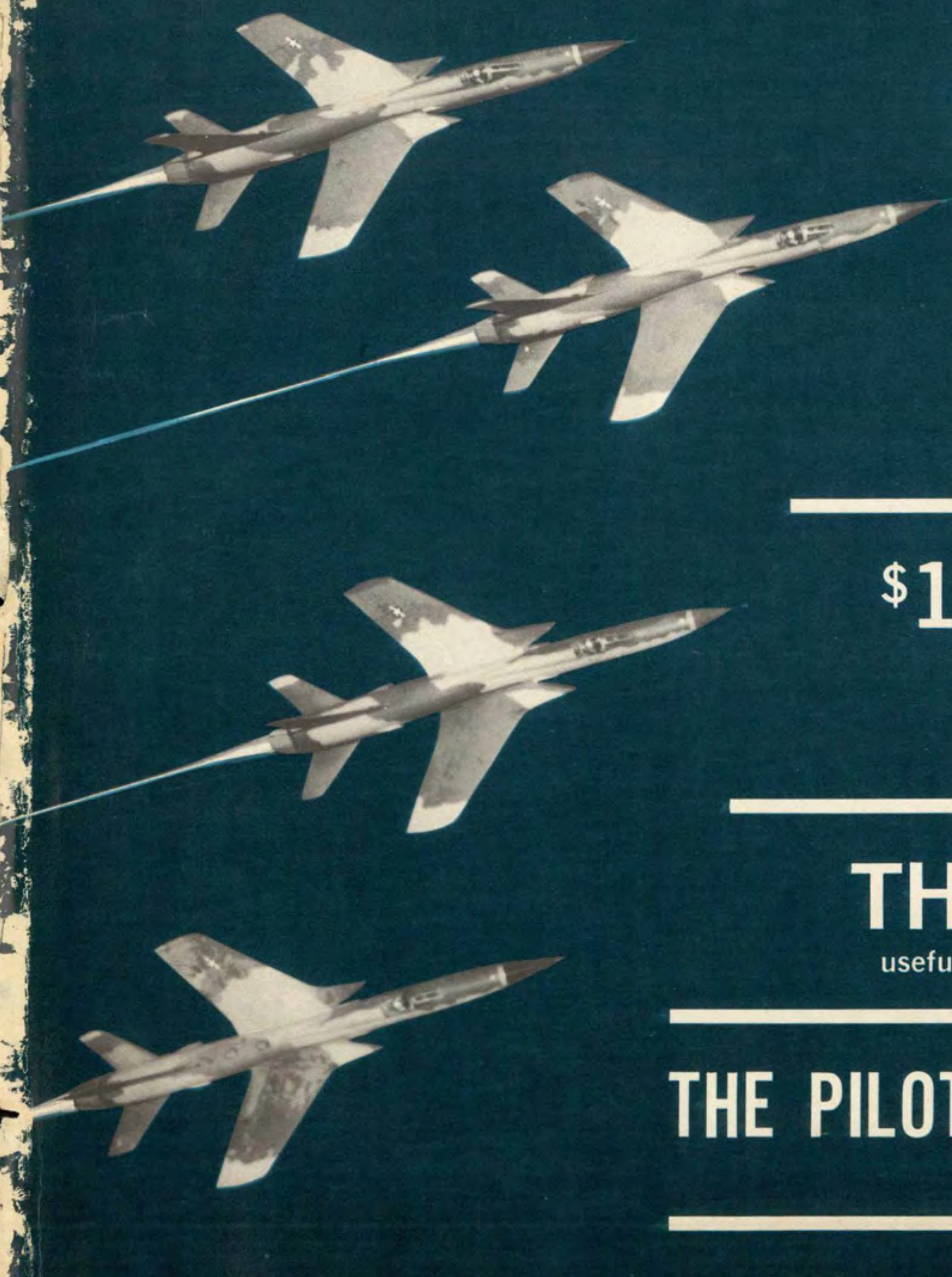
UNITED STATES AIR FORCE • JANUARY 1969

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT



ARE MIDAIRS A MUST?

tips on avoiding them

$1,200,000 A DAY

accidents are expensive

THE LASER

useful, but not without hazards

THE PILOT'S DECISION

to take the bird or not

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

January 1969 AFRP 62-1 Volume 25 Number 1

SPECIAL FEATURES

NEW YEAR'S RESOLUTIONS... *pilots, ponder yours* 1
$1,200,000 A DAY... *accidents are expensive* 2
THE PILOT'S DECISION... *to take the bird or not* 8
THE LASER... *useful, but not without hazards* 10
28 TENTACLED MONSTER... *called a parachute* 16
THIS *#@&¢$ GROUND TRAINING... *you have to walk before you can fly* 17
ARE MIDAIRS A MUST?... *tips on avoiding them* 18
WEATHER TO ORDER... *an inch of rain, and hold the wind, please* . . 20
ONE AIRCRAFT—THREE FATALITIES... *chopper topics* 22
MIGHTY MOUSE AND ME... *a case of common sense* 24
SAFETY IS:... *no compromise* 25

REGULAR FEATURES

THE IPIS APPROACH 7 • X-C NOTES FROM REX RILEY 14 • AEROBITS 26 • MAIL CALL 28 • WELL DONE 29

Lt Gen Joseph H. Moore • Inspector General, USAF
Maj Gen R. O. Hunziker • Deputy Inspector General for Inspection and Safety, USAF
Brig Gen Frank K. Everest, Jr. • Director of Aerospace Safety
Col James G. Fussell • Chief, Flight Safety Division
Col Willis H. Wood • Chief, Ground Safety Division
Col Ray W. Whipple • Chief, Missile and Space Safety Division
Col Samuel O. Smelsey • Chief, Life Sciences Group
Mr. William Russler • Chief, Records & Statistics Group
Col Howard S. Davis • Chief, Systems Safety Engineering Group

Chief, Safety Education Group • Col John F. Landry
Editor • Lt Col Henry W. Compton
Managing Editor • Robert W. Harrison
Feature Editor • Amelia S. Askew
Art Editor • David Baer
Staff Illustrator • SSgt Dave Rider
Staff Photographer • TSgt David L. Reis

SUBSCRIPTION—AEROSPACE SAFETY is available on subscription for $3.50 per year domestic; $4.50 foreign; 30c per copy, through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony and conclusions of aircraft accidents printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts submitted for publication in the Aerospace Safety Magazine. Contributions are welcome as are comments and criticism. Address all correspondence to the Editor, Aerospace Safety Magazine, Deputy Inspector General for Inspection and Safety, USAF, Norton Air Force Base, California 92409. The Editor reserves the right to make any editorial change in manuscripts which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from AEROSPACE SAFETY without further authorization. Prior to reprinting by non-Air Force organizations, it is requested that the Editor be queried, advising the intended use of material. Such action will insure complete accuracy of material, amended in light of most recent developments. The contents of this magazine are informative and should not be construed as regulations, technical orders or directives unless so stated.

PREFLIGHT

During the past 20 years the Air Force has done an unprecedented job of reducing the number of aircraft accidents. We still haven't reached that magic number—zero. But the effort must continue. A senior officer, about to complete his Air Force career, points out some areas that contribute to accidents and actions that can reduce the number of these accidents. Specifically, he discusses materiel failure and maintenance errors in "$1,200,000 A Day," the average daily loss in hardware alone. The article begins on page 2 and we highly recommend it to all Air Force personnel concerned with aircraft operation, maintenance and support. The author, Col Edward W. Szaniawski, has been deputy director of the Directorate of Aerospace Safety for the past four years.

For some first rate tips on water survival see "The 28 Tentacled Monster" by Major George Braue, Life Support Officer for 7th Air Force. He's talking about the lines attaching the crewman to his parachute canopy. Read it and avoid becoming a victim of this "monster." You'll find the article on page 16.

There is also some very good advice on avoiding midair collisions in "Are Midairs A Must?" page 18. The article is concerned with the combat environment, but the tips apply to non-combat flying as well. Good info on a hot subject.

There are some exotic new devices in the Air Force called Lasers. We're going to be seeing a lot more of these things, and now is the time to learn something about what they are, some of the uses they are being put to, and the hazards they present. You can get at least an introduction to these subjects in "The Laser," page 10. ★

NEW YEAR'S RESOLUTIONS

Lt Col Marshall D. Norris, Directorate of Aerospace Safety

Every now and again, those of us who earn our pay as project officers here at Norton are asked why we continue to belabor the pilots. After all, USAF pilots have been through an effective screening and selection program, and have received one of the most elaborate, extensive, and expensive educations offered in the Air Force today. No Air Force pilot flies just for the money; the dedication and professionalism of most of our pilots is beyond question. Therefore, why pick on the jock? Why emphasize checklists and procedures over and over again?

There's a reason. Some of us in the proud profession of military pilot make a mistake once in awhile. Here is a listing of some pilot factor accident briefs, selected at random, and offered without comment. Note that this list does *not* contain such things as refueling accidents, hard landings, running off the runway, or midair collisions, where a minor misjudgment can make the difference between a successful mission and a mishap.

B-52. Functional Check Flight. Nr 7 engine would not start. Took off on seven engines. Fire started when airstart of Nr 7 engine attempted. Primary cause — pilot elected to airstart engine without determining the nature of a known malfunction.

T-39A. Transporting personnel. Complete electrical failure forced landing in a pea patch. Primary cause—pilot in right seat inadvertently placed electrical master switch in off position.

T-39A. Administrative flight. Due to possible hydraulic failure, landing planned to allow as much stopping distance as possible. Landed short.

C-124C. Support mission, last contact with aircraft 58 minutes before destination estimate. Crashed into mountain. Primary cause—pilot filed, and apparently flew, a route and altitude that did not clear the mountains.

B-57E. Return from pilot proficiency mission. Pilot taxied into bus.

T-33A. Instrument check. Pilot aborted first takeoff due to stiffness of controls. No discrepancies noted. On second takeoff, at 50 feet, aircraft veered sharply left. Aircraft spiked back onto runway and ran off end. Primary cause—pilot did not notice that front cockpit aileron boost lever was in off position.

F-100D. Annual Standardization/Evaluation check. On third strafing pass, engine flamed out. Restart unsuccessful. Primary cause—pilot forgot to turn on external fuel tanks.

C-123B. Transition. Practice assault landings. Landed gear up. Primary cause—pilot forgot to extend gear, IP didn't check him. Other aircraft landed wheels up: two A-1Es, two C-7As, A-26A, F-100C, F-102A, B-57E, T-33A, U-3A and U-3B.

F-105D. Functional Check Flight. Four thousand feet down the runway on takeoff, aircraft settled onto runway wheels-up. Primary cause—pilot retracted landing gear prior to attaining flying speed.

F-100C. Transition. Wing takeoff. Staggered into air after falling behind flight leader, did "Sabre Dance" and crashed. Primary cause—pilot attempted a no-afterburner takeoff and over-rotated.

T-38D. Formation training. While in the lead position, engine stopped. Pilot made wheels-up landing in a plowed field. Primary cause—pilot accepted aircraft with a defective fuel quantity indicator and insufficient fuel.

F-100D. Deployment. Wingman broke away from flight leader in weather when AC generator failed. Unable to rejoin. Flew an hour and 42 minutes to fuel exhaustion and ejected. Primary cause—pilot did not use available navigational aids, attempted to use equipment not available with inoperative AC generator.

Short summaries:

- Two F-4 pilots on Quick Reaction Alert taxied over their crew chiefs.
- An F-4 pilot took off with double generator failure.
- A T-38 pilot attempted a single-engine takeoff, planning to airstart the dead engine.
- An F-100 pilot flew his GCA 10,000 feet too high, was unable to complete it and had to eject.
- Another F-100 pilot landed at the wrong base and ran off the end of the short runway.

We're entering a new year, and New Year's Resolutions are quite the thing. How about making a resolution that no mishap of the type shown here will ever involve YOU or YOUR crew? ★

This article is an adaptation of an address by Colonel Edward W. Szaniawski, Deputy Director of the Directorate of Aerospace Safety, to the Worldwide Materiel Conference at Vandenberg AFB, California.

we can't afford accidents at . . .

Col Edward W. Szaniawski, Deputy Director of Aerospace Safety

Just two days after my presentation to the abovementioned conference an aircraft crashed shortly after takeoff from a western air base. The aircraft caught fire, exploded, and the two pilots barely escaped. One of them was seriously injured.

Maintenance records, which indicated work done on the aircraft just prior to the accident, provided investigators a clue. Sure enough, a maintenance malpractice that caused the accident was discovered. But was it entirely a maintenance failure? Would a simpler, more foolproof design have prevented the maintenance error, or at least, have made it less likely to have occurred?

This accident is directly related to the remarks to follow. I want to discuss the part that materiel failures and maintenance errors play in accidents, and suggest some specific actions required to decrease the number of these types of accidents.

First, let's review the dramatic progress made by the Air Force in reducing the number of accidents. Our safety programs have paid off. There were more than 500 accidents per 100,000 flying hours in 1921. Compare this with approximately six during the current time period.

