

The armed version (fighter-bomber-interceptor) carries a very wide range of missiles and stores. Four Sparrows IIIs (beam-riders) are normally carried on the integral fuselage launchers. Two more Sparrows, or four Sidewinders, or a mixed load, can be carried on wing pylons. Both nuclear and conventional bombs of many types can also be carried. The aircraft is equipped for all types of manual and automatic delivery, including LABS. All Air Force tactical inventory armaments have been fully demonstrated on the Nellis AFB bombing ranges.

The photographic system for the RF-110 is still in design, and is largely classified anyhow. Suffice it to say that it is a highly sophisticated multi-camera system installed in the nose, after the manner of the RF-101. Camera controls will be handled from the rear cockpit, as the radar is in the armed version.

• HOW ABOUT GROUND HANDLING?

Towing poses no unusual or new problems. The airplane, though fairly large, is compact; the Navy handles its counterpart, the F4H, aboard aircraft carriers with no difficulty. One convenient feature is that nose gear scissors do not have to be disconnected for towing. Although there are large areas of vulnerable honeycomb, there are also ample walkway areas on the wings and fuselage suitable for pedestrian traffic.

Careful ground handling has, of course, been important since cows first ate the fabric off flying machines. It is getting more important as the price tag of aircraft goes up, and repair techniques become more complex. Consider the lower wing surface of the F-110: this is not sheet metal. The main skin on each side is a single piece, about four feet wide and 18 feet long. It's milled to a precise contour, taper, and thickness, and it has integral stiffeners on the inside. If you should carelessly raise a fork-lift and punch a hole in it, it very definitely cannot be patched with a flattened beer can, Guadalcanal style.

As to personnel hazards, they are there, of course; but the F-110 is the same as any modern jet fighter

in that respect. There are no unusual dangers lying in wait for the innocent passerby. The jet exhausts and intakes are dangerous; so are the power control surfaces, the flaps, the gear, the canopies, and the tail hook.

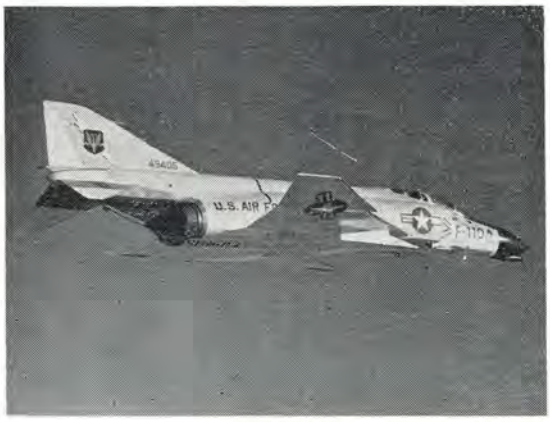
• MAINTENANCE

It would be foolish to say that F-110 maintenance is simple and easy. It can't be. This weapon system's versatile capability and record-breaking performance are made possible only by complex systems and equipment. The maintenance of these systems and equipment is correspondingly complex; training and careful work are of course absolutely necessary. The basic planned maintenance card system, however, has already been worked out and is functioning smoothly for the Navy.

Your first look at this aircraft with all the doors off may be something of a shock. Packaging so many mission capabilities into a fighter-size airframe has resulted in a very high equipment density. Take heart; everything possible has been done to make the works accessible. The radar pulls straight out of the nose on a roller track. The hydraulic and electric plug-ins are all convenient, in the wheel wells and in the undersurface of the fuselage. The whole bottom opens up to expose the engines. There are many structural doors for access to other equipment. In places, unavoidable, the components are a couple of layers deep; but the planned maintenance cards and the handbooks have already been through their trial-and revision period in service. Their established procedures make straight a pathway in the wilderness.

As a cheering illustration of the airplane's maintainability, here are some figures from the orientation tour of the two F-110s mentioned at the beginning of this article. During the bombing program at Nellis, the two aircraft logged 90 hours per month per aircraft, a total of 180 hours. During the whole first phase of the tour, they flew 292 hours in 196 flights; this was double the number of flights that had been planned. Organizational maintenance time averaged 6½ man hours per flight hour (not counting calendar inspections, which would bring the figure up to 10½ hours). This small amount of maintenance time produced a flight ready availability of 92 per cent and an operationally ready availability of 82 per cent; this during a cross-country tour involving many types of missions. Admittedly the maintenance crews were experts, and we probably can't expect such a low work/flight ratio in general service, but it does show what a reliable bird the F-110 is when it's treated right.

This, then, is the newest addition to the Air Force inventory. It'll be in general service before too long, at which time you'll be getting much more detailed information in this magazine, Maintenance Review, and the McDonnell Field Service Digest. We'll be seeing you. ★



WELL DONE

Captain William Weiger 36 TAC Fighter Squadron PACAF

Captain William F. Weiger, a flight commander of the 36th Tactical Fighter Squadron, was flying as instructor pilot in the back seat of an F-100F with a newly assigned pilot during a training mission from Itazuke Air Base. The mission progressed as briefed until a right hand turn was attempted at 800 feet, GCA circling approach minimums, for a landing. The aircraft entered a left skid and could not be turned right during level flight.

Captain Weiger immediately took control of the aircraft and started a left hand climbing turn for a right hand pattern to Runway 33, simultaneously declaring an emergency with an unknown flight control problem. Full right rudder offered no improvement and remaining fuel did not permit further airborne analysis. During the turn onto final the external tanks were jettisoned over an open area and the approach was flown with full right rudder and full right aileron. A good touchdown was performed in front of the Mobile Control unit and the drag chute deployed. Nosewheel steering could not be engaged. Full right rudder and full right brake failed to prevent the aircraft from leaving the runway. The aircraft stopped 10 feet off to the side of the runway and received only negligible damage.

It was later determined that a nut had separated from a bolt in the rudder system, locking the rudder in the full left postion. Capt. Weiger, realizing the emergency constituted a possible bailout condition, elected under the circumstances to stay with the aircraft and attempt a landing. Through superior pilot ability Captain Weiger successfully saved an aircraft and possible loss of life which often results from bailout at low altitude.

The professional skill, knowledge and courage displayed by Captain Weiger, in the face of a severe emergency, reflects the highest credit upon himself and his unit.

WELL DONE! ★

'62 AIRCRAFT

1962 JANUARY 1962						
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1962 FEBRUARY 1962						
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1962 MARCH 1962						
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This article deals with aircraft accident experience during the first quarter of 1962. Its purpose is to examine accidents, particularly their cause factors, analyze for trends and report major trouble areas. It will not, of itself, prevent accidents. It should, however, provide information as to where effort can be most profitably applied.

With the year but one-fourth over, accident statistics have already spotlighted areas that are cause for considerable concern. Here are some such areas:

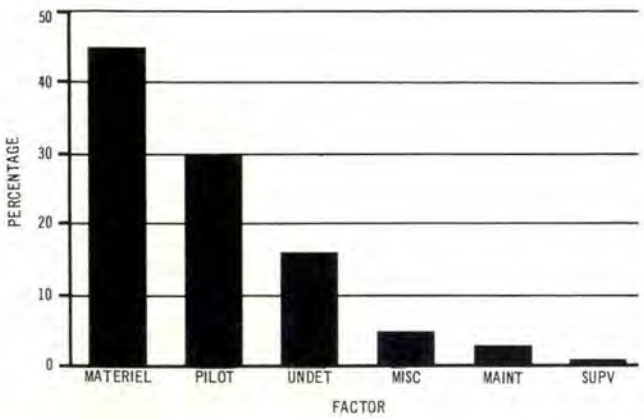
Pilot fatalities were up although there were fewer accidents than during the same period of 1961 and there was a three per cent increase in the number of successful ejections.

Fighter type aircraft accounted for half the accidents.

Helicopters recorded the highest accident rate by type aircraft.

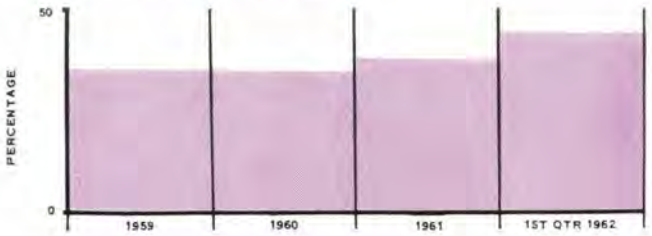
Forty-six per cent of all accidents were experienced in two major commands.

Now for a breakdown by cause factors:



Analysis of these statistics requires some qualification. Fairly accurate conclusions are possible; however, due to lead time required in magazine publication coupled with the time lag in obtaining final determination of cause factors, exact statistics are not available as of this writing. Nevertheless, if maximum benefit is to be gained from accident experience, analysis must be made and prevention measures recommended and instituted at the earliest practicable date.

• MATERIEL FAILURE



F-84: After a letdown the pilot added power at leveloff. As the RPM built up the engine began vibrating, progressing into a severe shaking. The engine was shut down but the vibration continued even with the engine windmilling at 14 per cent. At 2500 feet the pilot tried an airstart, but the vibration became so severe he again shut down the engine and ejected.

Preliminary evaluation listed the cause as failure of one or more blades in the sixth stage compressor due to stress rupture.

F-106: Malfunction in the main landing gear control valve prevented extension of the main gear to full down and locked by either normal or emergency extension systems.

KC-135: Failure of the fuel air starter turbine resulted in a fire and almost 100 per cent destruction of the aircraft.

F-100: The pilot ejected and the aircraft crashed. The accident was caused by failure of the 3-7-9 tube assembly, afterburner manifold to spray nozzle, from metal fatigue.

Under the same general heading of materiel failure is the matter of design deficiency. Item: Lead's (F-105) first rocket pass was observed to be at an angle of about 40 degrees. He fired at approximately 2000 feet, pulled out smoothly and recovered at about 1100 feet above the ground. The second pass was essentially the same. On the third pass lead pulled off high at 430 KIAS, did not fire and made a 4 G pullout. As the nose reached 10 degrees below the horizon the aircraft suddenly pitched up 10 to 15 degrees causing a high speed stall. With application of forward stick the aircraft pitched down, then porpoised two or three times. The pilot then held the stick slightly aft of neutral and recovered at about 300 feet. He observed that his stability augmentation system was disengaged. He later reengaged it and had no further difficulty.

In response to query from the range officer, the pilot said the maneuvers had not been intentional and that he had observed +7 G and −1 G on the G meter.

ACCIDENT REPORT

Lead's fourth pass was at an angle of 45 degrees or higher. He fired a rocket, appeared to pull out smoothly and leveled at about 800 feet. The nose of the aircraft then oscillated above and below the horizon, started yawing in both directions, fell to about 35 degrees below the horizon then rose to 85 degrees above, yawing wildly. The aircraft then dropped like a falling leaf until it struck the ground 3800 feet beyond and slightly left of the target and appeared to explode on contact. No transmissions were heard from the pilot after he rolled in for the pass.

Materiel failures seem to grow in number with the age of equipment and with the complexity of new equipment. Among the recommendations for prevention of this type accident, based on experience during the first three months of this year, are:

Conduct design studies and instrumented test flight programs when design deficiency appears to be an accident cause factor or potential cause factor.

Until there are suitable fixes, restrict aircraft from flight regimes where safety of flight deficiencies have been noted.

Revise Dash Ones to define hazard areas, how to avoid them and how to recover when they are encountered.

Continued action by DIG/Safety to insure worldwide dissemination of known materiel deficiencies in aircraft systems.

Rebrief aircrew members on alternate bailout procedures.

Obtain technical assistance for accident investigation boards from those not connected with quality control or inspection responsibility in the accident being investigated.