During the past 15 years, the number of aircraft destroyed in a year has decreased from more than 900 in 1953 to just over 260 in 1967.

Our pilot fatality rate has improved from 4.8 to 1.6 in the same time period and our total fatality rate from 11.1 to 4.5. Yet flying accidents have cost us more than 7100 aircraft and 7600 fatalities, of which approximately 3500 were pilots.

During the same period, the dollar cost of aircraft damage or loss for hardware alone is staggering. Our average daily loss is about 1.2 million dollars in equipment, and two people.

Almost $500,000 of this daily loss is caused by materiel/maintenance failure. The Air Force can ill afford losses such as these. Therefore, not only does our accident experience *validate* the vital importance of our safety efforts, but it documents the fact that despite past successes, there is still much room for improvement.

Despite declining rates and fewer accidents, the percentages of materiel and maintenance cause factors in accidents have remained relatively constant. To decrease these causes is a challenge that each of us must accept and to which we must devote our attention.

Now, what are some of the things you and I can do to reduce this wasteful loss of equipment and human lives? There are five areas I will discuss on which we need to place increased emphasis.

1 The application of System Safety Engineering to the design, development, and modification of Air Force systems.

You may well ask, "What can system safety do to reduce materiel failures and maintenance errors?" Well, system safety is the discipline of carefully analyzing all parts of a system, from the first concept through design and development, to ensure the individual components and their interactions are as free from hazards as possible. This is a continuing effort of applying the "*What happens if*" question, and then redesigning parts or changing procedures to minimize the risk associated with a failure. For instance, a typical question is, "What happens if we have an engine fuel leak during flight?" If we can't accept the consequences, we'd better do all that is possible to prevent it.

An example is the fuel manifold on the C-5 engine. This was but one of more than a hundred deficiencies found during C-5 design by the application of system safety. Experience has shown that most fuel leaks occur on jet engines around the "pigtails" and "B" nuts of the engine fuel manifold. In the event a leak should


$1,
200-
000-
00 A
DAY!

The Air Force is working on these and other problems, but we must continue to forge ahead with new prediction techniques to identify accidents about to happen, then take aggressive action to prevent them by fixing the deficiency.

occur without proper ventilation, a fire or even an explosion is likely to occur. A review of the design revealed an excessive number of "pigtails" and "B" nuts, and the volume of airflow along the hot section of the engine was considered to be low. Pre-hardware redesign reduced the number of "B" nuts and "pigtails" by 60 per cent and the airflow was increased.

One can immediately see the impact this low cost change will have on reducing the possibility of C-5 engine fires due to failure of these parts—possible accidents that would be charged to materiel failure. Think of the reduction in potential maintenance errors by eliminating 60 per cent of the pieces that could, for example, be overtorqued, causing a leak and resultant fire—possible accidents that would be charged to maintenance error.

System safety, the newest element to the Air Force accident prevention program can, if applied to our development and modification programs, prevent accidents. We call it "before-the-fact" accident prevention.

2 Early identification of hazards in operational systems that will ultimately cause accidents.

We must realize that system safety can't identify all possible deficiencies before the system is assembled. The first operational use of a new system will disclose hazards previously unforeseen. So, we must continue our efforts toward early identification of hazards in our operational systems that will ultimately cause accidents. Since early identification would be fruitless without the fixes to prevent accidents, we must consider items two and three together.

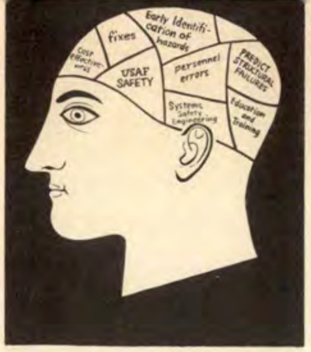
3 Development of fixes to prevent accidents.

We have many examples where early recognition of hazards and immediate corrective actions have prevented possible serious accidents.

The C-141 pressure door locking failure is an example of what can be done when a deficiency affecting safety of flight is detected and all agencies apply their efforts toward a solution. The first accident occurred on a training mission in July 1966, when the pressure door locking assembly failed. No immediate fix was proposed because it was believed this was an isolated occurrence. When a repeat occurred in January 1967, all agencies recognized that immediate and positive corrective action was required. An interim fix was designed and incorporated in a series of engineering change proposals; the first was released in February 1967. This fix and recent additional improvements should solve the problem.

While this is an example of what we can do when we set our minds to it, there are many other examples in which we failed to properly respond. Two come to my mind. The first was in the F-100, and was truly a nuts and bolts affair. This involved complete loss of control, associated with the separation of flight control linkages when either the cotter key or nut was not installed on a bolt. The Air Force was losing an average of three F-100s each year from this cause. Although many agencies participated in resolving the problem, it took more than five years to get an acceptable fix (kits were due for delivery by December 1968).

Another example is the failure of the F-4 aileron actuator cylinders. In August of 1964, the cracking of aileron actuator cylinder walls allowed complete loss of fluid resulting in loss of aircraft control. Again, the problem was well recognized within the Air Force and was included in the AFLC/operating command System Safety Review meetings of 1965, 1966, and 1967. Interim "fixes" were developed, such as: "Beefing up" the external walls, redirecting the fluid, shotpeening the cylinder, and establishing a rework and inspection cycle of the cylinders. Still cracks kept occurring. In December 1967, a TCTO was issued, replumbing the F-4 so that the utility system "backed up" the normal power systems for the aileron actuators. Fleet retrofit of this "fix" was completed in March 1968, some four years after the problem was first discovered, and after we had lost seven F-4s from this cause. Since March



1968, 14 F-4s have been saved by this modification.

We are still waiting for the ultimate solution to this problem, which I am told is installation of new steel cylinders. The point is, we recognized the need for the fix; all agencies worked on a fix, but we took *too long*, suffering additional losses.

Currently we have the problem of F-4 out-of-control accidents. This has cost 30 aircraft since the F-4 entered the inventory. Based on this experience, we forecast that, by 1980, we would lose a minimum of 143 more F-4s to this same cause, at a cost of 367 million dollars!

We must prevent these accidents, either by finding a way to keep pilots from getting into the out-of-control condition, or by correcting aircraft systems so the pilots can regain control.

The Air Force is working on these and other problems, but we must continue to forge ahead with new prediction techniques to identify accidents about to happen, then take aggressive action to prevent them by fixing the deficiency. This means making full use of the aircraft accident and materiel deficiency data. But, we must be very careful about evaluating it. The acquisition of data is justified only when it serves our purposes by correct application.

This calls to mind the scientist who was conducting an experiment on fleas. This chap had trained a particular flea to respond in a Pavlovian reaction. Whenever he hollered "jump," the flea would jump.

Continuing with the experiment, the scientist pulled one leg off the flea and hollered "jump." The flea jumped almost as high as it did with six legs. Then, he pulled another leg off and hollered, "jump," and the flea jumped. And, so in the interest of scientific research, the scientist continued to pull a leg off the flea and each time he hollered "jump," the flea would jump—a little less, but still there was a response. Then he pulled the last leg off and hollered "jump," but the flea just lay there. He hollered "jump," and again there was no reaction. And so, in his scientific wisdom, he came to the conclusion: That when you pull all the legs off a flea, it turns deaf. So, we must continue to analyze our data intelligently, then streamline our procedures to obtain approval and funding, and accomplish the necessary engineering to correct the deficiency.

4 Prevention of personnel errors that either directly cause accidents or cause materiel failures that result in accidents.

The causes of personnel error accidents are presently under study in the Directorate of Aerospace Safety. And this is not exclusively in the materiel or maintenance area but applies across the board. Why do people make mistakes? Why does an experienced crew chief ignore items on a checklist which results in an aircraft or explosives accident or incident? Why does a social drinker start drinking heavily? Why does a normally agreeable person become belligerent and hard to get along with?

A senior flight surgeon on our staff, who just returned from Southeast Asia, believes that underlying many personnel errors is a *subclinical depression*. By this, he means that many of our airmen, especially the older ones, have a mild depression not recognizable either to themselves or to their supervisors. The symptoms, mild though they may be, are not conducive to good safety practices: insomnia, early awakening, change in drinking or social habits, irritability and finally, if severe enough, a "don't care" attitude. The onset is usually insidious and may gradually develop to a degree severe enough to degrade duty performance. However, the symptoms generally are not so obvious that the individual is referred to a psychiatrist.

There may be many reasons for this condition, but to name just one: an older individual fighting his second or third war and away from family and home environment—perhaps with his wife writing constantly about problems with the house, the children, money.

According to a recent study on psychiatric problems in SEA, the danger period is between four and six months. Neither the serviceman nor his family believes that the year will ever be over. At the halfway point, six months, he is over the hump, and the end is in sight. Things seem to get better.

What can be done? For one thing, an awareness of this syndrome on the part of all concerned will help. Supervisors should watch for personality changes in their men, particularly in those cases where an individual starts to become seclusive. The boss should be alert and take positive and timely action to get his men out of the dumps. He should watch for the development of this condition in himself and others, and recognize it for what it is. Supervisors in the combat zone should be especially alert for any personality changes during the crucial period of four to six months after the assignment of his personnel. They should watch for individuals beginning to ignore or sluff over established procedures.

It may be only conjecture whether or not this "subclinical depression" is responsible for personnel error accidents. However, the concept is presented for your consideration, just in case it might be responsible not only in SEA, but in any location where our personnel serve on isolated duty.

One thing we are sure of is that the personnel error rate is not diminishing, in spite of continuing efforts in education, training and supervision. As an example, in 1967 some 350 explosives accidents/incidents occurred wherein *personnel error* was identified as either the primary or contributing cause. Consider the case of a technical sergeant, 14 years on the job, who soberly proceeds to disarm a system contrary to well known technical order instructions. Consider the major who stands up in a cockpit without first installing his ejection seat safety pins. Then, there is the airman who pushes the bombs off a stack, knowing that several disastrous explosions have occurred under similar circumstances. Recently an experienced maintenance man installed a guidance system gyro backwards in a booster missile. We lost a very expensive space payload.

It seems that at least until we learn more about the complexities of humans, we must emphasize the need for proper training of our materiel/maintenance managers and technicians.

5 Testing to predict and thus prevent structural failure accidents.

I am talking about destructive testing. Characteristically, the Air Force is forced to keep aircraft in its inventory far beyond the length of time the Air Force or the designer ever envisioned. Good examples are the C-47, C-119, C-124, F-84, F-100, B-26, and A-1 aircraft. Many of these have accumulated thousands of hours beyond their design life. As we continue to fly these aircraft, failures cause accidents. In all cases, we have found the weak point, but not until lives and resources were lost.

The worst part of this is that we have the techniques to prevent these losses. Today we are able to predict, well in advance, when an aircraft wing spar or bulkhead may fail from fatigue. To continue extending the operational life of our aircraft without adequate destructive testing and proven nondestructive inspection is folly. We know that many of the accidents that have occurred to these aircraft could have been prevented—"before-the-fact accident prevention." We must emphasize testing and inspection of a new aircraft at the very beginning of its operational life, to predict and detect fatigue failures that might occur many thousands of flying hours in the future. The lead-the-force aircraft concept is one attempt, but it doesn't do the entire job.

I have covered five areas in which we in the Air Force and industry mutually need to work to further reduce those losses which are charged to materiel failure and maintenance personnel errors. One area, System Safety Engineering, is relatively new, but all others are proven ones that we have worked in to achieve our present all time low accident rate. However, they are areas we need to reemphasize from time to time, if we are going to make a sizable reduction in the one-half million dollars lost each day to materiel and maintenance causes. ★

Colonel Szaniawski this month completed 30 years of military service, most of it in operational units. He vividly recalls accidents involving members of the units he served in. This experience and his four years as deputy director of the Directorate of Aerospace Safety have, he says, broadened his perspective of the causes of accidents and the means of preventing them. He firmly believes that while safety is a management function, as a discipline it does not operate independently. Rather, it is dependent upon the total effort—which includes the aerospace industry as well as all facets of Air Force operations.

the I.P.I.S. *approach*

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

Q An aircraft on short final to runway 27 was cleared "to circle right, cleared to land runway nine." What is the meaning of the terminology circle right? In the situation described, should the pilot have initially turned left and made a right traffic pattern or initially turned right with a left traffic pattern?

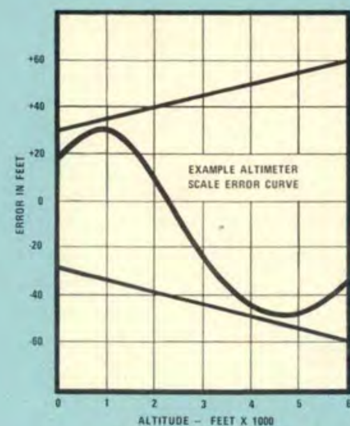
A Any specific answer would be a guess as the clearance "circle right" is ambiguous. If the pilot had been simply cleared to "circle to runway nine," the choice of traffic pattern would have been his. If the controller had a requirement to restrict the circling pattern, the correct clearance would have been: "Cleared to circle runway nine. Circle north of runway 27/9." The pilot in the described situation had no alternative but to ask the controller for further explanation.

Q Why did AFM 51-37 eliminate the procedure of determining an altimeter correction factor before takeoff and applying this correction to all subsequent altimeter settings? If a correction is not applied to later altimeter settings, won't the success of approaches in low weather ceilings be in doubt?

A We have received many questions on this subject. Simply, the procedure was eliminated because it was technically incorrect and could compound altimeter errors.

Barometric altimeters have several inherent errors. The old altimeter correction procedure was intended as a correction for scale error. Scale error is caused by the irregular expansion of altimeter aneroids, and every altimeter has its own individual scale error curve. Acceptable scale errors at sea level are in the order of ± 30 feet, increasing at the rate of 5 feet per thousand feet of altitude. By 6000 feet, acceptable scale error tolerances approximate ± 60 feet. Significantly, scale errors for any given altimeter may be plus at one altitude and minus at another, and one altimeter correction cannot be applied across the board.

Consider this example altimeter scale error curve:

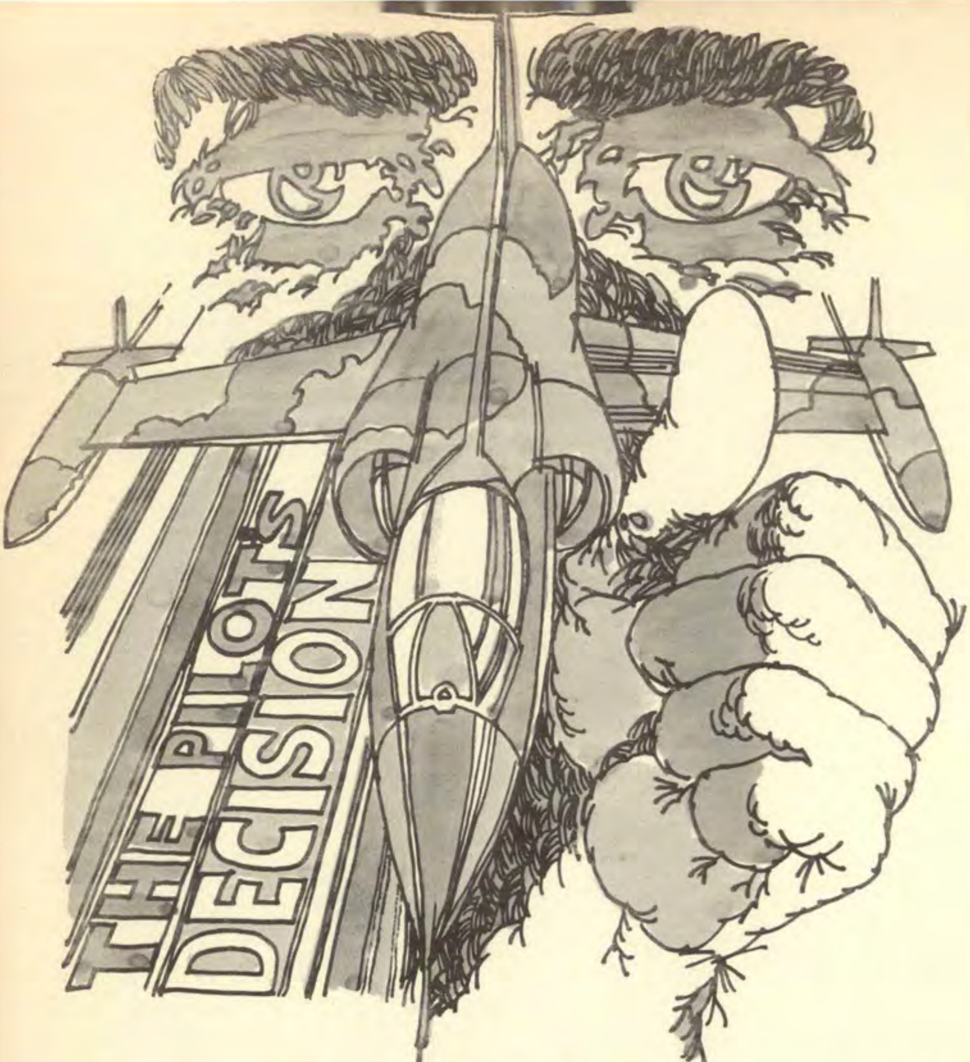


With the example altimeter, a pilot taking off from a field elevation of 1000 feet would have a scale error correction of approximately +30 feet. If his destination field elevation was 4500 feet, the scale error correction there would be approximately −50 feet. Using the old altimeter correction procedure, the pilot would have applied a +30 foot correction to his destination altimeter setting, and he would have given himself an 80-foot altimeter error. It is the incorrect use of altimeter corrections that places the success of approaches in low ceilings in doubt.

Wouldn't a pilot landing at the same airport he took off from be safe in applying an altimeter correction? The answer is still no. A correction is only valid at a specific instant and location and does not recognize what the real source of the discrepancy may be. Temperature effects, inaccurate altimeter settings, and unrecognized field elevation variations are some other error causes. These errors may or may not be constant. Haven't you ever noticed differences in altimeter errors in the same altimeter at the same base before and after a flight?

Future plans for lower approach minimums are all predicated on radar altitude information. Current state of the art in barometric altimetry will not support approaches beyond current FAA Category I minimums (200 feet DH) unless radar glide slope information is available.

Meanwhile, check your altimeter with a current altimeter setting at a known field elevation. If the error exceeds 75 feet, do not use the altimeter for IFR flight. ★



Lt Col Louis G. Creveling, Directorate of Aerospace Safety

So often in the Operations Ready Room, the pilots will discuss their own "go-no-go" checklist on the aircraft they fly. The Chief of Maintenance or the Director of Operations will have a published directive on what systems must be operational for flight. The technical data will give a detailed definition of when an aircraft is not operationally ready, either grounded or non-grounded, depending upon the seriousness of the ailing bird's condition. In addition, the pilot gets his briefing from his squadron commander or operations officer on when to go or not to go.

But all this knowledge of the aircraft and its systems that has been crowded into an aircrewman's head since he first started in the transition program can slip by the wayside in the pressure to accomplish the mission. The word comes down from the old man that, "we're behind in flying time," or "the combat situation is getting hot and the ground troops need relief." So the pilot gets his adrenalin up and becomes mission oriented. "Damn the checklists, we're going on the flight in spite of aircraft condition."

Or, the pressure to fly a non-airworthy aircraft comes from within. We are on a cross-country and the trip is extended. The little woman has laid down her word, "You be home by Friday night, or else." Or there are other pressures such as a heavy date or, the base policy permits only a three-day flight for this type of cross-country. It could be the desire to get back before the weather deteriorates. The old saw that if we delay to get the aircraft repaired, we'll exceed crew rest and then have to RON. This delay will change the alert posture at the home base, or the office planned a big day tomorrow. These are a few of the many pressures that can be placed on the pilot to stretch his judgment beyond what he knows about flying an ailing aircraft.

We must set standards and stick to them. Explaining a delay is much easier than explaining an accident. Many a wing commander has given second and even third thoughts to how he addresses his aircrews on mission orientation, as he waits to brief the major commander on the accident that could have been prevented, because of aircrew judgment on what constitutes a safety of flight discrepancy.

In a training situation the pilot, on reviewing the write-ups in the AFTO Form 781A or 781J, might discover an inoperative system that would hinder performance of a mission. If he is knowledgeable in the aircraft, he decides on his own initiative not to fly the mission with that aircraft, and either aborts or gets a replacement. He may comment, "This bird is not ready for flight because this system is inoperative. If this were wartime and I had to go, I would accept degraded performance to get the job accomplished; however, since this is only a training mission, I will not fly this aircraft."

Well, we have a war going on in Southeast Asia, and what do the pilots say when confronted with a similar situation? You might have guessed. When a pilot finds some system non-operational that might affect the mission, he might decline the flight and for good reason. In SEA the flights are often diverted from original mission for a RESCUE Combat Air Patrol (RESCAP) or to go to the aid of beleaguered ground units. The pilot and his airplane must be prepared for any mission within the capability of the aircraft. His comment on turning down the flight might be, "This is a combat mission, and if I fail to do the job properly, I very likely might lose the aircraft and my life at the same time. If I need that defective system and don't have it, the military does not have the complete use of air power. Had this been a training mission on which I might accomplish some of the training requirements, I would go, but I'll not risk this flight on a wartime task when I need everything possible going for me."

So pilots change philosophy between peacetime and wartime conditions. Look at it this way: The aircraft commander or pilot is a judge of the airworthiness or capability of his air machine. That's part of the talent for which Uncle Sam pays him. We aviators are not robots and contrary to conjectural opinion, we are paid to think and apply judgment, not the least of which is that "go-no-go" decision.

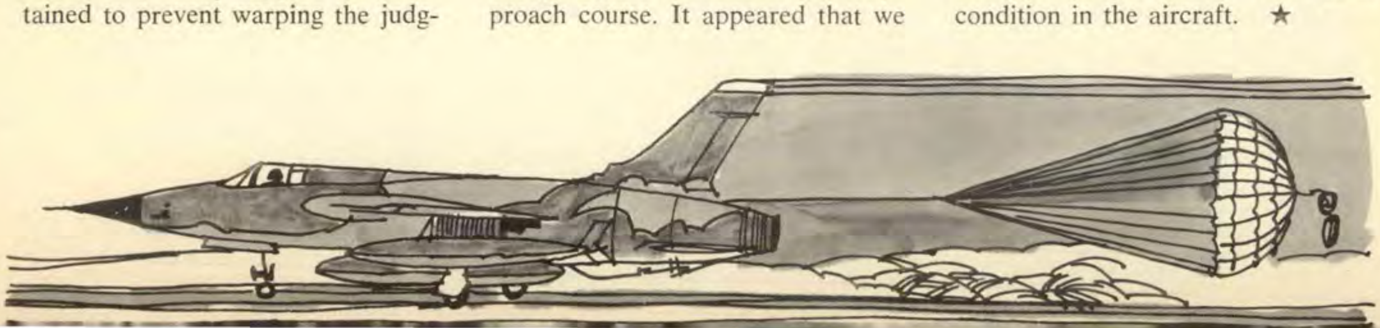
The flight commanders and squadron operations officers have a strong influence on the pilots who make these decisions. This is especially true with the younger pilots who know the aircraft but may not be mature in their judgment of which system is important and critical for flight. The pilots, in "hangar" talk, will rehash decisions and are sensitive to criticism on their decision to abort when it appears the aircraft is non-operationally ready. The first echelon supervisors have the responsibility to watch for trends in ground aborts. Criticism or kidding by his peers or flight leader may lead a pilot to believe he was wrong to abort. Only through a close personal relationship between flight crews and their supervisors can the necessary rapport be maintained to prevent warping the judgment of an inexperienced aircrewman. He must be prevented from jeopardizing his life through a wrong decision to fly when he should abort, a decision made because of harassment or mistaken opinion on safety of flight discrepancies. Regardless of the pressure put on a pilot to fly, he must resist accepting a non-airworthy aircraft, and any questioning of his judgment should be in light of constructive criticism and not embarrassment.