Re-emphasize to pilots that, as per Handbook instructions, they should land as soon as possible when an overtemp indication is noted.

Explore the possibility of obtaining an improvement in the present zero lanyard system with a goal of a positive parachute opening device less dependent on memory. Stress proper use of the present system until such improvement may be realized.

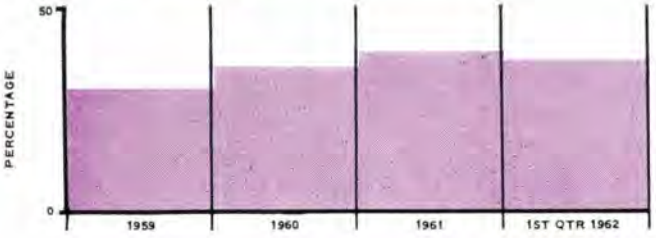
Pilots can cope with many inflight emergencies. Often, however, when a malfunction occurs, their only recourse is to eject. Nevertheless, there are many ways in which they and maintenance people can prevent those "eject or die" situations.

All personnel working with aircraft must know those items with known failure histories; they must be able to detect symptoms that provide warnings and actions to be taken. Where a flight safety hazard exists, Emergency Unsatisfactory Reports should be submitted.

While many of the following may seem elementary, they are some of the best accident prevention tools we have:

- When abnormal operations or indications are present, always make detailed writeups on the Form 781A.
- Demand careful quality control inspections.
- Keep overdue time changes at a minimum. Preplan requirements so as to have a minimum of life expectancy extensions.
- Strictly comply with 66-1 procedures.
- Drill on emergency procedures in simulators.
- Submit command assistance letters from the using command to the command responsible for quality of the equipment.

• PILOT FACTOR



Despite the fact that in several cases highly skilled pilots eventually had to eject after trying every approved procedure to recover from an emergency situation, there were some who, flying perfectly normal aircraft, caused accidents by their own shortcomings.

A C-47 pilot attempted a downwind, short-field takeoff at a civilian field when there was no mission requirement for such a maximum performance procedure. The aircraft became airborne in less than 600 feet, climbed in an extremely steep angle (35 to 55 degrees), reached an altitude of approximately 200 feet, faltered, appeared to stall, struck the runway in an almost wing vertical position, broke up and burned. The Board found that the crash was the culmination of a long series of mistakes, deviations and irregularities. It terminated a weekend cross-country flight that was very loosely planned by the crew, and even more loosely executed.

'62 AIRCRAFT ACCIDENT REPORT

Another transport pilot, leading a flight of six aircraft, attempted to maintain VFR, descended to a low altitude, struck trees and crashed. The No. 2 man, losing sight of lead, took over the lead and maintained an altitude that would assure terrain clearance. The five remaining aircraft made routine landings after uneventful flights to destination.

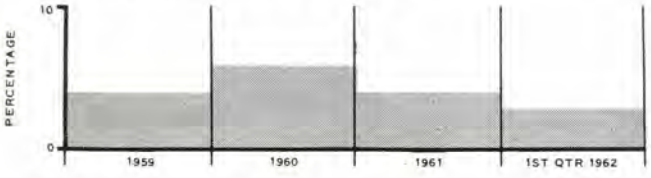
A fighter pilot taxied too fast, couldn't stop, and ran off the taxiway. The main gear collapsed.

Here is a sampling of recommendations picked from pilot error type accidents:

- Don't try to fly VFR in marginal weather conditions.
- Follow Handbook procedure for rotation.
- Report minimum fuel conditions when they exist.
- Connect zero lanyards in accordance with Dash One specified procedures.

Pounding away at known operator deficiencies appears to still be a profitable area in this category. Lapses in self-discipline have caused accidents in the past—during formation flight, during approaches in minimum weather conditions, when fuel consumption was greater than flight planned, or when unforecast weather conditions were encountered. False motivation—gethomeitis or missionitis—call it what you will; this has been an accident maker. Without unrelenting, repetitive emphasis by safety and supervisory personnel, such things will continue to appear as cause factors on accident reports of the future.

• MAINTENANCE FACTOR



A flight chief did not properly secure the hot air ducts from the 15th stage compressor after maintenance was performed. The result: heat damage to a '106 that required about 9000 manhours to repair.

An electrician working on a C-119 let the hot end of a jumper wire touch the landing gear relay. The gear collapsed and the aircraft was substantially damaged.

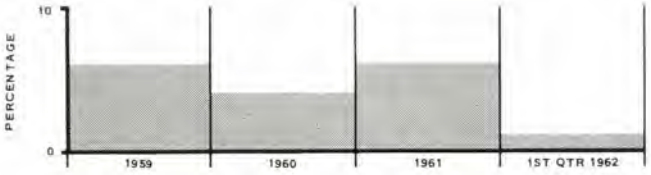
An F-102 was destroyed when a NADAR can was left in an air intake.

Although maintenance was charged with primary cause of but three per cent of the accidents during the first quarter, let's consider just one section of a non-maintenance type accident report to eliminate any complacency in this area. This report disclosed that, although there were no maintenance discrepancies that contributed to the cause of the accident, the maintenance records were unsatisfactory because of inadequate documentation and numerous, serious administrative errors. There were 103 outstanding organizational/field maintenance TCTOs. Three of these were overdue compliance and not entered in the AFTO 781B. Kits were not available or the compliance date had not expired on all other TCTOs.

We can surmise that in some cases such discrepancies could have contributed to accidents.

And along this same line, we are concerning ourselves only with primary cause factors in this analysis. We know that such things as improper torqueing, lubrication, assembly and the like can be the first in a series of events that ultimately result in a materiel failure, or "undetermined" accident. Pilots have been charged with accidents when they were unable to successfully cope with an emergency situation they would never have faced had it not been for a prior maintenance malpractice. On the ground, if it isn't done right, but is properly inspected, it can be done over. Inflight fixes are rarely possible, particularly in century series fighters.

• SUPERVISION



A KC-97 was making a power check at the approach end of the runway while an F-106 was landing. As the fighter flared a wing dropped, the nose gear was sheared and the left main tire blew out. Fragments of the left main wheel or door punctured the left wing tank and sparks ignited the fuel. Fortunately the pilot was able to maintain directional control and got out of the aircraft.

Apparently the leg guards on the rotational upward ejection seat restrict lateral movement of the stick. An Unsatisfactory Report was submitted on the seat calling for an appraisal of the maximum crosswind component permissible with this seat.

Recommendations included closer supervision of flying operations during marginal wind conditions, and that no aircraft perform power checks near the approach end and upwind from the active runway.

An F-100 landed short of the runway and the nose gear failed. The pilot was landing over snow and the overrun had not been cleared. Proper supervision includes not only flight operations but many other areas including efficient maintenance of the airfield. In this case the pilot landed on the uncleared overrun.

Although the number of accidents in which poor supervision was a part has sharply declined, there is still room for improvement. Some of the recommendations out of experience during the first quarter of 1962 were:

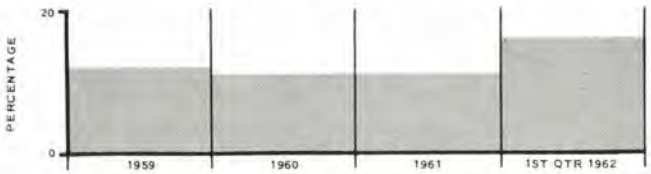
• Managers of support flying activities review training and selection procedures.

• That key supervisory personnel become fully qualified in unit aircraft on a priority basis.

• Continuing emphasis on aircrew discipline and standard procedures.

• More comprehensive instruction for aircrews on weather factors.

• UNDETERMINED



The pilot of an F-102 was forced to eject and the aircraft was destroyed. The exact cause of this accident was undetermined, but the most probable cause was fuel system icing. As a result of this accident the investigating board recommended that a modification be made to allow drainage of water from all components of the fuel system and that a Safety of Flight Supplement be issued to familiarize aircrews with the following:

• Uneven fuel feeding may result from icing in the fuel system.

• Partial power loss may subsequently occur.

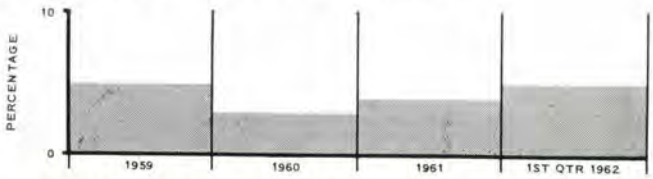
• If the above is encountered, more frequent acceleration checks should be made.

• That landing be accomplished from an SFO, if possible.

Frequently it is impossible to determine the exact cause of an accident from the rubble of a destroyed airplane. Investigators then must depend on evidence obtained from the aircrew, maintenance records and the history of problems with the same type of equipment. Just as the condition of the wreckage may rule out finding the cause there, so may sloppily kept records. To the contrary, well kept maintenance records, URs submitted on the equipment and experience with similar equipment may lead directly to the cause, thus these are valuable accident prevention tools.

There have been too many accidents preceded by a long line of discrepancies unreported by aircrews. For protection of themselves as well as others, aircrews have a responsibility of writing up all discrepancies. Maintenance personnel must document the action taken and, where indicated, submit URs. Also, not to be overlooked are OHRs and incident reports, which may head off accidents before they occur.

• MISCELLANEOUS CAUSES



An RF-101 landed with a flat tire. The aircraft veered to the right, left the runway and struck some large rocks. Primary cause: materiel. But let's look a bit deeper.

Five per cent of the accidents during the first quarter were listed under miscellaneous, which admittedly can cover a broad area. We have used the above case under this category to illustrate a number of factors that might be involved in one accident.

At this base it was the habit to land without drag chutes because of the long runway. So, for this landing no drag chute was used. The tire was due for a change after this landing, but it appeared to be okay before the flight. Possibly on a previous landing with no drag chute excessive braking may have been used with resultant heating of the tire from hot brakes. This may have caused damage that did not show.

The investigators recommended an immediate clean-up program within 300 feet of the runway, and a pilots' briefing on landing procedures with emphasis on blown tires.

• CONCLUSION

Accident reports during the first quarter of 1962 demonstrate that there are many areas over which control is possible. In other words, many of the accidents were preventable. From the foregoing there should be some insight as to problem areas. In order to reduce the number of accidents in future operations, application of recommendations such as those suggested in this article is recommended.

Finally, one sobering thought: As accidents during the first quarter disclosed, there is still considerable room for *real* improvement in accident prevention. ★

Dear Jimmie

Thanks for your letter, son. Your old man is absolutely, but absolutely, right. You came to the right place for information. I'm glad you wrote because I think those articles in Aerospace Safety have often done less than justice to the living legend, C. Z. Chumley. Let me tell you a few of my experiences.

BLAME ME

Last winter I was temporarily flying an old recip job. One morning we took off for another base with a load of KEEP OFF THE GRASS signs which their paint shop was to convert to NO PARKING (our painter got a job as an artist on Aerospace Safety). When we arrived at destination the weather was getting a little sticky. Visibility, because of the snow, was less than 50 feet. Normally I don't mind such inconveniences—100 and an eighth is practically VFR for Capt Chumley—but the old man (the CO was in the right seat) suggested we go to our alternate. That was 15 miles away and, of course, the weather was about the same there.

The nearest place with good weather was 200 miles north, so we set off in that direction. Meanwhile the wind had changed and by the time we found out where we were, we were 20 miles east of track. The reason for this, in case you are wondering about our navigation, was that the old man was considerably shook and I switched on the ADF to get him a little music and missed the weather forecast. Not being familiar with the area, I was tuned to a commercial station east of the base where we intended to land.

Well, from there to the base the aircraft was in a direct headwind of about 80 knots. To make a long story short, we ran out of gas and had to bail out. Boy, was the boss mad! These desk types get pretty soft, you know. Aren't used to roughing it.

We got on the ground all right, but found that most of the survival equipment was missing and what we had wouldn't work. Finally a rancher, plowing through the snow to take hay to some cows, came along and gave us a lift. First, however, we had to help him spread the hay.

Now, as to safety. Something must be done about those survival kits. If it hadn't been for that rancher, we could have gotten into deep trouble.

Then there was the time I was landing a T-Bird out of an SFO. I happened to be a mite low, but show me the man who can judge within two feet from a mile out at 160 kts. The overrun had a six-inch lip and I hit it and tore off the gear.

There's a safety message here, too. Instead of blaming those engineer types for allowing such a dangerous condition as that lip, the board charged me with pilot error. What we need is better accident investigation so that we really get to the bottom of things.

This should be enough stuff for you. Ask your father to explain anything you don't understand. If you need any more help, please let me know. Ol' Chum will never let you down, son.

Sincerely
C. Z. Chumley

Dear Capt Chumley

Thanks for answering my letter. Dad says you are a wonder. I think you missed my point. Or maybe I didn't explain so good. Your stories were interesting but what I need is how to be a safer pilot. Teacher says if I can write something good on that the Air Force will give me a medal. Please tell me how the Air Force prevents accidents.

Yours,
Jimmie Jackson

Dear Jimmie

I'm sure you understand that I am a very busy man, what with the F.E.B., etc. But I will do the best I can for you. The USAF has a very fine safety program. This is good. The way some people apply the program . . . that's bad. I know because I fly with some of the unsafe jokers everyday. Take last week. Figmo Flaherty and I were on our way to Albuquerque. I was in the front seat going. While taxiing out I knocked over a fire extinguisher. Naturally, I was busy taxiing and Figmo should have been keeping an eye on things and warned me about the bottle. (Figmo is in the lower bracket brainwise). Kirtland weather was lousy so we diverted to our alternate. Imagine, when we broke out there was a steamroller on the runway. Of all the . . .

By that time we were too low to go around so we landed on the grass. Superior airmanship prevented a serious accident. We found out there WAS a NOTAM, but nobody had told us about it before we took off.

After they got the wires and lights untangled from the gear and the mud and puncture weeds off the tires, the ol' bus was ready to fly again. By that time the equipment was off the runway. Figmo took off, in the front seat.

Everything was routine on the way home, except for that airliner that come busting along right in front of us. Those guys should be more careful. Could have

caused an accident. Finally we got into the pattern and I called the tower and told them we were on final.

The tower came back and said they couldn't see us. Knowing how blind some of them tower operators are, I wasn't surprised. But I called them again and told them we were three miles out. They still couldn't see us, even with the landing lights on. Figmo got in the act then and what he called the tower I can't put in this letter.

The tower chief then said "You're a double, in spades." Figmo got mad and you should have heard it. Figmo and the tower chief yelling at each other at the same time so loud I couldn't hear that third guy except every now and then. I thought he was saying something

about "who's on first?" but it turned out he was trying to find out who was on final.

About that time a B-47 turned right into us and we almost hit him except that Figmo got so mad that at just that moment he pulled up sharp to go around. He never did see the B-47. As it turned out I'd made a slight mistake in setting the ILS, (You ought to see how small they make those numbers) and we were landing at the wrong base, about 20 miles away.

We finally got the bird on the ground at home but

Figmo was so anxious to get out of that beast that he tried to get off the runway at the first turnoff and we took out another string of lights and the corner of the GCA shack. Hence the F.E.B. I mentioned earlier.

Why they included me I'll never know. Figmo obviously had no business in an airplane. First, he failed to warn me about the fire extinguisher. Then he almost hit the airliner, or vice versa, I was asleep at the time and Figmo was tying his shoe. Finally he tried that short turnoff and wound up against the GCA shack, not to mention almost tangling with the B-47.

There, that should give you all you need for that paper you are writing. It may not be safety, but it's how not to run a safety program. As I said, people again—not the program.

Sincerely
Capt C. Z. Chumley

Dear Capt Chumley

How did you make out with the F.E.B.? Dad and I have a bet on.

Yours,
Jimmie Jackson

Dear Jimmie

A boy your age shouldn't be gambling. Besides that, you are impertinent. I'm full of safety and tried to give you a grasp of some of the problems. Apparently you haven't been raised right. Better straighten up, son.

Chumley

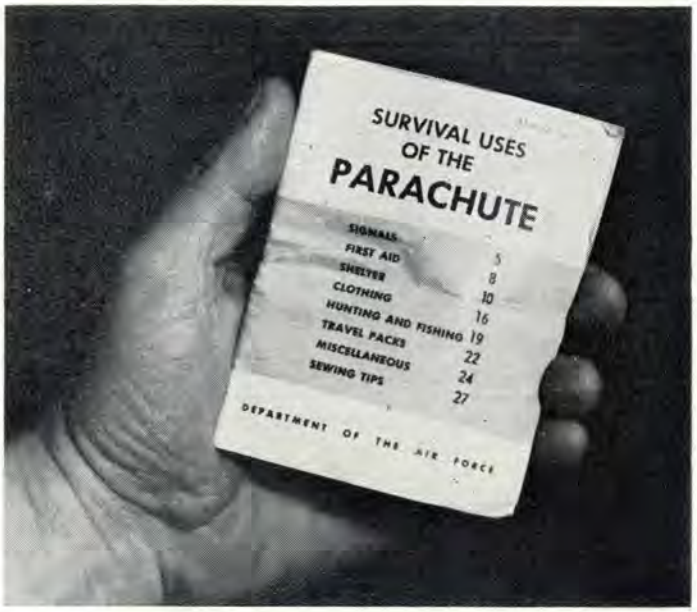
Dear Capt Chumley

You say you are full of safety. I think you are full of jelly beans. Dad says it's all right to mail this to you.

Jimmie

P.S. You didn't answer my question about the F.E.B.

'CHUTE USES



SSgt James L. Mercier, Jet PE Supervisor, 2848 Air Base Wing, Norton AFB, Calif.

Snuggled tightly in a small pocket hidden from view in the pack of seat style and most back style parachutes or in the inspection book pocket of others, is an Air Force Manual that could very well be the most informative friend an airman could hope for in a survival situation. (Air Force Manual 64-15, Survival Uses of the Parachute.)

Unfortunately there are many crewmembers who are unaware that this small 3" x 4" publication is with them from the time they put on their parachute until they remove it again. And when in need, this little friend will provide you with more information about the survival and emergency uses of your parachute than you can imagine. This manual has only one purpose: to help you survive until rescued, regardless of geographic location or climate condition. Is this important enough for you to devote a little of your time to find out more about 64-15? I say yes.

After you have made a successful crash landing or bailout, you should let your position and situation be known to the rescue aircraft that appear in the area. The first few pages in the manual describe methods of improvising signals with the use of parachute material. It also provides the "Ground to Air Emergency Code."

First aid is the next subject for discussion and it illustrates uses of canopy nylon for such items as bandages, tourniquets, slings, litters and splints. If there was only some way we could pack a cute little nurse in with the canopy, our medical problems would be resolved, or at least our problems would be little ones.

A suitable shelter would be a major concern, and the manual elaborates on the construction of various types, from paratepees to lean-to's, hammocks to sleeping bags in easy-to-follow picture instructions. Our little friend even instructs us in methods of improvising protective clothing. They might not be the latest fashions in formal attire or military dress, but will provide protection from wind, cold, sun, rain and insects. Now you say, what about food? They have not as yet devised a method of making parachutes edible but until they do, this little fellow will show you how to obtain food by hunting, fishing, and trapping with improvised equipment that would make any sport store owner feel envious.

AF Manual 64-15 supplies information on many other miscellaneous items for use by the downed crewmember, including sewing tips. Maybe your wife would be interested in that article.

I could go on and on about 64-15 but the point I am trying to put over is this: *Know the location of this manual in the particular chute you use.* Look it over occasionally, and become familiar with its contents. It may be one of the most informative survival instructors you will ever meet. And you can be sure it is near when you require its services.

The following is quoted from the foreword of the manual:

"This manual cannot show all the survival uses of the parachute. Use your ingenuity to devise what you need if it is not shown here."

Now *there* is an interesting thought. How many new uses can you come up with? How about the sponge rubber material in the parachute cushion? If you put a match to it, it lets off a black smoke that lasts for a long time and can be seen for a great distance. The parachute pack opening bands will provide sling shots. If your chute has a bailout bottle, it can be used as a water flask or even a billy club. The bailout bottle knob makes an excellent fishing bob.

Stop by your Personal Equipment Shop and ask the PE troops where AFM 64-15 is located on your chute. You will soon realize that this nylon vehicle that transports you from air to ground is an important part of your survival equipment. ★

THE DAEDALIAN TROPHY

BEST SAFETY RECORD. Lt Gen Joseph Kelly, left, Commander of the Military Air Transport Service, accepts the Daedalian Trophy for Flight Safety on behalf of all MATS personnel for having the most effective aircraft accident prevention program among major Air Force commands during 1961. Making the presentation is Lt Gen William H. Blanchard, Air Force Inspector General, who represented Air Force Chief of Staff General Curtis E. LeMay.

The Chief of Staff has selected the Military Air Transport Service as recipient of the Daedalian Flying Safety Trophy for calendar year 1961. MATS was considered as having the most effective aircraft accident prevention program of all eligible major air commands and was first in relative standing as determined by the selection criteria for this coveted award. Trophy presentation was at San Antonio, Texas, during the annual meeting of the Order of Daedalians.

During 1961 MATS reduced its accident rate to 1.08; the ninth consecutive year in which the major aircraft accident rate had been reduced and a 25 per cent reduction over the previous year's rate. Nearly a million hours were flown in carrying out the worldwide mission of MATS.

Only 10 accidents were recorded during the year, despite such hazards as small arms fire damage to four transports, aerial supply to South Pole and Dew Line sites, the urgency of local base rescue helicopter operations, weather reconnaissance that includes hurricane and typhoon tracking, support of HIRAN sites in primitive areas, defense operations with a squadron of F-89s in Iceland, and many others. On occasion, because of mission requirements, crews have logged over 150 hours in one month.

MILITARY AIR TRANSPORT SERVICE
U.S. AIR FORCE

Although 80 per cent of MATS aircraft are over eight years old, none of the 1961 accidents was attributed to MATS maintenance personnel.

Twice before, in 1950 and 1954, MATS was named as recipient of the Daedalian Trophy. ★

THE KOLLIGIAN TROPHY

CAPTAIN PAUL R. BAKER

Captain Paul R. Baker, 29 Tac Recon Sq, Shaw AFB, has been awarded the Koren Kolligian, Jr. Trophy for 1961 in recognition of his outstanding feat of airmanship while flying an RF-101 aircraft.

Captain Baker was performing a low level, high speed combat equivalent maneuver when the windscreen of his aircraft was struck by a large bird. The bird, which penetrated the cockpit, injuring and temporarily blinding Captain Baker, struck with such force that the left front quarter panel of the windscreen was shattered, the upper left side of the instrument panel demolished and the cockpit filled with flying debris. Bleeding from numerous cuts and totally deaf, Captain Baker began an immediate climb in order to assess the damage. When he recovered partial vision he determined the cause and extent of the damage. After climbing to 15,000 feet he decided that the bleeding was under control and he could return to Shaw AFB. Due to his deafness he was unable to use his radio, so with hand signals he directed his wingman to take the lead and proceed directly to Shaw and land as soon as possible.

Despite his injuries and the windblast through the broken windscreen, Captain Baker maintained formation during the 30 minute flight to Shaw and made a successful landing.