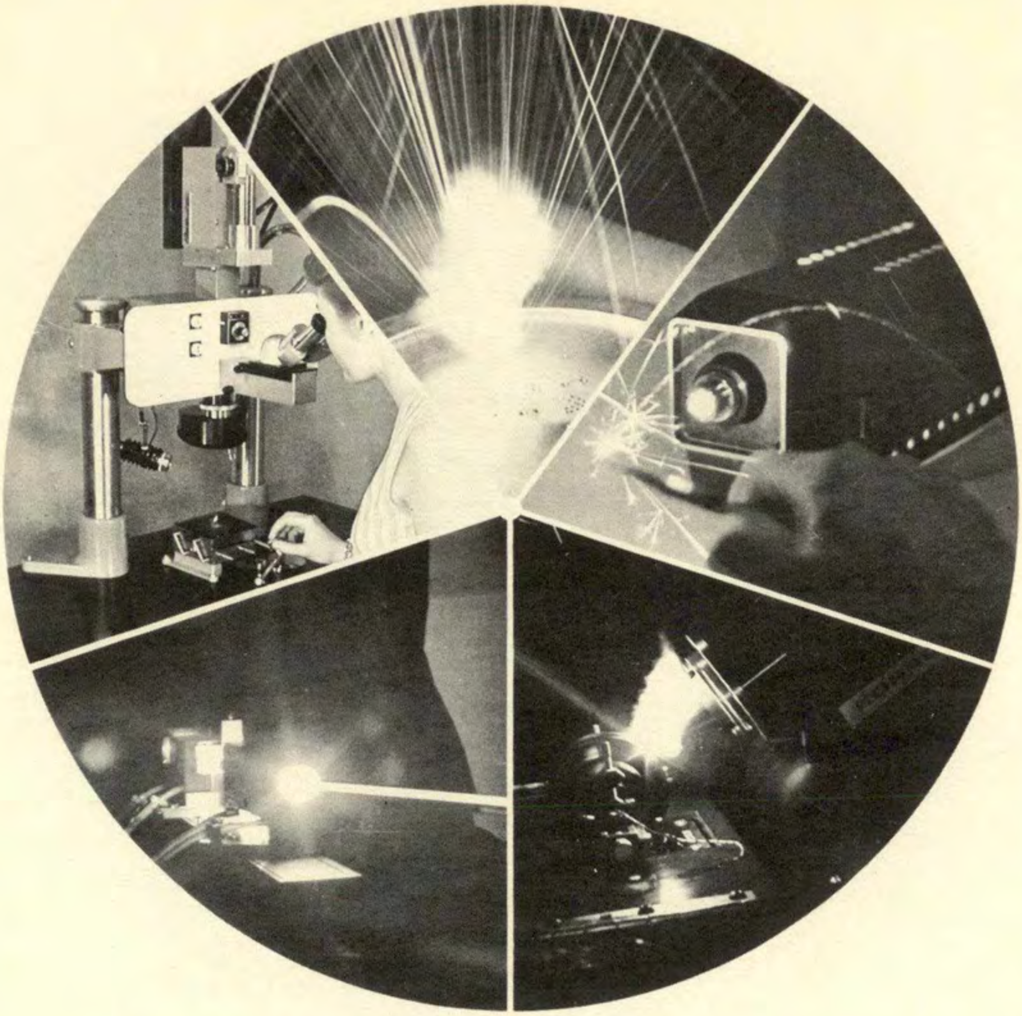
Recently, two major aircraft accidents occurred when the pilots knew better than to take the aircraft. Or rather, they should have known better, but they took off under dangerous conditions and crashed. One aircraft had double generator failure. Both mishaps involved two engine aircraft with a generator on each engine. In our modern day aircraft, with complex electronic systems and high demands on electrical power, all generating equipment must be functioning at the start to insure safety of flight. Anything less is not only dangerous but unnecessarily foolhardy. Electric power in today's aircraft is as vital as castor oil was to the World War I fighter planes.

In your examination and preflight check, seemingly unimportant items may become of major consequence later in the flight. A simple thing like an inoperative standby compass light was impressed on me as a vital item for flight safety. On a night cross-country, this light was out in the front cockpit of the F-4. All else, including rear cockpit instrumentation, was okay, so we pressed on to a base under known IFR conditions. On descent in the teardrop, with GCA pickup, we were in the soup and the surveillance controller was giving directions to the final approach course. It appeared that we were not following directions because the track we were following was not bringing us to course.

The controller gave us a heading which I held, but it was improper. He assumed correctly that something was wrong with the heading indicator, and went immediately into "no-gyro" approach procedures. I was flying the aircraft, so I asked the pilot in the rear cockpit to take over. He was a well qualified IP with considerable F-4 and weather experience. His answer was, "I can't, I have vertigo and everything seems upside down." I asked him to settle down, and I switched from primary reference system to standby reference system. The horizontal situation indicator went off to another heading, even farther than it had been under the primary system. Since the light was out, I could not check the standby compass and flying the aircraft prevented my using the flashlight to read the compass. The GCA operator continued giving no-gyro corrections accurately, so I landed without incident. I had a weird feeling for a few minutes as to my exact position, until the runway lights appeared and the aircraft was exactly aligned for landing.

In summary, the pilot or any aircrewman must check the aircraft with a careful assessment of the mission and demands on aircraft systems to perform that mission. It is difficult to weigh those pressures for carrying on in spite of known discrepancies. In the cases cited above, with generator failures before takeoff, one pilot survived and the other didn't. Those were gambles that never should have been considered. Know your aircraft; check it before flight. It is easier to reschedule than to explain why you took off with a known hazardous condition in the aircraft. ★





THE LASER

Maj Edward H. Thrush, Directorate of Aerospace Safety

How would you like to have a flashlight with a beam that didn't spread? A light you could focus on a gnat's hindquarters a mile away.

Well, there is such a flashlight, but it's a heck of a lot more sophisticated than any flashlight you've ever owned. It's called a laser. In the following article, Major Thrush will tell you what a laser is, how it works and what it is used for in the Air Force. First, though, we want to tell you why it is important for you to have some knowledge of laser devices—why you should take a few minutes to read what follows.

Lasers are potentially dangerous. If one looks directly into a laser beam or at its reflection from a bright surface, severe eye damage can result. Any part of a person's body in a laser beam path can be severely burned. Looking at the pumping source of some lasers can cause blindness similar to snowblindness. Some laser devices require high voltages, which must be safeguarded against.

From this, you can see that lasers are not just ingenious devices to be toyed with. Now read on and learn something about them.

—Editor

A laser is a source of monochromatic (one frequency or color) coherent (in - phase) light. The term laser is an acronym for light amplification by stimulated emission of radiation.

Ordinary white light is composed of all visible frequencies and radiates in all directions unless focused. Laser light is one color and radiates in a very narrow beam that remains narrow for long distances.

Another device that operates by stimulated emitted radiation is the maser. A maser (microwave amplification by stimulated emission of radiation) operates at a much lower frequency than the laser. The frequency spectrum, Figure 1, shows this difference. The other essential difference between lasers and masers is that masers are used as amplifiers, as in radio astronomy to amplify weak radio signals emanating from space. Lasers, however, are used primarily as a source of light or oscillator rather than as an amplifier.

Lasers are single frequency devices with very narrow bandwidths and are usually referred to by these wavelengths in angstrom units, Å. An angstrom is a unit of length and is equal to one ten-billionth of a meter. The frequency spectrum shows the relationship between X-ray wave lengths in angstroms and an audible tone of 1 KC or a wavelength of $3x10^{15}$ Å.

What makes a laser different is its coherent property. Figure 2, "Coherence," shows that the laser light beam diverges by a factor of only 48 while ordinary light that is *focused* diverges by a factor of 293 over the same distance. The point is that laser light does not spread out. The advantage of coherent light is that it can also be focused or concentrated by lenses and mirrors, but to images much brighter than the original source, which is impossible with ordinary light. This is one of the reasons why laser beams can burn holes in steel.

How do we achieve a single frequency coherent beam of light? Figure 3 illustrates how this occurs.

As you can see level 2 is what makes a laser material different. This level is close to 3 in energy value. Materials used in lasers have electrons that decay from 3 to 2 and stay at level 2, without losing energy, for a short time before they can decay to level 1. As the flash tube in a ruby laser keeps pumping light into the lasing material, more and more electrons collect at level 2 until there are more electrons at this level than at level 1. This is called population inversion. If there were some way the electrons at level 2 could be made to decay to level 1 in an orderly fashion, they would lose energy in the form of light photons of the same frequency that are coherent or laser light.

The trick is to get the light photons that are released to bounce back and forth in a cavity—to line up, or oscillate as in a resonator. This is done by placing mirrors at each end of the lasing material, as shown in the schematic of the gas laser, Figure 4. The optical resonator principle is the same for a ruby or gas laser. The cathode to anode voltage in the gas laser causes the gas to ionize; i.e., gas atoms lose electrons. This plasma then provides the excitation energy, electron collision, just as the flash tube provided light energy to the ruby laser. The mirrors at each end form the optical resonator. The mirror at the left end reflects close to 100 per cent of the incident light while the one at the right is partially transparent, say 10 per cent.

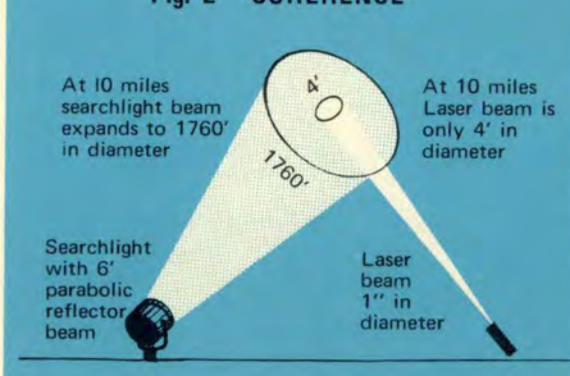
Fig. 1 WHAT IS A LASER?

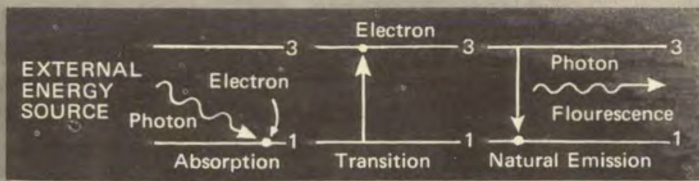
A source of monocromatic (one frequency or color) coherent (in phase) light.

Frequency Spectrum

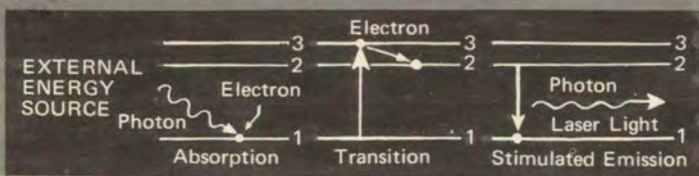
High Frequency			Low Frequency	
X-Ray	Visible	Infrared	Micowaves	Radio
150 to 10 Å	7500 Å 400 Å			IKC or $3X10^{15}$ Å
	Ruby Laser	Gas Laser	Ruby Maser	

Fig. 2 COHERENCE





Electron–Photon Action in a Material That Will Flouresce

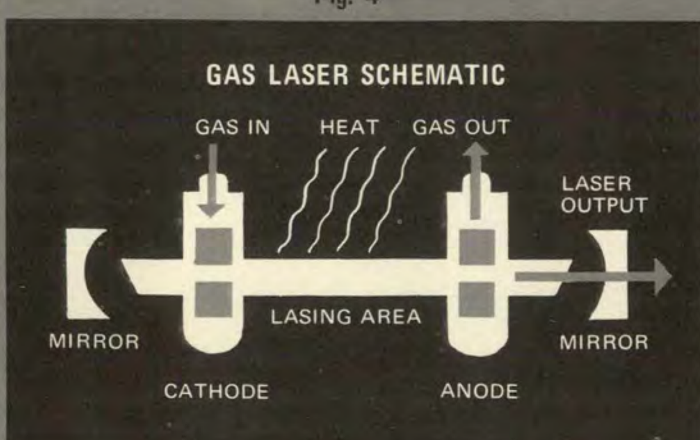


Electron–Photon Action in a Material That Will Lase

Fig. 3

Electrons can exist at energy levels 1, 2 and 3 in the energy level diagram of the atom, illustrated above. If electrons in their normal state, level 1, absorb sufficient energy from an external source they will transition to the higher energy band of level 3. In lasers, the external energy source or pump can be light energy, photons, from a flash tube as in the case of a solid state (such as ruby) laser, or kinetic energy from electrons in a plasma in gas lasers. Electrons at level 1 that absorb energy cannot remain at level 1 because they have more energy than is permitted at this level in these atoms. Therefore, they transition to level 3 where higher electron energies are accepted. At energy level 3 they are not stable and will emit a photon of light as they fall back to level 1. The action of absorbing, then emitting, a photon of light is called fluorescence—light of one color radiating in all directions. However, in a laser material electrons at level 3 transition to level 2 without fluorescing. Electrons at level 2 remain there for a short period of time (this is necessary for population inversion), then emit a photon of light as they return to level 1. When these photons are lined up in an optical cavity a laser beam can result.

Fig. 4



Oscillations start when some electrons at level 2 start decaying to level 1. These electrons lose energy in the form of photons of light just as in fluorescence (the light is scattered in all directions). However, some of the photons strike the mirrors longitudinally and are reflected back and forth between the mirrors. As these photons bounce back and forth they hit other electrons at level 2 and cause them to release photons in the same direction. These oscillations contain more and more photons as population inversion increases. The device is still being pumped with flashes of light or a gas plasma. As soon as there are enough photons oscillating to overcome losses due to scattering and the resistance of the mirror on the right, Figure 4, a laser beam will emerge to the right since this mirror is 10 per cent transparent. This entire process takes only a fraction of a second and is called stimulated emission of radiation.

What kinds of lasers are there?

Laser materials are usually divided into three classes, solid state or crystalline materials such as ruby, neodymium; gases — argon, CO_2, krypton; and semiconductors—gallium arsenide (G_aA_s). Recent research, however, has established two new classes, the chemical and liquid (organic dye) lasers. Of these lasers the liquid is the newest and must be pumped or excited by another laser before it will operate.

Lasers also differ in their operating characteristics. Ruby and some neodymium lasers are pulse devices, i.e., they emit pulses of laser light. Gas lasers are usually continuous wave (CW) devices whereas semiconductor lasers can be either pulsed or CW devices. The frequencies or wavelengths of these lasers vary from the ultraviolet (above visible), through the visible and into the infrared, as the frequency spectrum shows.

Where are lasers used?

Approximately 9400 lasers are in use at the present time. Their applications range from the scientific to the practical.

In the communications field it is theoretically possible to transmit an infinite number of messages on one beam. The problems are how to modulate the beam (put intelligence on it), and demodulate it (extract intelligence from it). Bell Laboratories have succeeded in placing 10 TV channels on one beam or frequency. This is in contrast to the present practice of one channel per carrier frequency.