Captain Baker's superior appraisal of an extreme emergency involving multiple injuries to himself, his ability and determination to save his aircraft, and his actions to prevent possible death or injury to civilians and damage to private property, conforms to the high standards established for the Koren Kolligian, Jr. Trophy and reflects great credit upon himself, the Tactical Air Command, and the United States Air Force.

The Kolligian Trophy is presented annually to the pilot or aircrew member who most successfully coped with an emergency during flight. ★

Don't Let The HEAT Get You Down

Capt Russell L. Rogers, Test Pilot, AFFTC, Edwards AFB, Calif.

Since the days when "Flying Safety" bore the "Restricted" tab there have appeared timely and informative articles dealing with seasonal hazards to flight. We've read so much about thunderstorms that even Dilbert of Navy fame no longer penetrates one—at 28,000 feet at least. The weather people warn us to be cautious of gusts and wind shear at final approach altitude during hot summer days, and every so often someone at the local flying safety meeting gets up and says we should take extra precautions on the walk-around because many bases in the hot country have policies about not putting the fuel caps on tight. Something about fuel expansion, he says. Now we all have enough pride in our profession to check the caps and the dip stick and general air-worthiness of our aircraft before we leap off, regardless of the heat or cold outside. We like to think that this is true all the time, but pick a day when it's 110° under the wing and notice how many of the troops skip the walk-around so they can get the air conditioner on a few minutes earlier.

We learn by the experience, good or bad, of others and by constant repetition of all instructive methods. Things that seem so elementary to one may be a revelation to another. Like the young balloon who made a special point of asking the tower for the winds. It turned out he was computing his final approach speed by subtracting the wind velocity from the basic speed if it was a head wind and adding if it was a tail wind. So help me! Luckily the winds lately had been straight across at only 40 knots.

Now the real point of a *safety* article or lecture is to teach something new or to jog our home-built analogs into guiding our actions and flight technique based on the cumulative experience of *all* airmen. And the repetition keeps the cells from being super-saturated with important (granted) but irrelevant 38-24-38 type statistics.

Flying has not and will never be relegated to an exact science. For the pilot, it is an art. An art in which one who is proficient can be justifiably proud. Discreetly smug if you will. To any who may disagree (and we're not speaking of pilots here) let me cite the use of man's unique capability in our present Mercury program and the planned use of the pilot's art in future Air Force space programs. So long as man assimilates his knowledge of temperature, density, gross weight, power, handling qualities, runway length, fuel flow, clouds, turbulence, obstructions, and on and on ad infinitum, then renders his judgment and decision capability to successful mission completion, we will have an art form as aesthetically pleasing to the airman as the violinist to the concert audience. The artist then, in whatever field, must know his subject completely. He must be the master.

In the presence of routine operations our skills are not seriously challenged, but extremes in ambient temperature and air density cause subtle changes to aircraft performance which become particularly significant in takeoff and landing. We have been admonished in the past to consider about 10 per cent increase in takeoff roll for every 10°F above sea level standard temperature of 59°F, and another 10 per cent increase in rolling distance for every 1000 feet elevation above sea level. The exact figures of course are in the Dash One but these thumb rules check out fairly close for most aircraft.

Just for a quick review about the cause of this performance degradation, remember that an increase of about 15°F will raise the density altitude 1000 feet and as the air density is decreased, it follows that the mass air flow through engine will be reduced with a corresponding decrease in thrust. Consider too, that as the air density decreases, your airplane simply must travel faster down the runway before the lift from the airfoil will be sufficient for takeoff. Hot temperature and high density altitude just mean less thrust and higher TAS at takeoff. You say you knew that already? Well, I said something

about repetition a while back—just the same check your Dash One for takeoff distances at say 110°F for a pressure altitude of 7000 feet to get the point fresh in mind. You say you have 12,000 feet of concrete and you fly an F-104 and that your takeoff roll is still less than 7000 feet, so what's the sweat? Maybe nothing, but in an hour or so after takeoff you will want to enjoy that "aesthetically pleasing" experience of your usual superbly executed approach and landing. With the high ambient temperature, your approach may be marginal or perhaps even impossible.

The big problem here must be explicitly associated with F-104 aircraft with landing flaps down and Boundary Layer Control (BLC) operating throughout the approach. When you stack the deck with high ambient temperature, high gross weight and throw in a sink rate around 1500 FPM on the final there may not be sufficient thrust at Military Power to execute a go-around. There may not even be enough thrust for the flare! The deterioration in approach or go-around performance in the landing configuration at high ambient temperature is such that go-arounds at light gross weights are marginal if the sink rate is excessive and can become critical at high gross weights even at normal or low sink rates. The cause of this dilemma is nothing new. Blame it on the heat, although the price we pay out of our available excess thrust for Boundary Layer Control is the crux of this discussion. BLC permits a lower approach speed and improves lateral control. Certainly, its use allows significant improvement but it doesn't come free and we must know the limitations it imposes upon us in order to use it wisely.

To better define this problem of reduced go-around capability in the landing configuration, performance tests were conducted at the Air Force Flight Test Center at Edwards AFB, California. A standard F-104A was used for the test in which the landing configuration was defined as:

1. Gear down.
2. Leading edge flaps at 30 degrees.
3. Trailing edge flaps at 45 degrees.
4. BLC operating.

The time-history recordings of two particular test flights are most revealing. On one, at an outside air temperature of 96°F, 2600 feet altitude, gross weight of 16,900 lbs., sufficient thrust was not available at military power to keep the aircraft from sinking to the ground. Touchdown was prevented only by selecting afterburner thrust. Correct approach speeds were used and on this flight a sink rate of 1350 FPM was established prior to the go-around. Even at this relatively shallow descent, it took afterburner thrust for almost five seconds to break the descent. Altitude loss during the flare with AB took an additional 70 feet. Another approach was flown at an altitude starting at 5400 feet with ambient air a pleasant 82°F. Aircraft gross weight was up to 17,160 lbs. This time the rate of sink was up to 2150 FPM. The engine was cobbed but the rate of descent was not reduced appreciably for 10 seconds. It took 700 feet altitude loss to bring the sink rate to zero from the instant the throttle was advanced and then there was no excess thrust available at the end of the flare to establish a climb. Obviously a go-around under these conditions would not be possible.

A measure of go-around capability for the F-104 is presented in the Appendix of the Handbook. This capability is expressed in terms of available rate of climb with military thrust at different values of temperature, pressure altitude and gross weight. It does not indicate time or altitude required to break an established rate of descent. In other words it shows the available rate of climb from level, stabilized flight.

The pilot is cautioned not to allow excessive sink rates to develop but the phrase "excessive sink rate" is ill-defined. When the pilot's attention is concentrated on outside references, as in the final phase of the landing approach, a sink rate of 1350 rpm does not *seem* excessive. At the correct approach speed the flight path angle is only on the order of four degrees but as we've seen, this must be defined under these marginal conditions as excessive.

If you are committed to land your Starfighter under prevailing high temperature, high density altitude, and high gross weight conditions, and your runway length and obstructions to the approach are not critical, you may elect to use just takeoff flaps since test results show that sufficient military thrust is available for all go-around conditions in this configuration.

A conclusion that some readers may have reached at this point is that selection of afterburner thrust would eliminate the lack of excess thrust and remove the dangers of a poor approach. Yes, this is true to a point, but remember that the pilot who flew this evaluation was *anticipating* the use of afterburner and still the time history shows a loss of 150 feet altitude after the throttle was advanced to the military stop. I submit that the altitude loss could easily exceed 300 feet for a pilot not anticipating the need for afterburner power, and such a margin is not adequate to guarantee a recovery from a high rate of descent. Of course, when it's the only thing left, then use it but do it quickly and set up for a safer approach.

In a final analysis, a careful evaluation of all the landing variables and very close adherence to Dash One recommended procedures will eliminate the need for this last resort technique.

The Starfighter is considered by all fighter types as "a real fighter pilot's airplane," probably the most affectionate accolade given a machine. Its performance is impressive by any standards and in normal operation, it is as docile and honest as they come, but 110°F, 5000 feet altitude and a heavy bird on the final can't be considered normal. Review the Dash One for those procedures specifically set forth for hot weather operation—pattern, airspeed, and use of landing flaps.

Don't let the heat get you down! ★

HOLDING PATTERNS AGAIN

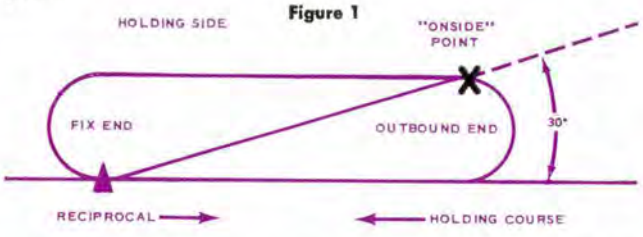
Holding pattern, since January, has become almost a dirty term. Why? Apparently because a lot of us have complicated the procedure.

Most of the time you'll be entering along or near the course line. This presents no problem. Occasionally you'll enter from a high angle. Once you have fixed the procedure for this type of entry in your mind, it will be no problem either.

Here is a computerless explanation.

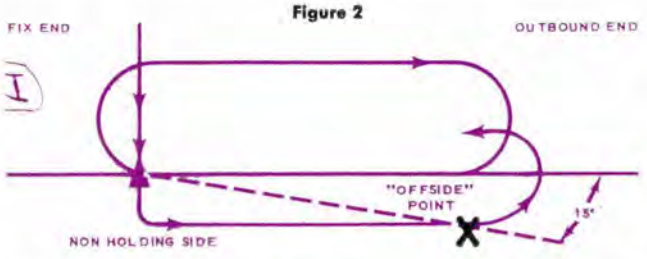
The immediate objective of entry to a race track holding pattern is to proceed outbound to a point from which a turn can be made toward the holding course. On the holding side of the pattern, this point is located, for practical use, along a line beginning at the fix and drawn at an angle of 30° to the holding course. For the sake of brevity this can be called the *"onside"* turn point.

Figure 1



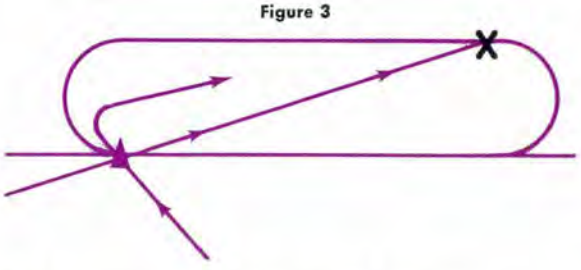
To accommodate entry from the fix end on the holding side, a second turning point is located on the *non* holding side along a line drawn from the fix at an angle of 15°. This can be called the *"offside"* turn point.

Figure 2



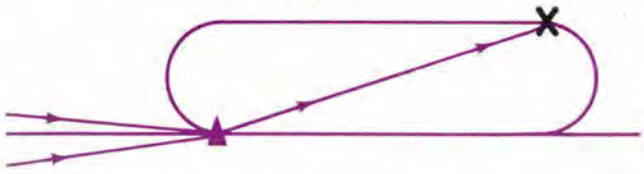
Now, when entering from the non holding side, turn outbound on the holding side.

Figure 3



When entering within 10° either side of the reciprocal of the holding course (standard or non standard) always fly a teardrop on the holding side.

Figure 4



When entering from the holding side determine whether the entry is at a high angle to the holding course.

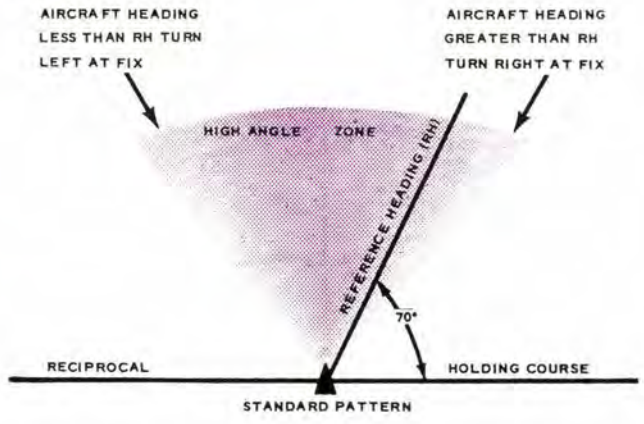


Figure 5

If the aircraft is at a low angle to the holding course, enter the pattern.

When the aircraft is at a low angle to the reciprocal, proceed to "offside" turn point (Fig. 5, Fig. 2).

Those few times that you are entering from a high angle a reference heading (RH) is required to determine the direction of turn. Obtain this by substracting 70° from the holding course for a standard pattern or by adding 70° to the holding course for a non standard. In either case, on arrival at the fix if the aircraft heading is greater than the RH, turn right. If less, turn left. For example: You are entering at an 80° angle to the holding course (270°). It's a standard pattern, so substract 70°. This gives you an RH of 200. Your heading is 210, so turn right.

Now let's summarize:

1. Visualize the holding pattern.
2. Determine your position in relation to the pattern.
3. Determine RH *only* when in the high angle area.
4. Recognize wind effect and compensate to the extent possible.

That's it! ★

THE LITTLE ONES ARE HERE TO STAY

In the early 1950s the weapon transition from machine guns to air-to-air rockets began. The F-86D aircraft was the first equipped with missiles, i.e., the 2.75 in. Folding Fin Aerial Rocket (FFAR). In late 1955 the F-89H began to carry the Falcon missile, and by 1957 the MB-1 (Genie) air-to-air atomic rocket was operational in ADC's F-89J squadrons. The next year the F-86Ds overseas were being replaced with Falcon-firing F-102 aircraft.

With the advent of F-106s in 1959 the super Falcons (GAR-3A/4A) were stocked at ADC's bases. The next year modification began on the F-102 fleet so that the Nuclear Falcon could be employed. By then the tactical fighter fleet (equipped with 2.75 in. FFAR and GAR-8 missiles as secondary armament since 1957) of F-100s and F-105s began operating the GAM-83 air-to-ground missile.

Calendar year 1961, then, was the peak year in Air Force history in gross numbers (excluding the 2.75 in. FFAR) and diversity of air launched missiles. With the phaseout of 2.75 in. FFAR firing F-86Ls and F-102 aircraft, the inventory will gradually decline. The complexity and kill capability of remaining missiles, however, will increase.

Upon receipt of the first missiles in the Air Force accidents began to happen. As time went by, much effort was expended by many individuals and agencies to make our missile firing systems safer. Needed, however, was one central office in the Air Force to guide the thinking and monitor the effort of all toward one common goal—**to discover and reveal the causes of missile mishaps and eliminate them.** The Directorate of Missile Safety was established for this reason.

The number of small air-to-air/air-to-ground missiles in the active USAF inventory approaches six digits. These missiles are possessed by some 130 fighter squadrons. At least 6000 of these missiles are exercised daily (loaded, transported, downloaded, checked out, flown) and over 1,500,000 individual handlings of these missiles occur annually. The exposure to mishap, then, is relatively high.

Even though these missiles comprise the majority of the USAF active missile inventory, they accounted for less than half of all missile mishaps during the year. In 1961, 170 mishaps were recorded and 60 missiles were destroyed in the GAR/GAM family.

The primary safety consideration (other than sheer numbers), is the fact that these missiles are small and, therefore, conducive to being handled manually. Consequently, they are dropped, bumped, and mishandled. **This, coupled with the failure of personnel to adhere to established procedures during handling is and has been our greatest safety problem.** In 1961 personnel error accounted for 69 per cent of all mishaps with these missiles.

Until 1960 no realistic statistical data were available on the number of USAF missile mishaps, since AFRs 136-9, 32-2 and 62-14 were not specifically devoted to missiles. The 110 mishaps reported in 1960 versus 170 in 1961 do not necessarily reveal a trend, since the missile mishap reporting regulation, AFR 58-10, did not arrive in the field until almost mid-year. However, an examination of accident data available from 1955 through 1960 showed a gradual decrease in the number of mishaps that were attributable to design deficiency and materiel failure. Conversely, mishaps charged to personnel error rose. So it is toward that thorn-in-the-side that we must channel most of our efforts.

The first step is underway, i.e., to make things easier for the man to do his job safely. He must have not only better equipment, but the basic safety tools: education, training, proven reliable instructions, good management and incentive. Without these tools he cannot perform to the peak efficiency desired and mishaps will continue.

What has been done?

To curtail the large number of personnel blunderings, standardization and educational materials were devised and distributed. We now have standardized tech order checklists for the assembly and test of the MB-1 rocket and Falcon missiles; loading checklists for the F-89J, F-101, F-102 and F-106, as well as final preparation of loading checklists for other fighter aircraft. Briefs of all missile mishaps were sent to using activities to make them aware of hazards to be avoided during missile operations. Not forgotten were missile handling and launching safety improvements. In this connection, stray voltage has long been evil terminology in the air launch missile business. A device has been needed to indicate to maintenance personnel the presence of transient electrical energy within a critical missile firing system. Such a device is now in production.

Although further statistics are considered redundant here, detailed 1961 statistics are contained in "Weapon System Safety Reviews," published by DIG/Safety for each major weapon system. Briefs of each USAF mishap are likewise contained in the appropriate "Weapon System Summary." (100 EURs, URs and Missile Hazard Reports were submitted in 1961 on these missile weapon systems.)

If personnel error is to be eliminated as the primary cause of missile mishaps, we must increase our emphasis on effective training and standardization programs, adequate and accurate technical data, and continue striving for professionalism. These are our accident prevention objectives for 1962. Incorporation of stray voltage monitors into our aircraft systems and exploding bridge wire squibs in our missiles will be added objectives to meet a mishap-free goal. ★

Lt Col Randall L. Earl, GAM Project Officer, D/MS

Flight Management

Lt Col Michael Smolen, Hq USAF

For several years the Air Force has been reducing its aircraft inventory and flying hours for mission support activities. At the end of FY 1958 there were 3800 mission support aircraft. By the end of FY 1962 there will be less than 2600. Concurrently flying hours allocated to mission support are being reduced. True, the impact of these reductions is being lessened to some degree through administrative personnel actions, i.e., over 15 years, no flying during terminal assignment, etc.; however, this is not the complete answer. We, in Flight Management Branch of the Directorate of Operations, USAF, believe the solution to this problem is Flight Management.

Flight Management must obtain maximum benefits from allocated resources. It must satisfy all mission and administrative support requirements. It must insure that each individual is guaranteed an equitable share of the flying hours and an opportunity to maintain flying proficiency. It must have checks and balances to insure standardization and provisions for periodic reviews of proficiency and mission accomplishments. Finally, it must satisfy mission support requirements at all subordinate command levels.

In November 1960 all mission support activities were ordered consolidated under one manager at each Air Force installation. Under this consolidation all mission support activities were assigned to the base or "host" commander. This included scheduling, records keeping, maintenance, supply, and personal equipment functions. Saving in manpower, facilities, and operating funds resulted.

Operating directives were established at Air Force level as guides for establishing management responsibilities, standardization/evaluation programs, annual proficiency requirements, training requirements and publications. To accomplish this, regulations were revamped and all previous "piecemeal" instructions, policy letters, and messages dealing with flight management were incorporated in the appropriate sections of the new directives.

AFR 60-1 establishes policies relating to management of aircrews, aircraft, and flying hours. Primary mission and mission support aircraft are defined and aircrew categories explained. Multiple currency is prohibited except when absolutely necessary to the command mission.

This regulation requires two

qualified jet pilots in dual controlled jet aircraft except when impractical because of operational or command support missions. It holds the commander responsible to insure that each crew member is afforded an equitable share of allocated flying hours, and that the highest level of individual crew proficiency and training is realized from each flying hour. It directs that, insofar as possible, annual flying requirements be accomplished while performing "hard core" support missions. Only when absolutely necessary will pure proficiency missions be scheduled.

AFR 60-2 directs commanders to continuously assess unit operational capability and individual crew proficiency and to schedule training and retraining requirements. It directs the commander's attention to sortie management and the need to accomplish maximum training per sortie with the minimum expenditure of flying time. It directs Air Force-wide recognition of previous qualifications and training accomplishments of aircrews who are rotated among commands.

The third directive is AFR 60-3. This regulation is most important to the individual aircrew member for it establishes the flying requirements which must be accomplished each year in order to maintain an aeronautical rating. First of all it limits proficiency flying to 110 hours per year. This means that when an individual has flown 110 hours he can no longer log pure proficiency time except for pay purposes. He may log administrative support time only. Each mission support manager and individual crewmember must maintain a close watch of annual flying to insure that the time is being flown in equal monthly or quarterly increments. This regulation also directs each commander to maintain a close watch of individual flying records to insure that specific annual requirements are being accomplished during each mission sortie. It may be necessary to schedule specific training requirements in the same manner as training is scheduled in tactical units.

The fourth directive in the flight management package is AFR 60-4. This regulation directs that standardization/evaluation manuals be developed to provide each aircrew member with specific checkout and qualification requirements for his type aircraft. These manuals, developed by designated major commands, will be approved by Hq USAF for Air Force-wide usage. They will assure a common minimum standard and will reduce hours required for checkout and retraining upon reassignment. For qualified individuals using the same type of aircraft reassignment retraining will consist only of area orientation and local traffic rules briefing. This regulation also establishes USAF standard academic courses for pilot instrument and navigator/observer requirements.

In summary, loss of mission support and flying hours has demanded rigid and more efficient control and management of resources. We can no longer "bore holes in the sky."

We must, within the extremely limited number of allocated flying hours and mission support aircraft, accomplish all mission support requirements while maintaining the highest level of individual aircrew proficiency. This means that mission support managers and aircrew members must be thoroughly familiar with the regulations and the intent of the USAF Flight Management Program. The individual who tries to "beat the system", either through chicanery or professed ignorance, will find the victim of his illicit practices to be himself. ★

2-WAY WX

Air Force weathermen are now seeing, electronically, both ends of the runway with new double-up equipment scheduled for 87 USAF bases and civil airports used for military flying.

This equipment package, known as a duplicate precision approach weather observation facility, puts weather instruments in approach and landing areas for USAF aircraft landing by radar or automatic instrument landing systems. Included in the package are equipments for measuring wind, visibility and cloud base height.

Each set of the dual equipment, located at each end of the all-weather runway, gives instantaneous information on touchdown wind direction and velocity, landing visibility and approach ceiling. The weather information is continuously displayed to skilled observers who can pass along highly accurate weather information for either end of the runway, day or night. For example, cloud height meters display the ceiling one mile from touchdown every six seconds. This is relayed to the pilot by the observer through approach control.

While the machines are accurate, constantly reporting what they "see" and thus decreasing human error, they will not replace the human observer. He must read the presentations, interpret them and pass them along to the pilot quickly and accurately.

A major use of the equipment will be the recovery of aircraft in bad weather. The base so equipped can recover aircraft from either direction on the instrumented runway, wind permitting. This is especially important to ADC aircraft. Dual weather instrumentation means that high speed weather reporting and analysis is keeping pace with high speed aircraft, thus saving Air Force lives and equipment. ★

SO YOU THINK YOU'VE GOT

The next time you step out of your bird and smile because you got home faster by cutting corners so to speak, or if you are burning because Air Traffic Control delayed you somewhere, think about yourself for a moment. Safety is of prime concern to you as well as it is to me. And if you cut corners and still made it, you were just plain lucky!