Laboratory measurements of velocity and frequency are more accurate by a factor of 1000 when using laser light. One practical application of the laser beam is its use in measuring the straightness of tunnels.

The laser used in ranging or radar has increased range over conventional microwave radar, particularly in space applications. As an example, for the same transmitted power, the laser radar has at least twice the range as a conventional radar. The reason for the increased range is the narrow beam divergence of the laser beam, its coherence. Because the beam does not diverge, as does ordinary microwave radiation, it is possible to project nearly all the transmitted power onto the target surface. When used in the atmosphere, however, laser light is subject to absorption and scattering and may not have an advantage over conventional microwave radar.

In guidance systems the applications range from devices such as gyros (the ring laser) to complete guidance systems. One exotic application that has been proposed is to literally push a satellite onto the correct course with a high power pulse of laser energy.

Airborne Laser Illuminator

Laser photography or holography as it is called, is the field of taking 3-D pictures—holograms. A hologram is a photo taken with laser light which, when viewed with laser light, gives a 3-D image, including parallax, which is identical with the original subject. Research is now being conducted on a holographic 3-D movie.

Some Air Force applications of lasers are in the fields of gun alignment, target ranging and designation, and reconnaissance.

From what has been said, it is obvious that the laser has already become important to the Air Force, and we will be seeing more of these devices as new applications are discovered. Therefore, we must recognize the hazards laser devices present and take positive action to minimize the hazards through protective devices and training of Air Force personnel.

Since the laser is relatively new, safety criteria and practices have not been fully developed. However, work is going forward and safety criteria will be available in the near future. An initial step has been a section on lasers in the Dec-Jan Safety Kit. Included are the material from which this article was adapted plus material covering safe operation and maintenance of laser systems, a guide for design of a laser facility, and a discussion of the biological effects of laser radiation. Safety directors should have this material available for interested persons desiring more knowledge of these devices and the necessary precautions in their use. ★

FOD—While I was on a trip recently the family car developed a slight illness that required the services of a mechanic. After the work was done, the mech assured us we shouldn't have any more trouble so we headed for the highway. Within 100 feet of the garage, as we drove on to the highway, there came a banging sound of metal striking metal and ol' Rex stopped to see what the trouble was. The trouble was a boxend wrench lying in the road. It had been left in the engine compartment by the mechanic. We knew it was his because his name was on it.

The mechanic seemed only slightly embarrassed when I returned his wrench. And he assured me that he had used only the one wrench; therefore, there couldn't possibly be any more under the hood.

Well, that cost him a wrench, because I later found another one with his name on it—lodged in the engine compartment. I steamed a little and had a few choice words on sloppy mechanics. "This used to be a big problem in the Air Force," I said, "but we seem to have pretty well licked it."

That was a couple of weeks ago. Now I have a message on my desk concerning an aircraft with control problems. While the message indicates that further checks are being made of the aircraft, one item has been established—an eight-inch boxend wrench was found inside the left horizontal stabilizer at the elevator control linkage. Like my mechanic's wrench, this one had some initials on it.

In an automobile a wrench left by a careless mechanic may be only a minor annoyance. In an aircraft it could be catastrophic. I guess all the careless mechanics are not in small roadside garages after all.

REX RILEY POSTER

A Rex "do-it-yourself" poster was distributed in the USAF Safety Kit for October-November 1968. You've probably seen it around the flight line. If not, it is a picture of Rex Riley with a blank balloon, so that safety and operations types can tailor the message to the local situations and problems. Quite a few safety officers have written to tell us how useful and effective this poster is. Maybe some of you other operations and safety types will pick up some ideas; drop us a line if you develop any unique uses at your base.

"1. Congratulations! Well done! Excellent!

2. We are having tremendous success with your 'do it yourself' Rex Riley poster. This is the opportunity we needed to get our specific messages across to the organization. May I suggest you continue the idea,

varying your background to avoid the loss of attention usually associated with repetition.

3. Our office could use twenty more posters if you have them available."

Maj Richard R. Wokoun, NYANG
US Naval Air Station, NY

"Excellent idea about the blank balloon in the Rex Posters. Please send me a dozen copies."

Maj Leonard W. Pierson
Mather AFB CA

"Yes! It serves a great purpose to get ideas across that may be peculiar to the local area. When black magic marker is used, the print looks like the real thing. To address 'You Andrews Pilots' is an attention getter to be sure. A great idea, valuable at least at the beginning of the changing seasons of the year."

LtCol Townsend
Bolling AFB, DC

"Appreciated this Rex Riley. My input was:

> 'Make your 781 write-ups as informative as you can—Maintenance will appreciate it. If necessary, follow up with an OHR to spotlight a real or potential trouble area. You and your fellow airmen will appreciate it.'

Can use some more in the future."

Maj Ralph T. Lashbrook
Bergstrom AFB, TX

"Roger that! I covered the 'balloon' with clear adhesive plastic so that Rex can speak many times."

Maj William Yanchek
APO San Francisco 96320

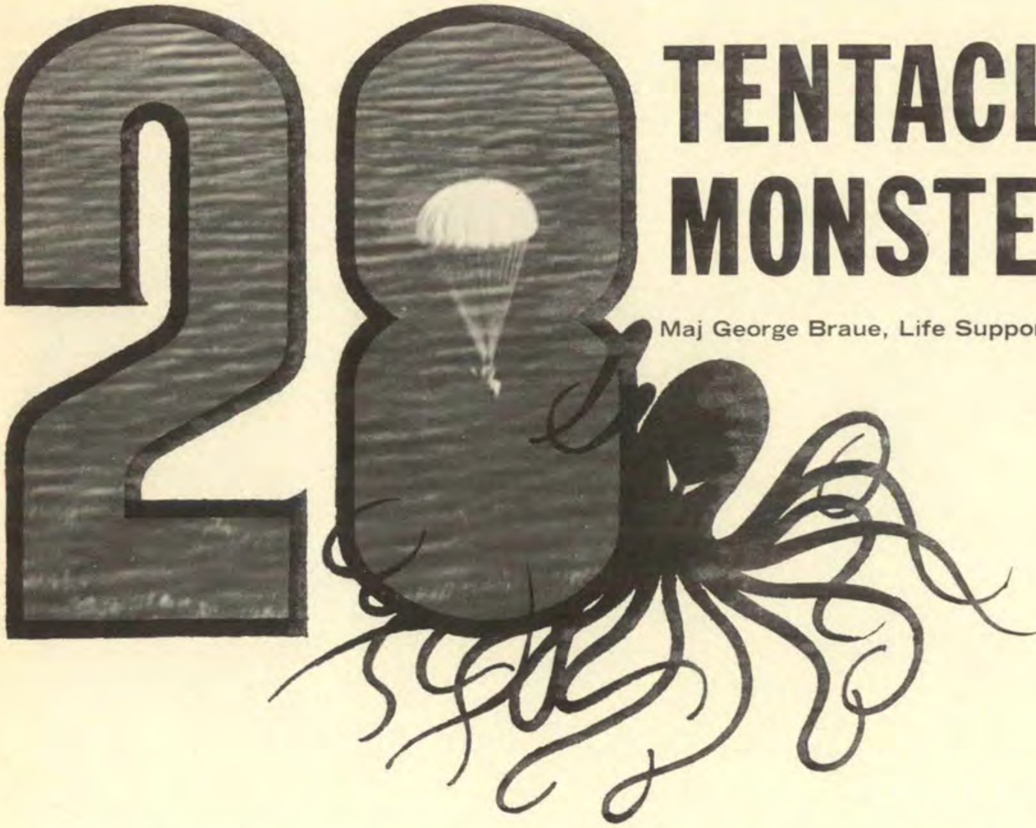
TRANSIENT SERVICES. Not long ago I was talking to a fellow pilot about flight line snack bars. He mentioned that he refueled at a southern base and was disappointed that they had only an automated snack bar in the base operations area. It so happens that I'm intimately acquainted with that particular base, and there is a 24-hour conventional snack bar about one block from base operations, complete with hot food short order service.

This brought to mind several other bases with excellent snack bars, some affiliated with NCO, officers' and service clubs, that are open from 18 to 24 hours a day. However, none of these facilities are obvious to a transient and inquiry is necessary to ascertain their existence. So, why not publicize these establishments, their hours and locations with a sign in base operations? There is nothing new about this idea; it's done on some bases but could be used to advantage on many more. Maybe your base is better equipped to serve transients than you, or they, think.

NEVER HOPPEN, we keep telling ourselves. The possibilities of having your fuel contaminated in this day and age are mighty slim—too many checks and balances. I received an informational copy of an Operational Hazard Report last month that told this story.

"My aircraft was refueled for an administrative mission. Approximately 45 minutes after takeoff I received a radio call informing me that there was a possibility my bird had been refueled with diesel fuel by mistake. An emergency landing was made at an intermediate airfield about 20 minutes later; throughout the entire flight all engine instruments were closely monitored and were within limits. I requested a fuel analysis. A sample was taken and found to be within specifications for 115/145 gasoline. I continued to my planned destination without incident and requested another fuel analysis. The result of the second sample was: fuel in tanks definitely contained diesel fuel. The tanks were drained, flushed and reserviced."

Apparently the diesel fuel floated on the aviation gas and didn't drain out of the tank when the first sample was taken. This hair-raiser happened in Vietnam where there are liable to be unfriendly natives between any two given points. The OHR didn't say how or why the error was made but with all the built-in hazards over there we can do without constructing our own. ★



28 TENTACLED MONSTER

Maj George Braue, Life Support Officer, 7th Air Force

Thorough knowledge of the use of life support equipment is essential during emergencies in SEA. The following, written by a highly experienced life support officer, covers some of the aspects of water survival.

When his aircraft is hit and it appears he will have to leave it, one of the first things the smart jock looks for is water. Water is his safe pickup area but, unfortunately, it is also the abode of a 28 tentacled monster that has recently snatched back into the sea crewmen who have successfully ejected and provided some near misses for others. This has led to more emphasis on water survival techniques, equipment use and aircrew pre-rescue procedures.

One recent loss to the 28 tentacled monster occurred at night when an F-4 type punched out successfully after making "feet wet." He got into his raft and reported being "slightly entangled" in his chute lines. A helicopter approached, and, as it hovered with horsecollar ready, it was noted that the pilot had partially deflated LPUs. The pilot departed his raft (good procedure) and got into the horsecollar. When he was 20 feet up, the helicopter crew reported seeing the pilot's chute following him out of the water and that he was kicking away at those "tentacles." He then bent over and appeared to be reaching toward his feet. The inevitable happened. The pilot fell from the hoist, was briefly seen and then disappeared. Once again the tentacles of the chute reached out and snatched another victim.

Let's look at some of the factors in this tragedy. The chopper crew saw the deflated LPUs. When the jock fell from the horsecollar, he had a lot of added weight to contend with and no flotation help. (Vest plus survival gear, tree lowering device, g-suit pockets loaded, etc.) We assumed he cleared chute lines prior to arrival of the helicopter, which meant the chute was probably in the vicinity of the raft. We think the "chute tentacles" snagged this pilot's feet as he climbed into the collar, or as he was raised out of the water. The ejection occurred at night, which probably prevented his seeing the lines, although this same thing has happened in day rescues.

THE MONSTER

What is this monster? It has 28 lines (tentacles) 15 feet long whereas the octopus has only 8. Add to this another 25 feet of nylon tape attached to your survival kit and another line to your sea anchor. This should be enough to worry about; however, let us add this little tidbit. Under certain conditions of rotor down wash on a water filled chute canopy, two TONS of force can be exerted upon YOU, the middle link in this tug of war between the chopper and your chute.

Okay, what can we offer to help fight this monster? Read and heed the following:

• Practice on the hang trainer, actuating your canopy release under load conditions so that you can readily locate and actuate even when blindfolded.

• Prepare for a water landing and strive for canopy release as your feet touch water. (Note: You would be surprised how many forget this basic procedure. Common attitude is: "I'm just glad to be alive with a chute.")

• If time and circumstances permit, swim away from released canopy, then board your raft.

• If entangled, attempt to clear lines, cut away if necessary and board raft, or board raft and then clear lines away.

• Attempt to paddle raft clear of area where canopy lines are floating. Don't stop functioning just because you got in your raft.

• Keep your LPUs inflated. Bulky yes, but you are not going to be there long. Average time is around 35 minutes.

• Above all, if you are fouled in either the 28 tentacles or the survival kit drop lines and can't clear them away, don't enter/board rescue hoist gear regardless of what it is—horsecollar, rescue seat, basket, etc. Radio or signal helicopter that you need help and they will deploy a PJ (pararescue jumper) to assist you. ARRS informs us that none of their PJs subscribes to the latest bathless fad.

• Don't let the natural anxiety to be up and away cause you to overlook the dictum that "the sea is reluctant to give up its potential victims." *Beware of the 28 tentacled monster!* ★

This ©☆#!&☆ GROUND TRAINING!