Who am I? Well, I'm your left hand . . . I'm the guy in the little glass house who calls himself "Tower." Some of you seem to think I'm here to irritate pilots, delay departures and arrivals (yours), and that I have a real negative attitude. You are right on one score. I do have a negative attitude—but only for *accidents.*

I want to see you follow the book. That makes my job easier and traffic safer. That goes double in spades for you. It's YOUR life. Why throw it away trying to save or gain five or six minutes?

Now, being a tower operator, I am most concerned with terminal air and ground traffic. From the time you get into your bird, taxi out, take off and clear my area, or when you enter my area, make your approach, land, and taxi in, my prime concern is for your safety. My brother controllers will see you safely from point to point.

Now let's start at the beginning. Have you ever been in a tower, GCA, Radar Air Traffic Control Center? If not, come see us! You may well get an education. I can remember a light colonel, a command pilot type, who was shocked to see airmen enlisted personnel controlling million-dollar aircraft. He had expected officers—or at least warrant officers. Well, maybe some day, but that is neither here nor there. He learned, and so may you.

I have had SAC tower officers say they wouldn't have this job for anything. Well I don't blame them for that. I would just like to have their help and yours, to make the most of a tough job.

Your controller has an overall picture of air and ground traffic on and around the terminal area. If he denies your request, it is because he has in mind the safety of you and all other personnel, plus protection of the property in his area. He's in the tower to help you, and he will too, if you'll let him.

One very common way of hindering his helping you is to stack up transmissions. Unnecessary and unauthorized transmissions and requests have reached the point where the controller becomes overloaded, just as a message relay center can be. Actually, he is doing part of the work you failed to do: Additions to flight plans, requests for coffee, meals, transportation, calls to your homes, offices, messages to this unit and to that one, and so on.

Where possible, make such requests before leaving, after returning, or make arrangements before you go for someone to do these things for you. The relay of such messages blocks air traffic control frequencies and is an added workload for your controller. That's like cutting off your link with safety. Your extra insurance has expired. Your controller is your other pair of eyes and ears—use him but don't abuse him.

If you observe a violation of regulations by your controller, don't spend the next five or ten minutes telling him he's in for it. By doing so you will open the way for the same treatment: misuse of air traffic control frequencies. Two wrongs don't make a right. File a report of the violation and save the frequencies for air traffic control.

Do you ever cut corners or take chances by violating regs or procedures to get there or back quicker? Do you know WHY it wasn't authorized?

Well, if you are reading this, I would guess you made it okay—but will you, the next time?

This is wisdom for me and you-
Knowing what to say and do-
When to querry and when reply-
To make it safer for you to fly.
And if in trouble, just give a call-
We're here to help you—one and all.

A. CONTROLLER

Pilots sometimes cuss the controllers, but those lads have their problems too. Here are some examples of the fine support received by grateful pilots.—ed.

* * *

Sometimes pilots are unaware of potential hazards. Here is a case in which the controller prevented what would have been, at the least, an embarrassing incident.

The pilot of a T-33 reported base with three in the green and was okayed for a touch and go. As the aircraft turned final, A2C James Johnson, tower con-

A1C Warren J. Lewis
2168 Comm Sq AFCS
APO 194, New York, N.Y.

troller, noted that the gear was not down and advised the pilot. The aircraft went around and the pilot later reported that he had to recycle the gear to get it down.

Here's a team job that paid off for a distressed aircrew.

A T-33 was cleared for a VOR-ILS aproach by A1C Ronald Toman, Ellsworth approach controller. The pilot reported a gear malfunction and on a flyby, the AO and SSgt Robert Meyer, tower local controller noted the aircraft had a cocked nose gear.

The pilot declared an emergency and asked for foam. Sgt Meyer alerted the proper agencies on the primary crash alarm of the trouble

TROUBLES -

and requested foam and coordinated with the command post. A1C Toman resumed control and cleared the aircraft to hold while foaming was in progress. While this was being done, weather went below minimums and radio contact with the aircraft was lost. Shortly, Ellsworth Wing Control Command Post notified TSgt Richard Carmen, watch supervisor, that they had contact with the pilot on 311.0, command post frequency, and that the pilot could read RAPCON on Guard. TSgt Carmen got permission to use 311.0 on backup to control the aircraft.

Foaming completed, Toman cleared the T-33 for an ILS approach. As the aircraft started inbound, prior to reaching the OM, the localizer monitor noted a malfunction. Toman advised the pilot to continue inbound and that the final controller would pick him up.

As the aircraft blip came on the final scope, TSgt Jerome Magee, final controller, spotted it and directed the aircraft throughout final approach. On touchdown, the gear snapped into normal position and the aircraft completed a normal landing roll.

The pilot visited the RAPCON next morning and thanked the controllers for their excellent help during the emergency.

* * *

Situation: Yokota AB, partial obscuration, measured 400 broken, 1000 overcast, vis 2½ miles, very light drizzle and fog. Johnson AB, about the same except visibility only one mile. Atsugi, measured 1700 broken, 2500 overcast, vis 2½ miles, fog. A T-33 making a missed approach under GCA control at Johnson AB.

The pilot failed to follow instructions for a rectangular pattern and second approach. Soon he was picked up by TSgt Eugene Hugel, Yokota RAPCON Feeder Controller, heading west toward Yokota AB. Having determined that the aircraft's Navaids, IFF and gyro were out, Sgt Hugel gave the pilot a no-gyro approach to Yokota. Precision contact was lost when the pilot did not follow instructions on final and headed westbound at 2000 feet toward mountainous terrain ranging from 4000 to 12,300 feet.

Weather and a low fuel state combined to disorient the pilots and the controller had a difficult time controlling the aircraft in climb and back out of the mountains to a VFR position on top at 10,500 between cloud layers. At this time 90 gallons of fuel remained. With the minimal radar return of the T-33, radar contact was lost, so Sgt Hugel put the aircraft in a pattern centering on Mt Fuji for clock position report reference. Meanwhile a '102 was scrambled from Yokota toward a position deduced as the T-Bird's location. Joinup was made on the first attempt, but the T-Bird now was down to 54 gallons.

Immediate vectors were given to Atsugi NAS, the nearest airport with acceptable weather, and a radar hand off made to CPO M. D. Green, Atsugi GCA. The pilot made a successful landing out of a single GCA approach; the T-33 ran out of gas while taxiing off the runway.

* * *

Most air traffic controllers spend many lonely evening and midnight shifts awaiting the opportunity to lend assistance and possibly save an aircraft in distress. Many never realize this ambition in an entire 20-year career. Not so with SSgt William J. Patterson, Jr., of the 1989 Communications Squadron, Torrejon AB, Spain, who was cited for saving two aircraft in distress during one eight hour shift.

Due to other traffic, a T-33 had delayed its approach for landing 'til the last minute during which time the weather had deteriorated to two miles in fog. Sgt Patterson, working the approach control position at Madrid Radar Air Traffic Control Center, cleared the T-33 for a TACAN approach and seconds later observed that the airplane was not following the standard approach pattern. He gave course directions when he learned the aircraft was unable to contact Torrejon radar for a Ground Controlled Approach, and the pilot realized that something was wrong with his TACAN equipment in the aircraft. Patterson vectored the aircraft on a successful approach course to where the pilot could see the runway.

Later the same evening, with visibility still low at Torrejon, Patterson answered the distress call of a C-47 which had lost an engine approximately 70 miles from Torrejon AB, and was unable to maintain altitude. When he first observed this aircraft, it was on a collision course with another aircraft. He vectored the C-47 away from the on-coming aircraft, causing them to pass four miles apart. At the same time, the C-47 was jettisoning cargo and baggage but still unable to maintain altitude and the crew had alerted the passengers for bailout. Sgt Patterson, knowing the terrain elevation in this area thoroughly, vectored the aircraft in an area of low terrain avoiding the high mountainous region toward which the pilot had been heading, thereby saving the aircraft from either being abandoned in flight or from collision with high terrain. The aircraft landed safely at Torrejon, and the rescue agencies were able to recover the jettisoned cargo and baggage as a result of information plotted from Sgt Patterson's vectoring of this aircraft. ★

DEAD WRONG!

Maj William R. Detrick, USAF
Aviation Physiologist
Life Sciences, DIG/Safety

You too can be dead, dead wrong!

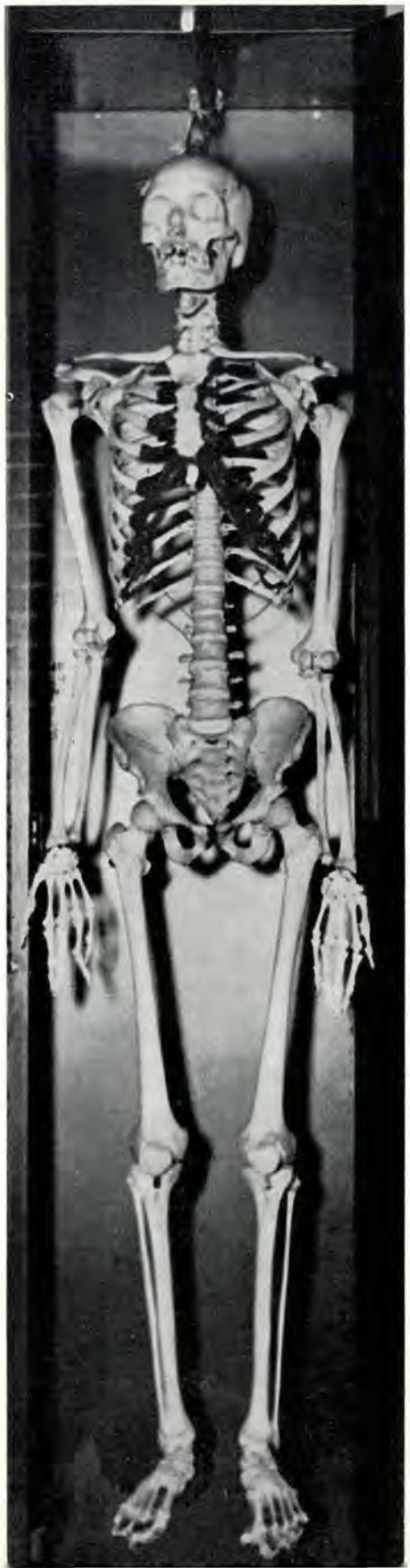
Shortly after level off at 39,000 feet, the aircraft commander of a B-52 noticed the tail gunner's cabin altimeter read approximately 40,000. He had been in contact with the tail gunner only 15 minutes earlier while cruising at 34,000 feet. Realizing that decompression had occurred in the aft section, he attempted to contact the gunner via interphone. When he received no reply, an emergency descent was initiated and a fellow crewmember sent to investigate. The investigator was unable to gain access to the tail compartment because the gunner's body was wedged against the door.

After the aircraft landed, the gunner was pronounced dead by the Flight Surgeon who met the plane. Diagnosis: Anoxia due to low atmospheric pressure. The gunner's helmet and mask were safely stored on the side of his compartment, unused, even though the aircraft was above the altitude at which their use was mandatory by current directives.

Even more recently, an F-100F flying at 29,000 feet lost its canopy. The front seat pilot was able to declare an emergency and safely land the aircraft although the pilot in the rear cockpit was pronounced dead on arrival. The doctor listed the cause of death as strangulation from his scarf, which had become entangled in his headrest by the slipstream. In spite of this, one glaring fact remains: *he did not have his oxygen mask on at the time of decompression.* He was known to have the habit of removing his mask during flight to enjoy that all important cigarette. It is academic to conjecture whether he died from hypoxia or the inability to extricate himself from the scarf, because he became unconscious in less than a minute from lack of oxygen.