Lt Col Thomas B. Reed, Directorate of Aerospace Safety

Each crewmember, regardless of his assigned command, seemingly finds himself surrounded by an endless list of trivial and irritating requirements, the sole purpose of which seems to be a complete utilization of one's time, so there is no time for the leisurely enjoyment of the finer things in life.

There is First Aid, 5BX, firing range, survival, and on and on the list goes. Because one feels that the requirements are designed solely to show time utilization, one often falls into the trap of paying lip service to each with little benefit to himself other than the arm exercise he receives from pencil-pushing.

Statisticians, watching trends, often see areas developing where the loss of life and time could be stopped if a particular type of training were made available. Hence, another requirement on the list, for example, emergency ground egress training.

Numerous aircraft accidents have occurred in which both passengers and crewmembers became fatalities only because they didn't know how to get out of an aircraft fast. So the supreme headquarters levied the requirement, then had the inspectors check throughout the Air Force to see if it was being accomplished. The inspectors reported that all units were keeping accurate tab on everyone and wall charts gave the time and date training was accomplished.

Maybe the following will help you change your viewpoint so that you can make a genuine effort to understand why an item is on the list of mandatory ground training.

A short time ago a crew had an unexpected crash landing when a gear collapsed after touchdown, the aircraft veered off the runway and burst into flames. The order was given to abandon the aircraft. One crewmember stood up to go over the side and felt the oxygen hose tugging on his helmet, so he sat back down in the seat and disconnected his hose and interphone cord, then successfully got out. Thanks to a helicopter overhead, the flames were kept from the cockpit area.

This crewmember negated all efforts of the Life Science people to make sure he could leave the aircraft in minimum time. He said he was surprised when he felt the tug on his neck and thought he wasn't going to get free. This man had been certified as having completed his ground egress training. Obviously he had never made an exit from his aircraft with helmet on and connected, utilizing the oxygen hose emergency disconnect and experiencing it work. When the time came to use it, he was surprised and confused. The intent of training had never been complied with fully.

Regardless of what your job may be, you represent a sizable investment to your government; to train you to experienced status is an expensive process. Like all business concerns, your government deserves protection from loss of resources. Help protect this investment—YOU—by knowing why the training is required and then by practicing properly. ★

ARE MIDAIRS A MUST?

In spite of all that has been done during the past several years, midair collisions continue to occur. SEA is a fertile field for this type of accident, due to many factors, one of which is the sheer number of aircraft operating in relatively confined areas.

A little over a year ago, the deputy commander of the 7/13 Air Forces in Thailand, Maj Gen W. C. Lindley, Jr., called attention to the problem of midairs in a letter to his wing commanders. While the factors have changed somewhat since then, the problem is still present. Therefore, pertinent excerpts from that letter are presented here toward the objective of preventing future accidents.

. . . Two points stand out loud and clear in all midair collisions involving Thai based aircraft. First, weather was not a factor, and second, all collisions but one involved aircraft in the same flight.

. . . Other losses sustained by combat forces may have been midairs but cannot be proved as such. These involve collision of Combat Air Patrol (CAP) aircraft over strike forces as well as possible collision of strike aircraft on the roll-in and/or pull off target.

. . . South Vietnam forces experienced similar accidents. When these mishaps are analyzed and compared with OHRs, "shop-talk" and *"near-hit"* reports, a picture of midair potential emerges. Therefore, they are preventable.

. . . The low and slow FAC aircraft cannot evade a high-speed jet fighter intent on striking a target. Nor can the FAC avoid 20 MM, rockets and other ordnance launched through his position at a target. Aircraft camouflage, poor visibility and enemy defenses cause distractions which compound the problem. The strike pilot must know where the FAC will hold in relation to the target, and the FAC must be there. The FAC also must rely on the strike aircraft attacking from the assigned direction and pulling off target toward a clear area. There can be no question in anyone's mind on these points.

. . . Strike aircraft and support aircraft have nearly collided as they converged at the same altitude. Each pilot is responsible for maintaining correct altimeter settings, maintaining assigned altitudes and applying correction factors as applicable to each aircraft . . . Once combat maneuvering begins, the pilot has only three things protecting him from a midair. They are his ability to "see and avoid," the ability of ground control agencies to maintain surveillance and separation, and the side benefits of his own airborne radar.

. . . Maneuvering a fighter loaded with ordnance, external fuel tanks and other gear to a successful refueling requires a bit of talent. Forcing the refueling cell to higher altitudes because of weather or other reasons accentuates the problem of aircraft control, especially when intermittent afterburner is required. SEA weather will continue to cause refueling problems. There is no doubt that pre-strike and post-strike refuelings are essential. The complete operation, therefore, requires that the pilot maintain constant vigilance. Refueling operations are not suited for tight formation flying, especially when control instability is encountered because of weather or external loads.

. . . Formation acrobatics are prohibited, about this there can be no doubt. There are two essential maneuvers that are similar to formation acrobatics. Both the flight roll-in and pull off target represent a strong collision potential. The only defense against this threat is good flight discipline and strong supervision.

. . . The old midair threat, head in the cockpit while making a UHF channel change, probably is a bit insidious in that fatigue may dull the keen mind essential to a pilot. There is no doubt that a wingman cannot keep his head in the cockpit for long. This is why the remote UHF indicator was designed.

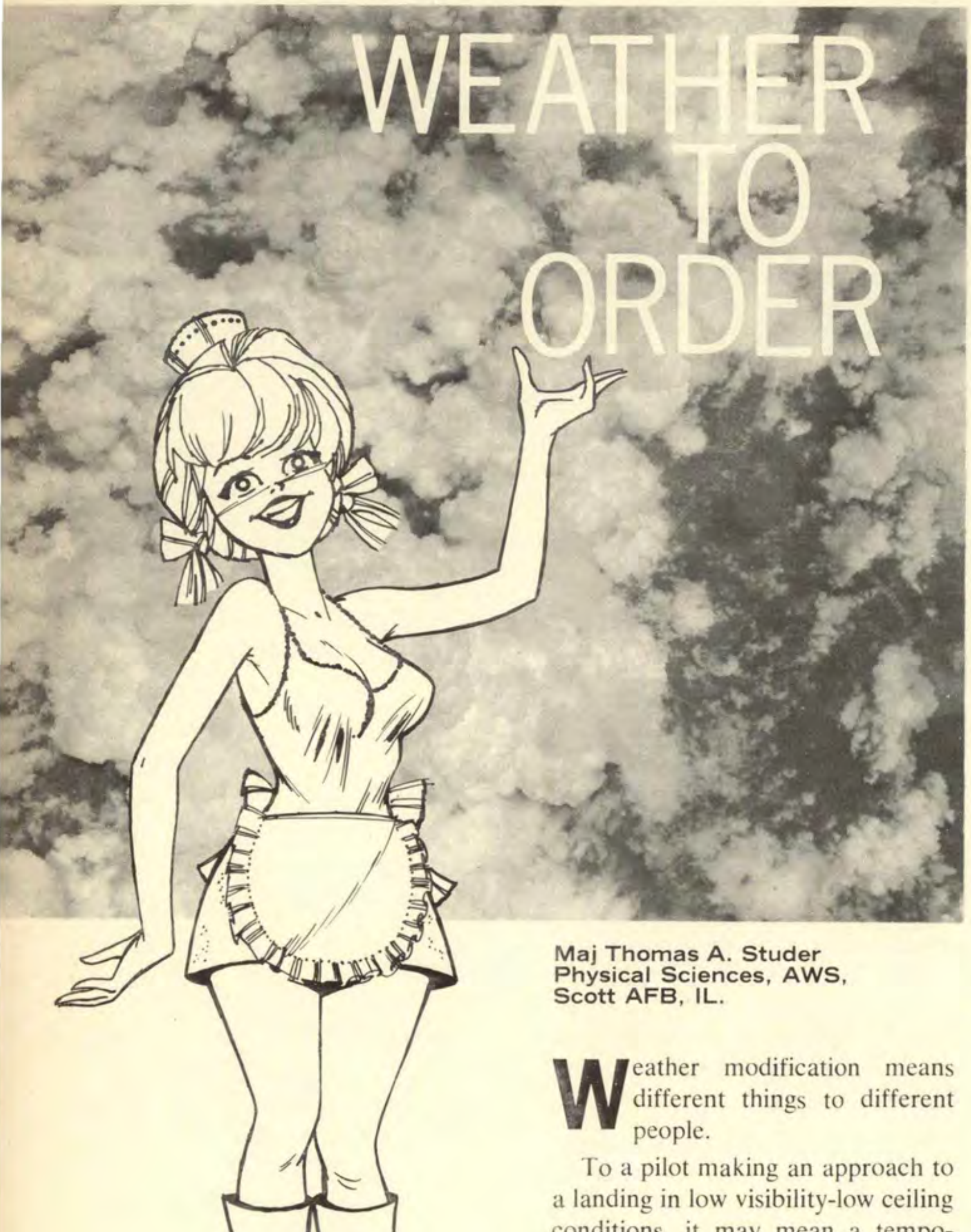
. . . Traffic around airfields is always an area of potential midair collisions. In SEA, the situation is the worst imaginable due to the conglomeration of aircraft seen around each base, language barriers and the demands of a combat environment. Changing weather, facilities, navaids and communications deficiencies can also cause situations to snowball on a fatigued pilot until he is oversaturated and a collision results. A good lookout and good support by ground controlling agencies is the only defense against collisions on or near airfields.

. . . One of the most lucrative places for the midair hazard to strike has been the battle damage check. To be sure, this is an essential check and assistance must be rendered as necessary in each case. However, all pilots must be alert to the potential danger of flying too close to damaged aircraft, regardless of the cause of damage. There is no way of predicting when the pilot of a damaged aircraft will lose effective flight controls and snap over or, perhaps, when an aircraft will burst into flames and explode.

. . . An analysis of midair collisions which have occurred in SEA revealed most involved aircraft within the same flight performing more or less normal maneuvers. . . . It becomes evident that, to prevent midairs aircrews must stay alert and know the maneuvering capabilities of their aircraft in all configurations. ★

Weathermen are learning more and doing more to serve up . . .

WEATHER TO ORDER



Maj Thomas A. Studer
Physical Sciences, AWS,
Scott AFB, IL.

Weather modification means different things to different people.

To a pilot making an approach to a landing in low visibility-low ceiling conditions, it may mean a temporary clearing of the area immediately surrounding the runway.

To the anxious resident of a gulf coast state, it may mean a hurricane dissipated or diverted, thus saving lives and preventing the destruction these horrendous storms produce.

To a farmer it may mean crop-saving rain, or, conversely, a flood or hail storm that ruins his crop.

Other people see weather modification as changing the climates of entire continents or of large geographical areas. Some react with enthusiasm, others with suspicion and distrust.

Regardless, the potential of weather modification is immense and the Air Force is actively engaged in weather modification research. The problems that must be solved, however, before this potential can be realized are in some instances staggering. Because some forms of modification may cause incalculable long-range effects, caution and common sense must be used in modification efforts. Caution should not hide the fact, though, that a limited but very useful ability now exists to modify weather and that this ability will expand in the near future.

Because of man's intimate involvement with weather during his daily activities, most of the ways in which weather can be modified can be applied in some manner in making these activities safer. As weather modification techniques are developed into routine operational procedures, particularly where they permit economical application, they can be exploited effectively to increase flight safety. Recognition of this has been a major factor in influencing USAF toward steadily increasing emphasis on research and development in this area.

One initially needs only to consider the impact of a single guaranteed alternate airport in an area of widespread fog to grasp a vision of the potential value of weather modification in advancing flight safety. Focusing farther into the future, the possibilities for suppressing hail and lightning to advantage present themselves. And some day, well into the future, it is almost certain that we will be able to diminish or divert the damaging hurricanes and typhoons.

Let's review what can be done now in weather modification. This was well stated by the American

Meteorological Society in October 1967. Essentially this statement indicates:

It is possible to increase modestly the precipitation from orographic clouds.

It is possible to modify convective cumulus clouds, though for the most part with unpredictable results.

It is possible to dissipate supercooled or cold fog, that fog consisting of liquid water droplets at temperatures below freezing and above approximately −20°F, but not ice fog which consists of ice crystals.

It is possible to dissipate warm fog, that fog occurring above 32°F, using heat, but clearing a sizable area such as an airport requires an expensive application of large amounts of heat.

Augmenting precipitation is of prime interest to civilian agencies. But with fog and stratus, where the means to achieve a limited control is at hand, USAF has already mounted a significant operational program.

Air Weather Service, which has responsibility for providing operational support in weather modification to the USAF and US Army, now has an airborne capability that can routinely and reliably dissipate supercooled fog. Support given the Alaskan Air Command at Elmendorf AFB under Project COLD COWL during the winter of 1967-68 demonstrated the value of such a system. As a result of seeding operations there, 91 COMBAT PACER aircraft, enroute to and from SEA, were enabled to land when normally they would have had to divert, and 94 made scheduled takeoffs that otherwise would have been delayed. This operation contributed substantially to the safety of flights routed through Elmendorf.

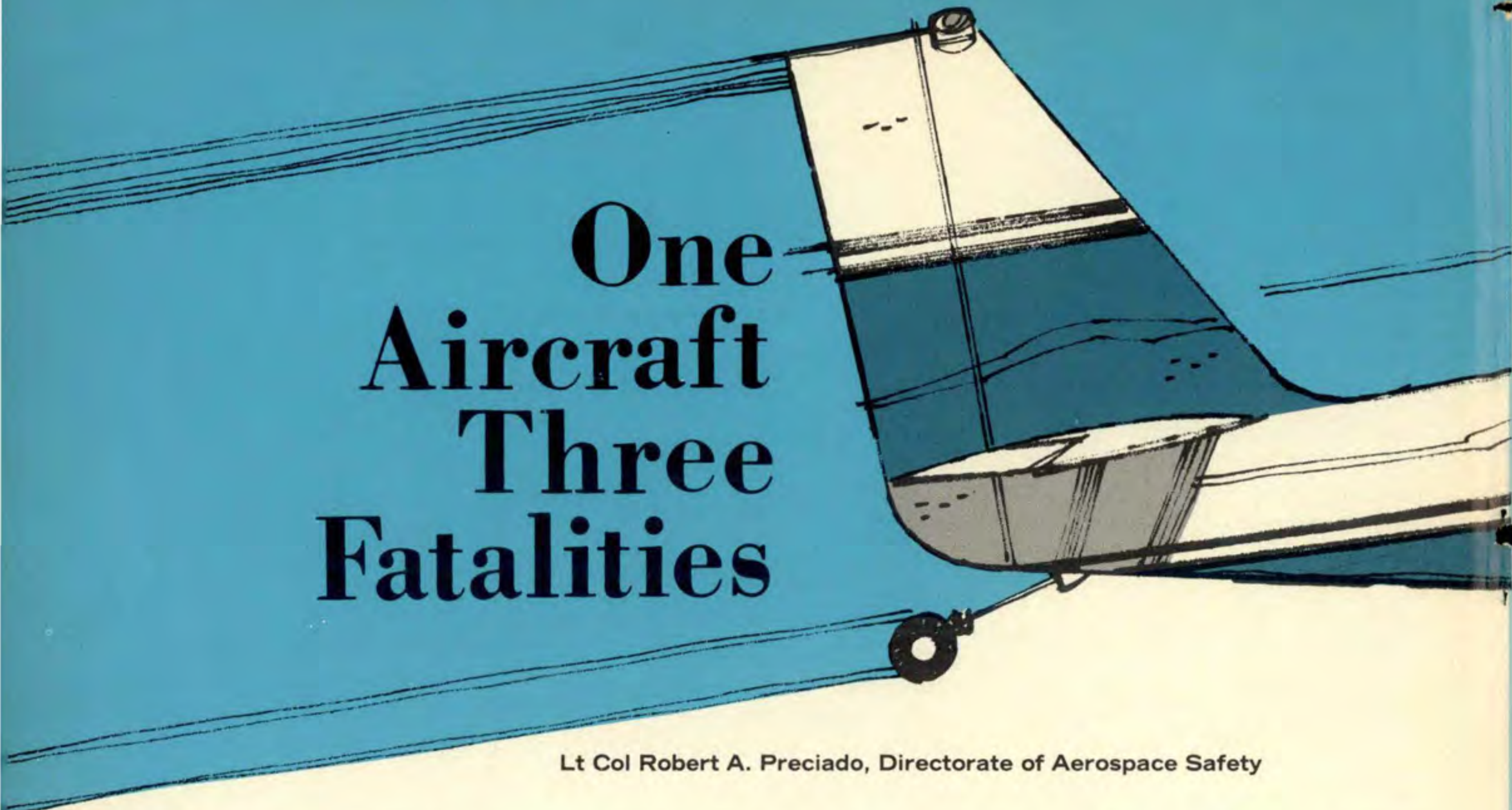
Supercooled fog dissipation under operation COLD COWL is being carried out again at Elmendorf AFB this winter. A similar program has been initiated in Germany to learn if this capability can be effective in support of flying units in USAFE. WC-130s, hurricane and typhoon reconnaissance aircraft out of the 9th Weather Reconnaissance Wing, are flying in support of both these programs.

To make dissipation of cold fog available to more operational units, AWS is now attempting to develop less costly ground-based systems. A ground system is being tested this winter at Fairchild AFB to dissipate the cold fog that frequently interferes with the flying operations of the 92nd Strategic Aerospace Wing. This represents the first time that operational support with ground-dispensed seeding material has been attempted at a USAF terminal. To further enhance the probability of developing a practical ground-based system, testing will also be conducted at Kingsley Field, Oregon, and Wiesbaden AB, Germany.

Most of the fog that causes operational problems is warm fog. So far a practical method of routinely dissipating fog of this type has eluded the efforts of all those seeking it. FIDO (fog investigation and dispersal operation), used in England during World War II, was effective but costly and somewhat hazardous. This technique depends upon burning hydrocarbon fuels openly to evaporate the fog. Other safer and more economical avenues are now being actively explored and the most promising will be adapted by Air Weather Service to USAF support as rapidly as practical. A preliminary evaluation of water-absorbing materials, injected from the ground, was made at Travis AFB during November and December. This approach to dissipating warm fog is theoretically promising but until this test it had never been adequately tested under actual fog conditions.

Other potential military uses for weather modification, such as suppressing lightning and hail and reducing the strength of winds in hurricanes and typhoons, have obvious value considered from the standpoint of safety. These capabilities are still well in the future and much research remains to be done before they can be phased into operational military support. A difficulty encountered in developing other modification techniques that is not encountered with fog problem, comes from the natural variability of these phenomena. Fog can be seeded and, if reasonable care is taken, it can be determined rather easily whether any observed clearing comes from the seeding. This is not so with techniques for hurricane, hail, and lightning modifications. One can seed to suppress hail, for example, as has been done so often in Europe and in Russia, but if it does not hail, the nagging doubt exists that it may not have hailed anyway. Admittedly this is due to a lack of basic knowledge as to what goes on when these phenomena occur and the limited means that are available to gather this information in the real atmosphere.

The development of cloud physics expertise is a prime goal of USAF weather research and development programs and the operational programs. This expertise, aided by the progress which is anticipated in the measurement and accumulation of observational data, will eventually permit progress in these more advanced areas of weather modification which have such great potential for exploitation in the interest of aerospace safety. ★



One Aircraft Three Fatalities

Lt Col Robert A. Preciado, Directorate of Aerospace Safety

Most of us have seen a sign hanging in an office somewhere that says "THIMK." The sign usually causes a chuckle but its implication is far from funny and all too often tragic. The following story is a case in point.

It was a nice weekend when three fine Air Force members decided to fly a private aircraft on a short cross-country flight to visit their families and friends. They arrived at their destination Friday evening and spent an enjoyable weekend. They scheduled the return trip early enough Sunday to preclude excessive fatigue during the flight. There was no evidence of drinking or drugs being used and the group seemed to be up to the return trip.

The pilot was well qualified and had several hundred hours in this type aircraft. From evidence available, it appears the pilot or one of the two passengers called a nearby USAF weather office for an enroute weather briefing. The forecast weather for takeoff and enroute was anything but good. Winds for takeoff would be gusting to 40 knots, and severe turbulence would have been encountered enroute.

It was important for the group to get back to their duty station so they proceeded as planned. Families and friends accompanied them to the airport to observe the departure. The pilot made a careful check of his aircraft, and the group strapped themselves in. The aircraft was taxied slowly because of the high gusty winds and upon arrival at the selected takeoff runway, the aircraft paused for approximately 30 seconds while another aircraft took off on the main runway in a severe crosswind. It is not known if a proper runup check was made by the pilot during the 30 seconds wait at the end of the runway.

After the short pause the aircraft lined up on the alternate runway with the nose pointed almost directly into the wind. The aircraft was not overloaded, but there were power lines to clear at the end of the runway and a small mountain one mile from where the takeoff roll began. In spite of being headed into the wind, the aircraft was observed to have a longer takeoff roll than normal. After the aircraft became airborne it climbed approximately 50 feet, dropped 20 to 30 feet, climbed to approximately 50 feet, dropped again 20 to 30 feet and then began what was to be its final climb. The aircraft cleared a telephone cable 21 feet above the ground, but the vertical stabilizer contacted power lines which were approximately 16 feet above the telephone cable. The right wing cleared one of the power poles of the system by seven feet.

When the vertical stabilizer hit the power lines the aircraft pitched up, rolled inverted and dived into the ground in a near vertical attitude. The three occupants received fatal injuries.

The exact cause for the aircraft not climbing as it should have was not determined. The aircraft engine

was thoroughly checked and nothing was found to indicate it was not performing as it should.

The pilot was found to have 22 per cent saturation of carbon monoxide in his blood system. This amount of carbon monoxide in the blood is enough to reduce mental acuity, cause a headache and induce symptoms similar to fatigue.

All of the other victims also had excessive carbon monoxide in their blood. They each came to the airport from separate homes and in separate automobiles. Therefore, it must be assumed that the carbon monoxide came from the aircraft, even though a check of the aircraft exhaust/heater system failed to reveal any deficiencies.

The location of the airport and runway heading in relation to the nearby mountain and wind direction creates a combination of adverse wind swirls and severe turbulence for aircraft taking off under similar conditions. The manager of the flying service at the airport considered the weather conditions (winds) unsafe and ceased his flying activities over six hours prior to the accident; however, there were two other aircraft flying out of the airport at the time but neither one of them elected to take off into the wind and toward the mountain. It is believed that the pilot of the ill-fated aircraft was not aware of the local weather problems and made his takeoff directly into the area having the most severe air currents.

Another factor which could not be overlooked was a possibility of carburetor icing. Although the temperature at the time of the accident was approximately 62°F (there was no visible moisture), the dew point was 36° and relative humidity was 37 per cent. The temperature drop in the throat of a carburetor can be as much as 72°F (40°C) but normally will not be over 36°F (20°C). With a temperature drop of only 30°F carburetor icing could have formed in the throat and caused a loss of power.

It is the opinion of the investigating officer and the medical officer that had shoulder harnesses been available and used by the victims, it is quite probable that they would have survived. As it was, shoulder harnesses were not available. All three victims sustained relatively minor body injuries and major head injuries. The head injuries resulted from instantaneous deceleration with the upper bodies and heads moving forward.

This accident is no different from any other. A precedent was established for it long ago and it has been repeated many times. The sequence of events leading to the final catastrophic moment is so familiar, yet this is not the last time an accident will happen from the same causes.

The big question is what to do about it. Do you fly private aircraft? The answer, then, is in your hands, because in the final analysis, only you can prevent something similar from happening.

"THINK—DON'T THIMK" ★

Mighty Mouse and Me

Grover Tate, General Dynamics, Edwards AFB, CA

"Hey, hey, ride the Mighty Mouse, get the thrill of your life—you too Dad, bring the kids, only one half of the dollar. Show the kids you're still a swinger." Thus yelled the carny barker as we stood watching the wildly swinging roller-coaster type ride.

"Come on, Dad," Sara, my six-year-old girl, encouraged.

"Yeah, come on, Dad," 10-year-old Tedi pleaded.

"Not on your life, or mine either," I answered.

"Golly, you won't ride any of the real fun rides," Tedi pouted. "You act like you're afraid or something."

"Yeah, they're fun and you won't let us ride any of the good ones. Lynn's daddy rides all of them with her and she's only five," Sara taunted.

"Are you afraid, Daddy?" asked Tedi.

This was a crucial time for me and I hesitated a long time before answering. I had never thought of myself as being particularly afraid of anything and the idea was not appealing. There are many things for which I have a healthy respect, things like rattlesnakes and guns pointed at me, but I had never really associated them with being afraid. Matter of fact, I always thought my conduct a bit on the heroic side rather than on the afraid side.

I watched the rattling car turn sharply on its track while its screaming occupants were thrown violently to one side of the car. I noted the bearing surface of its wheels on the loose tracks. The stove bolts, sans safety, that held things together fell into view. The mechanic with his stilson wrench who wandered about the machinery was hardly Airman-of-the-Month material. Even the start-stop lever was badly worn and in that respect reflected the physical appearance of its operation. The whole set up was more Mickey Mouse than Mighty Mouse.

I guess I am afraid, I thought. The kids could tell that they had got to me and rather than press their advantage they started to make amends. Guess that's one of the real beauties of kids, you have sort of a mutual admiration society with them that shows up when the going gets rough.

"Daddy flies and tests airplanes so you know he's not afraid," Tedi defended.

"Well, if he is not afraid in airplanes, why is he afraid of Mighty Mouse?" Sara questioned.

"Well, I guess it's not the same thing," Tedi reasoned.

Both girls stole quick glances at me and then stared wistfully at the noisy monster before us. I owed them an answer.

"Guys, you are both a little young to understand what I'll tell you, but let's give it a go anyway. You know the man wouldn't give you a sticker for your bicycles until he had checked the brakes and lights? We can't get a base sticker until they give our car a safety check to see that everything is in working order and safe. With airplanes, it's a much bigger task to make sure they're safe. You know, zapping along at five or six hundred miles an hour you can't get out to tighten a loose bolt."