Case number three involves the loss of an aircraft but fortunately no fatalities. A B-52 on an extended mission experienced uncontrollable heat in the foreward compartment approximately one hour after takeoff. At times during the first 13 hours of flight, when pressurization was required in order to accomplish refueling, the crew was exposed to temperatures estimated at 125° to 160°. During these periods of intense heat in the pilots' compartment, these crewmembers alternated going downstairs to the navigator's compartment to cool off before resuming pilot duties. Approximately four hours after the second refueling, the pilot's window shattered. After a short period of unpressurized flight, the radar navigator experienced bends in his knee and the copilot suffered stomach cramps. The aircraft commander elected to descend to 12,000 feet where the remainder of the flight was conducted.

To make a long story short, heat exposure of 13 hours, plus mild hypoxia induced by unpressurized flight at 12,000 feet for over eight hours, plus the inherent fatigue in over 22 hours of continuous flight add up to a combination that produces a rapid physiological breakdown. In this case the result was extreme fatigue, lack



of attention and errors in judgment. The only happy part of the story is that the crew safely abandoned the aircraft after it had flamed out from lack of fuel.

The problem of hypoxia in flying has received much attention, but apparently we haven't gotten all the way through to some people. Hypoxia or oxygen deficiency in body tissues is caused by inadequate oxygen supply, or transport, or inability of the tissues to use oxygen. Although some individual difference exists, the time of onset and severity of symptoms can generally be divided into four stages related to altitude ranges.

• **The indifferent stage.** The only consistent effect in this stage, which exists from 0 to 10,000 feet, is the deterioration of night vision that becomes significant at about 5000 feet.

• **The compensatory stage,** which ranges from about 10,000 to 15,000 feet, is where the respiration and circulation of the body attempt to make up the oxygen deficiency by working harder. After 10 to 15 minutes, impaired efficiency of the nervous system becomes obvious. Difficulties with simple tasks requiring mental alertness or moderate muscular coordination are compounded by drowsiness and *errors in judgment.* From here on up we are in trouble, since the main reason for human beings in aircraft today is that all important function—judgment.

• **The disturbance stage.** From 15,000 to 20,000 feet, we enter this stage where the body can no longer compensate for the oxygen deficiency. Few persons realize any particular symptoms up to the point of unconsciousness. Most of them report such symptoms as fatigue, sleepiness, dizziness, headache, breathlessness and a feeling of well-being. Here the senses are impaired —vision and hearing, touch and pain. The mental processes are slowed (which often prevents recognizing the impairment), calculations are unreliable, memory is poor and judgment and reaction time are affected. There may be a change in basic personality, as with alcoholic intoxication. Stammering and poor coordination in aerobatics or formation flying are typical at this stage.

• **The critical stage** ranging from 20,000 to 23,000 feet gives us about three to five minutes of useful conscious time before severe hypoxia and incapacitation result.

Above these four stages, it's simply a matter of time. The interval of useful consciousness becomes shorter with increase in altitude, varying from about three minutes at 26,000 feet to 20 seconds or less at 40,000 feet. The value of his period of consciousness depends on how quickly the individual realizes his problem and reacts.

The time of useful consciousness is cut even shorter following a rapid or explosive decompression to altitude. In general, the normal consciousness time without oxygen is *cut in half* following rapid decompression. This means less than a minute at 30,000 feet.

It is because of the established facts related to oxygen deficiency that certain regulations are written, not to hinder or give us a hard time but to aid and protect us, sometimes from ourselves. AFR 50-27 requires re-indoctrination in Aviation Physiology every three years for all flyers. This is considered the *bare minimum* and most of us need reminding of these dangers more often. One thing this regulation requires is a re-study of hypoxia, both in the classroom as well as in the altitude chamber. The symptoms of hypoxia are so *insidious* that we need to be continually reminded of them under a safe, controlled condition. Each man needs to know his own individual symptoms to protect *his own life.* You're not making that chamber flight to fill a quota or make the flight surgeon happy. You're doing it for your own good, to save your neck!

Paragraph 19 of AFR 60-16 has to do with oxygen and pressurization requirements. Again, it wasn't dreamed up to give you a hard time, but to provide the bare minimum requirements to keep you alive. It was written by people who have an excellent knowledge of your problems of fatigue and comfort on long missions. When it states that your oxygen mask and helmet must be ready, it doesn't mean on the hook behind your head or across the cockpit; it means helmet on your head, oxygen mask attached and plugged in, ready to slap on your face at a moment's notice. When it requires one man in each compartment to be ON oxygen, that is the *bare minimum* required for your safety.

The USAF continues to spend millions of dollars for added crew comfort and safety. Among the items are better oxygen masks, helmets and pressurization systems. If one more life is saved by these efforts, it is worth the dollars spent, particularly if it's **MY** life, or in this case, **YOURS.** ★

AERO BITS

BOMBERS

• B-52

Air refueling techniques were developed by the Air Force for the purpose of extending combat range of bomber aircraft. It is doubtful if the early advocates of air refueling realized how these same techniques would also extend our combat capability by preventing the loss of many first line aircraft during peacetime operations.

Another example of this occurred recently when a B-52 bomber was saved from possible damage or destruction by a timely inflight refueling. At the time of initial difficulty, the B-52 had consumed all body fuel and only main tank and tip tank fuel remained. The copilot started fuel transfer from the full tip tanks, but soon realized that the left tank was not feeding. Transfer from the right drop tank was stopped to maintain lateral balance. After recomputing fuel, allowing for approximately 35,000 pounds of trapped fuel in the tips, the crew determined that they would have 21,000 pounds of fuel over their home station. Also, it was soon noted that an aft CG condition was developing as fuel was burned from the main tanks. After consultation with the command post it was determined that the center of gravity was beyond the aft CG limits of 35 per cent MAC. An airborne KC-135 was diverted to rendezvous with the B-52 and an off load of 25,000 pounds of fuel was accomplished. This brought the CG back within operating limits and an uneventful landing was made.

Reminder: Whenever usable fuel is limited in the main tanks and fuel is trapped in the 3000-gal. tip tanks, the aft shift of CG is fairly rapid and CG limits will be exceeded if main fuel tank level is lowered appreciably. Should such a condition be encountered, inflight refueling or prompt landing is necessary. Remember, too, that TO 1 B-52B-1-2 (Fig. B5-14) gives approximate CG only. In this case the chartered indication showed CG to be in limits, but the load adjuster disclosed the aircraft to have exceeded the aft CG limit.

• B-52G

During penetration turn in a B-52G the radar navigator's life raft suddenly inflated pinning the man's legs beneath the desk of his console. The pressure finally became so great the raft exploded. Inspection of the kit revealed that the MXU-1/p CO_2 cylinder had discharged; both handles of the ML-2 kit container were still in place. Cause of the incident was movement of the cylinder inside the kit container.

Carry that pig sticker with you. All crews occupying ejection seats should have some sharp object that can be used to puncture a raft if need be.

FIGHTERS

• F-100

During a hooded LABS maneuver in an F-100F both pilots heard a thud. Power was reduced immediately and the maneuver aborted. An external check revealed that the external stores had been released. The instructor pilot checked the armament switches and found the armament selector switch in the "jet all" position. The IP stated that prior to beginning the LABS maneuver he had visually checked the position of the switch twice and thought it was in the *off* position. TO 1F-100-828 replaced the present armament selector switch with one of a different shape. However, all pilots should visually and manually check the position of the switch to insure that it is not 180 degrees out of phase with the proper position.

• F-105

Information has been received from the contractor as the result of a recent F-105 bash at one of our overseas bases. In this instance, the young sport flying this aircraft was attempting a takeoff in a 22-knot, 70-degree crosswind. (As he was taught in flying school, when the aircraft attempted to weathervane into the crosswind he corrected with rudder against the direction of turn and aileron into the wind.) At approximately 170 knots, he noted that he had full aileron and full opposite rudder, and for this reason he elected not to attempt to lift the aircraft off the ground. Instead, he aborted the takeoff, ran into the BAK-9 barrier and engaged the MA-1 barrier, swerving off the runway and collapsing one of the landing gears.

A second look at this operation resulted in some information being developed by the contractor which indicates that at low speeds, i.e., takeoff, the most powerful lateral control in the aircraft is the spoiler; thus, when the spoiler is actuated on the upwind wing of the aircraft to correct for crosswind, it tends to weathervane the aircraft into the wind. This aggravates the weathervaning effect of the crosswind and requires more downwind rudder. If use of the aileron is excessive it

will continue until both the aileron and rudder are against the stop, fully crossed. Thus, it would appear that the safest bet for crosswind takeoffs will be to use rudder only and to eliminate the use of the aileron as a crosswind correction while the gear is on the ground. This is not an official position as yet; however, further information about this characteristic can be expected in the near future in the form of changes to the Dash One and/or Safety of Flight Supplements.

Maj Donald G. Page, Tactical Br, Fighter Div

HELICOPTERS

• H-43B

During an H-43B flight test program at Edwards a serious inflight emergency occurred and the blades of the helicopter disintegrated. Thanks to thorough preparation and proper personal equipment adjustment, the two pilots, Capt. Jimmie S. Honaker and 1/Lt. Gene L. Colvin, parachuted with but minor injuries. This is the first incident on record in which Air Force pilots have successfully abandoned a helicopter in flight under actual emergency conditions. ★

TRAINERS

• T-33

1.	4 Jan. 62	Wheels Up	Pilot Factor
2.	12 Jan. 62	Wheels Up	Pilot Factor
3.	13 Jan. 62	Wheels Up	Pilot Factor
4.	27 Jan. 62	Overshoot	Pilot Factor
5.	6 Feb. 62	Gear Collapse	Pilot Factor
6.	6 Feb. 62	Overshoot	Materiel Failure
7.	15 Feb. 62	Hard Landing	Pilot Factor
8.	23 Feb. 62	Undershoot	Pilot Factor
9.	24 Feb. 62	Undershoot	Pilot Factor
10.	14 Mar. 62	Wheels Up	Pilot Factor
11.	6 Mar. 62	Bird Strike	Other Collision
12.	11 Apr. 62	Gear Collapse	Other Crewmember

Above are T-33 minor accidents—January through 11 April 1962. It was thought for a while that we might's well glue the gear in the well! Throw in a couple of wheels-up incidents during the mentioned period and we've got a good trend. Far too many T-33 jocks were landing their aircraft with the landing gear tucked neatly in the wheel wells. This is surprising too because airplanes landing gear up were dual-manned by pilots with a bundle of flying time and many years of experience.

It is recognized that the gear unsafe warning system in the T-Bird isn't the ultimate, but neither is it totally inadequate. The landing gear position indicators disturb the visual sense, while the bleating of the landing gear warning horn will make an audible impression. Apparently the visual senses of the pilots in the machines were not disturbed because the eyes weren't attracted to the gear position indicators and warning light. Evidently the throttle was left forward of that position where activation of the gear warning horn commences until airspeed was suitable and flare was commenced, or was it? One should become accustomed to using all warning devices available even though closed traffic flying causes one to reluctantly retard the throttle while at low altitude and an airspeed less than 195 KIAS. It's easy to imagine that one de-planing from an aircraft that has landed on its stomach feels a certain sadness and some little embarrassment. One such party stepped over the canopy sill and explained: "Aw!!*!œ*ææ***--!

A modification proposal—consisting of a big needle in the seat bottom—was not approved but SMAMA has under consideration installation of the MA-1 system (a system which gives an audible warning sound through the earphones when conditions of airspeed, altitude and RPM approach that suitable for landing). It will be some time before the MA-1 system is installed in the T-Bird, so, jocks, ya' gotta use the indicators and horn or you might experience a certain sadness and some little embarrassment. Aw!**æ*œ-*!

• T-38

Here's one that ended a perfect accident-free record for the T-38 Talon. When you review the various causes of USAF aircraft accidents, the reason for writing this bird off the record tends to make a grown man cry. As a rule accidents result from one or two causes. In the case of this T-38 there were so many contributing causes that one or two would not have caused any panic. However, when you take the three and one-half pages of preliminary and contributing causes as found by the investigating board you come up with one each destroyed bird.

Things were going along like gangbusters for a student and IP on a training mission. That is, up until the time the air patch was being sought out for a landing, with the fuel gages dropping off pounds faster than a fat man on Metrecal. On initial approach about 700 pounds of fuel remained, so everything was going along fine until an unexpected go-around was initiated due to a poor pattern. The instructor pilot took control and re-entered for a normal traffic pattern, declaring minimum fuel on initial.

Now things started getting real hairy. The runway supervisory unit was located in the approximate area of an F-102 runup pad, and as luck would have it an engine runup was going on. Thus, the RSU officer did

AERO BITS

not hear the first transmission of minium fuel, or if he did, little was done about it. Back in the T-38 a second approach was terminated due to jet wash and another go-around was made.

Now the sweat begins to run. A request for a closed pattern was denied. So, another close initial was set up and our unlucky pilot found himself about three birds back in line for landing. Since he was a mite close to the aircraft ahead of him, the runway supervisor instructed our troop to go around. When advised he was driving in on fumes the controller asked the pilot of the aircraft ahead to go around, but he smartly replied: "Negative, I am minimum fuel, too." Again jet wash took a fatal hand and a third go-around was in the making. With nothing left but fumes and courage the bird climbed up to approximately 600 feet and quit.

This is one that never should have happened, as the pilot should have made his needs known and the control agency should have helped this boy out and given landing precedence under minimum fuel conditions. But what really rips is that a *parallel runway on the same base sat vacant* and was never considered for use either by the pilot of this ill-fated flight or by the RSU controller.

Lt Col Wm. A. Wennergren
Tactical Br, Fighter Div

• T-29

Small dents on the underside of one wing flap and on the leading edge of the horizontal stabilizer. These signs tell a story.

The flight was a pilot proficiency local IFR for practice instrument approaches and night landings. The weather was clear, winds light. Aboard the T-29 were two pilots and a flight mechanic. After some approaches the crew was advised that maintenance was being performed on the precision radar and the approach would have to be an ASR.

The pilot made a low go and requested another approach. The GCA controller acknowledged but advised caution because controller training was in progress. On this approach the aircraft struck the top of a tree 4330 feet from the approach end and 200 feet left of the runway centerline. The brush with the tree did not seem to affect the flying characteristics of the aircraft and the pilot continued the approach to a full stop landing.

The aircraft was stopped, engines running, and the mechanic got out with a flashlight to look for damage, finding none. The pilots then changed seats and continued flying for several more landings. Later, on the ramp, another inspection was made and again no damage was found. The AC then instructed the mechanic to have the airplane towed into a hanger where adequate lighting was available for a closer inspection. The incident was not recorded in the Form 781. Later the mechanic again inspected the aircraft and discovered the dents in the flap and stabilizer.

Among other things investigation disclosed the following: The pilot started descent at the recommended range and accurately flew the recommended altitudes. The RAPCON tapes revealed that at the recommended minimum of 953 feet the controller said "nine thousand fifty-three feet." The crew neither noted nor remembered this error later.

While the aircraft continued the approach, descending at 500 feet per minute, the pilot called for lights. Thinking he meant "High-lights," the copilot turned on the water injection and increased RPM to the "High-lights" setting. Again the pilot called for lights and the mechanic turned on the landing lights. It was then that the trees were spotted by the copilot who warned the pilot. Power was added and the aircraft rotated into a climb. The aircraft hit the top of the tree, which was 96 feet above runway elevation.

Examination of the tape recordings and the controllers instructions revealed that an error in the controller's interpretation of his radar scope led to the descent being started too far from the end of the run way.

Primary cause of the accident was laid to pilot factor in that the pilot did not properly observe visual references outside the cockpit upon reaching recommended minimum altitude. ★

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WRECKAGE REMOVER

On rare occasions an aircraft may have to land immediately and cannot be diverted elsewhere. What, then, if the only suitable runway should be closed because of wreckage on the runway?

The FLYING SAFETY OFFICERS' KIT for June contains an article telling how to prepare to cope with just such a situation. *Snatch Them While They're Hot* describes equipment for rapid removal of wrecked aircraft from the runway and furnishes the source for information and drawings so that the equipment can be locally fabricated.

a MEN

Maj Alexander P. McDonald
N. Dak. ANG, Fargo, N. Dak.

Capt Robert G. Clithero
Lockbourne AFB, Ohio SAC

Capt Stuart J. Williams
Barksdale AFB, La SAC

Capt John W. Snider
Kingsley Field, Ore ADC

A useful item to a safety officer in promoting his safety program is a straight "A" average from the Flight Safety Officers Course at USC. The four officers named are armed with this achievement.

Congratulations from Aerospace Safety *Magazine!*

mum frequency capabilities. Recently a pilot filed an instrument flight plan at this base and the only functioning frequency was guard channel 243 mcs. We did not issue a clearance to this aircraft. He probably failed to mention this little discrepancy on his flight plan form.

On any given day aircraft arrive at this airport without the capability of communicating in part or in whole with Ground Control, Tower, Approach and Departure Control.

Now that this reply is out of my system, I would like for you to know that I fully enjoy AEROSPACE SAFETY and read it from cover to back.

John A. Busby, FAA
Charleston, S. C.

P.S. We would also appreciate some improvement on the pilots' part to receive and reply to radio calls.

J.A.B.

Your point is well taken. The controller/pilot communications phase of flight safety is pretty important. Perhaps if the subject is brought out in the open enough times, we'll all get squared away and Guard channel will finally come into its own—emergency frequency.

MB-4 Computer

While working a wind problem it appeared that I had suddenly lost my ability to solve it because things just were not working out. Further twirling revealed that the circular plastic disc had literally "come unglued" from the rotating compass ring. As I marked in the wind arrows and rotated the outer ring to the desired course, my hand covered most of the plastic window. Therefore I didn't notice that the window was not always turning with the outer ring. Anyway, a few anxious moments during which I seriously questioned my sanity taught me to watch the reaction of the computer from now on. It's quite improbable that a pilot could proceed with erroneous readings such as I was getting and complete a flight plan with incorrect info, but it could conceivably result in some real navigation problems.

Maj James L. Randolph
Chief, Safety & Flight Ops
Mira Loma AFS, California

Safety Pinpointed

Like most Tac Fighter Units this command has a rather diversified weapons delivery mission that includes storage and handling of GAM 83, GAR 8, and 2.75 rockets. Accident prevention guidance published in the Missile Safety Kit is primarily pinpointed toward missile units as such. This is understandable, in view of the funds committed to large missiles and the potential dangers inherent in their operation. However, accident/incident/hazard information on small airborne missiles is rather scarce and usually scattered among briefs for all types, including the large ones with which this base is not presently concerned.

I believe it would assist in the development of a missile safety program adapted to our operation if accident experience and prevention tips for the small airborne missiles used by TAC and ADC were identified and presented as a separate section of the safety magazines and the safety kit. Presentation in this manner would reduce the likelihood that published accident experience concerning airborne missiles might be overlooked amid the briefs on large ground launched missiles.

Maj James O. Cowee
832d Air Div, Cannon AFB

Your suggestion to publish TAC and ADC missile safety notes in a separate section is a good one and will be given a try. Coverage of air launched missiles from the operations viewpoint will be built up, so bring on the story leads and safety tips!

Sea Survival

The article "The Problem of Sea Survival" in the January issue brings clearly into focus an area which is of more than minor concern to me. I certainly concur that water survival training is all important in coping with an actual situation. However, as indicated all too clearly in the article, we have a definite hazard in the present parachute canopy quick-release system, and I feel it could be corrected.

In five of the situations you described, serious problems developed when the individuals attempted to release the canopy, and indications are that several pilots drowned because they were unable to do so. After participating in "Operation Cool Dip" here in the New York Air Defense Sector, I've become convinced that some drastic changes are in order for this piece of equipment. During the exercise, aircrews jumped into a lake having water temperature of 35° and were dragged by a Coast Guard amphibious craft until they released themselves by means of the canopy quick release. Then they climbed into their life rafts and were subsequently picked up by Navy rescue helicopters.

In the very short time that I was in the water I found that I had lost the use of my fingers to such an extent that it was necessary to use both hands to actuate the release. Many other crewmembers encountered the same problem. When you consider that this exercise was conducted in calm, fresh water under rather ideal conditions, I'm sure you can appreciate my concern. The Atlantic Ocean, in these parts, becomes a mighty unfriendly beast during the winter months.

In addition to the above statements, consider what condition your fingers would be in after descending from 14,000 feet in sub-zero temperatures, and I'm sure you will agree that you have a real problem on your hands before you ever get into the water.

I have suggested an ACORN, and it has been further suggested in an OHR, that a ring and cable assembly be developed to actuate a canopy release or that a release similar to the old parachute harness quick release be developed. In any event, I feel that a winter water survival situation in itself presents more than ample problems without being compounded by questionable equipment.

Lt Col Franklin C. Crain
98th FIS (ADC) Dover AFB, Del.

We concur wholeheartedly with your position, since accident records point out the need for action in this area. A study of the problem has now been completed and will be distributed soon. It has been recommended that a more desirable parachute canopy release be procured, and this problem has been submitted to the USAF Personal Equipment Supervisory Group as an agenda item. We'll keep you posted.

Landing on Foam

In the article "Foaming the Runway" in the March issue of Aerospace Safety Magazine Chief Crews is quoted as saying "However, if you had one of the main gear hung up it would be best to belly land." I take that to mean he recommends retracting the landing gear and landing with all gear up.

What do you in the Flight Safety Division recommend in such situations? When I left the Air Force in 1956 the procedure was to land with any available gear down.

As you can guess from my question, every word on flying safety in Aerospace Safety Magazine is read by our Operations Divisions pilots. We appreciate very much being able to share Air Force flying safety experience which we consider invaluable.

J. E. Colburn
Director Flight Engineering
Continental Airlines
Denver 7, Colo.

The referenced comment by Chief Crews reflects his opinion based on his experience with emergency landings on foam at Edwards AFB. As pointed out in the masthead of each issue, material in Aerospace Safety Magazine should not be construed as regulations, technical orders or directives unless so stated. Often, as is the case in a general article such as this, space does not permit breakouts for specific conditions and aircraft. Procedures are spelled out in the aircraft Dash Ones (Operating Procedures Manuals). In the case of the C/KC-135, the procedure is to land with all available gear down.

NOTE: REQUEST THAT THE ATTACHED QUESTIONNAIRE BE ANSWERED *NOW* AND FORWARDED *IMMEDIATELY* TO YOUR MAJOR AIR COMMAND DIRECTOR OF SAFETY. A NEW DISTRIBUTION LIST WILL BE MADE UPON RECEIPT OF THIS RESPONSE.

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CONTENT

1. I find the material in AEROSPACE SAFETY

   Very interesting.... Interesting..... Fairly interesting.....

   Uninteresting.....

2. As a safety tool, AEROSPACE SAFETY is

   Very useful..... Useful..... Of little use.....

3. Does AEROSPACE SAFETY carry articles pertaining to your specific problem areas? Yes..... No.....

   (If 'No', explain) .....

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4. What changes do you suggest to improve the magazine?

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