While thinking about airplanes and safety and looking at the rickety carnival ride before me, I realized just how good our safety program really is. First of all, safety is designed into the machine, the hardware is the best available, the people who do the work are dedicated professionals and one entire unit of the Air Force is devoted to making and keeping airplanes safe. Pilots and crewmembers are made safety conscious and have the last word as to whether or not their machine is safe to fly. Sure, I feel safe flying. Now I'm not about to compromise my safety, much less that of my little girls by being complacent about this shaky carnival ride.

"The airplanes I fly are put together to stay together. The people who work on them are interested in my safety so they do a good job. My airplanes are as safe as a machine can be made. These rides are taken apart and put back together every couple of days and most times by whoever can be scrounged up to do the work. I just don't like the looks of this ride and don't feel that it's safe. I'm not afraid of it, it's just that my judgment tells me that it would be better not to ride that thing. There is no point in asking for trouble. You guys understand that don't you?"

"Guess so," they answered, almost in unison.

"O.K., let's see what else we can find to do," I said, looking for a graceful conclusion.

For the rest of the evening we had a marvelous time riding less exhilerating rides, throwing baseballs, pitching dimes, betting on electric horse races, seeing two-headed cows and petrified giants and eating too much cotton candy, peanuts, etc.

The evening appeared to be a roaring success and both little girls were asleep when we got home. I carried them into the house and with their drowsy help got them dressed in their nightclothes and into bed. I covered them and kissed each one good night.

"I love you guys," I whispered as I turned out their light.

"We love you, too, goodnight," they answered.

As I went toward my own bedroom, Sara whispered, "I still wish we had got to ride Mighty Mouse."

"Me, too," answered Tedi.

Oh, well, you can't win them all. ★

SAFETY IS:

Accepting personal responsibility in performing *your* mission or task.

Acquiring the knowledge to accomplish *your* assigned duty.

Insuring that the required personnel, technical data and equipment are available prior to starting *your* mission or task.

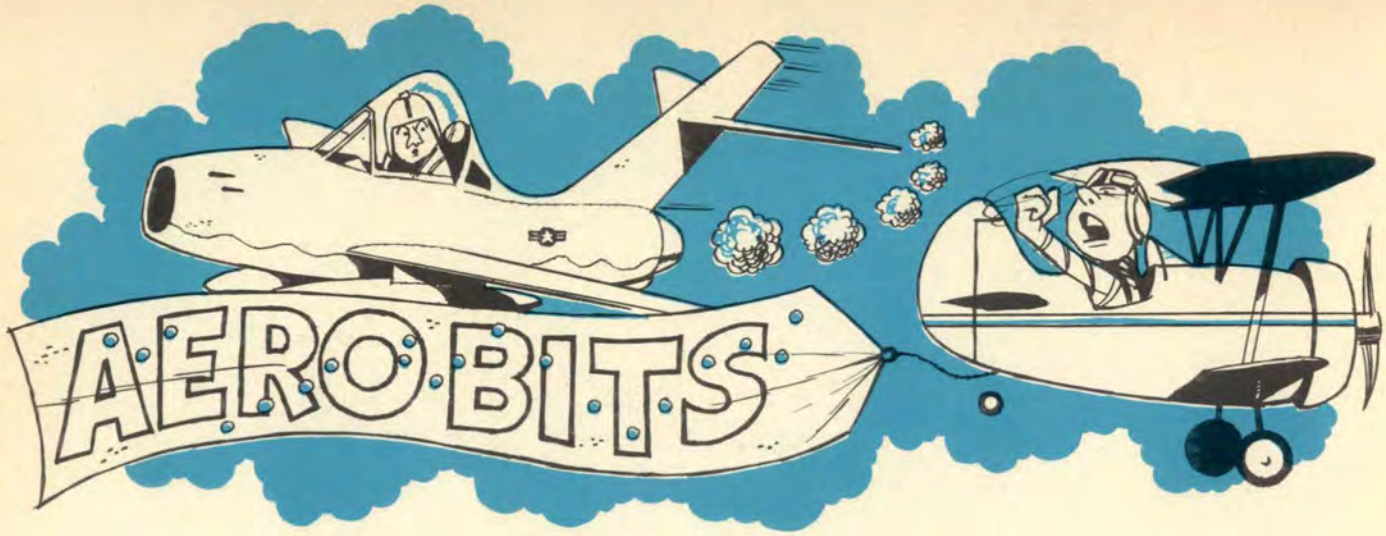
Performing *your* assigned duty in a professional manner, as outlined in applicable directives.

Advising *your* immediate supervisor of difficulties or problems associated with the task and obtaining the necessary guidance before continuing with the job at hand.

Assuring, through *your* coordination with supervisors, that problem areas encountered are identified and action is taken to preclude recurrence.

NEVER compromising safety for expediency.

Maj William C. Mossholder
Directorate of Aerospace Safety



NOTHING BUT THE TRUTH. A member of the FAA's air traffic control contingent in Vietnam has passed along this story about a conversational exchange between a control tower operator and commercial pilot at the big Da Nang airbase. The pilot, after receiving instructions to execute a 360 degree turn to the left for spacing purposes, asked if the controller realized that even a 180 degree turn cost his company $40. "Roger," the controller replied calmly, "make me an $80 turn to the left." The source for this story is considered "generally reliable"—that is, we haven't caught him in an untruth lately. (FAA)

ATIS PROCEDURES. Pilots are no longer required to tell tower controllers that they have received Automatic Terminal Information Service (ATIS) broadcasts as a result of new Federal Aviation Administration procedures designed to reduce further unnecessary radio communications between pilots and controllers in the terminal area.

Previously, pilots were asked to notify the tower on their first radio contact whether they had received the pre-recorded ATIS broadcast. Failure to provide this information necessitated additional radio conversation between controller and pilot to confirm receipt of the ATIS broadcast.

Under the new procedures, it will be assumed that pilots have received the broadcast unless they indicate otherwise. (FAA)

NOT LONG AGO A C-123 got away from the pilot during the propeller reversal phase of an assault landing demonstration. All of the crewmembers received injuries and the aircraft was not reparable. The primary cause was materiel failure in the number two propeller system resulting in asymmetrical thrust and loss of control. Listed as a contributing cause was: "Crew who flew the aircraft the day before the accident failed to document a propeller reversal malfunction and the pilot identified a prop overspeed with the wrong engine." Granted the pilot who had the accident moved the throttles to maximum reverse too rapidly, but who put him on the "razor's edge?" Obviously the flight crew who failed to make a complete and accurate postflight write-up started the chain of events that led to the loss of another valuable resource. Mechanics aren't magicians; they depend on accurate aircrew write-ups so that they can pinpoint troubles.

EJECTION PROBLEM. It started as a normal three ship nav training mission—until the pilot of Nr 2 decided to come out of burner. At that instant an explosion, much like a very heavy compressor stall, knocked his feet off the rudder pedals. He saw that rpm was decreasing with three or four warning lights on, and turned on the airstart switch. As he reached for the emergency fuel switch, Nr 3 radioed that 2's bird was on fire. Nr 2 pilot pulled back on the stick and fumbled with the ejection handles. Despite this, the ejection was a success and he landed in a pine forest.

The fumbling with ejection handles resulted because this pilot was in the habit of storing the Form 781 between the left seat handle and the side of the cockpit, and it got in his way when he tried to grab the left handle. So much so that he finally used the right side handle for the ejection. A small point, perhaps, but not so small during a low altitude ejection.

THE RAMPS ARE ALWAYS CROWDED in SEA and quite often congested on bases in other areas. It obviously isn't enough to warn pilots away from parking too close to the aft end of large jet powered aircraft or to warn the men flying these powerhouses against using high power before ascertaining exactly what is parked behind them. This statement leads to the question, "What is too close?"

A recent accident in SEA proved beyond a doubt that 200 feet is much too close. A multi-jet contract

carrier did considerable damage to the empennage of a USAF transport when the pilot advanced power to leave the blocks and taxi out for takeoff. Come on, men, competition is great but let's refrain from violence against the "good guys." Everytime you park you must be acutely aware of the area and its occupants. You must also take a good look in every direction before you climb on board to fire up and leave. So, don't just be warned of these dangers; think about what happened to the other guy and realize that it might be your turn next!

AFTER LIFTOFF THE F-105 PILOT noticed immediately that the aircraft was left wing heavy. As he accelerated the condition worsened until the aircraft suddenly rolled violently to the left. The resulting forces prevented the pilot from maintaining the optimum ejection position and he sustained multiple injuries when he punched out. The board determined that a failure in the trailing edge flap system caused the flaps to stop traveling at about the 68 per cent extension point. At this point, there was a five to seven degree differential between the flaps. As the airspeed increased, the left flap failed completely and caused a violent roll to the left. The board findings included confirmation that the pilot checked the stick grip trim override "OFF," thus negating trim assistance. All control surface actuators were in neutral at impact. The primary cause was failure of either the flex shaft or jackscrew drive gear of the trailing edge flap screwjack. A contributing cause was pilot factor in that he failed to recognize a differential in flap position and exceeded the handbook airspeed for this condition.

DISPLAY THOSE SEAT PINS. Based on recent experience and conversations with a large number of pilots, it appears that the old reliable procedure of displaying the ejection seat safety pins to the ground crew prior to taxi is not being practiced in many instances.

Regardless of how many times something is printed in the checklist, pilots occasionally forget items, especially when confronted with an unusual or strange situation. An interruption during the normal before taxi procedures, such as receiving the ATC clearance, can distract the pilot causing him to forget the seat pins. Put him at a strange field at night, and he may also forget to remove them prior to takeoff. Sound familiar?

There are probably several procedures which could be instituted to prevent this omission; however, the one single procedure which will absolutely guarantee seat pin removal prior to taxi is a joint responsibility on the part of the pilot and the ground crew. If the ground crew will simply refuse to remove the chocks until the pilot has displayed the seat pins, this error of omission will be prevented. If this is accomplished prior to every flight, some pilot's life just might be saved during a low altitude bailout immediately after takeoff.

Apparently there are no Air Force directives which specifically address this subject. AFR 60-11, AFM 127-101, and flight manuals for each aircraft equipped with ejection seats should be amended to include instructions for mandatory display of seat pins prior to removal of chocks. The Directorate of Aerospace Safety has taken action to amend these directives.

In the interim, adherence to the procedure recommended above should be re-emphasized to all air and ground crews. It's a good common sense safety practice, designed to save lives. ★

Maj Larry T. Cooper
Directorate of Aerospace Safety

GREETINGS FROM LAOS

I would like to tell my old companions in Flight Safety that *Aerospace Safety* is an integral part of our somewhat primitive flight safety program in Laos. The magazine is especially helpful to us because the printed word from the highest level of safety in the USAF is considered gospel by the pilots of the Royal Laos Air Force (RLAF). All editions passed to them are read avidly, treasured, and well dog-eared before being stored as reference material.

The RLAF flies and maintains T-28, C-47, H-34, O-1, U-17 and U-6 aircraft, so articles concerning reciprocating engines and these aircraft types are of particular interest—keep them coming.

Further, the RLAF, though small, can be justly proud of its combat operations in SEA. Articles devoted to tactical ordnance delivery techniques, particularly those containing hazard and safety tips, always prove to be the most stimulating and controversial in discussions....

Col Eugene P. Sonnenberg
Assistant Air Attache, RLAF

"SLIPPERY RUNWAYS AND CROSSWINDS"

1. The article, "Slippery Runways and Crosswinds," by Lt Col John M. Lowery, in your October 1968 issue, was excellent. Congratulations are extended to Lt Col Lowery for his excellent treatment of this growing flying safety problem from a pilot's viewpoint.

2. Now, to make the circuit complete, how about a few precautions for Flight Supervisors and Command/Controllers? Areas of principal concern would appear to be centered around the following areas:

a. Can a pilot *normally* be expected to avoid a formation takeoff or formation landing if he has been committed to the takeoff or landing by his flight supervisor or command/controller? I think it would be highly doubtful. Don't you?

b. Landing on the upwind side in a crosswind and on a water covered runway may not be a "best judgment" because water trying to drain upwind from the runway crown may be more deeply puddled by the opposing force of the wind than might be the case on the downwind side of the runway. The point is, without an actual investigation before the fact, no clear best course of action can be assumed by the pilot in the cockpit. The decision of whether to use the center, the upwind or downwind side of the runway in a crosswind and water covered runway condition cannot be soundly made from the cockpit. Is this not a supervision/command problem?

c. Use of short field landing approach speeds and firm touchdown may be OK for no gusts and no crosswind conditions when landing on slippery runways; however, does the pilot have much choice but to add knots for crosswinds and gusts? How can the pilot in the cockpit make a good decision when all he has to select from are bad alternatives?

d. Considering barrier engagement as a solution to a normal roll out and braking may be the safest way out for a *pilot* course of action under questionable circumstances; however, supervision and command/control has goofed when the pilot finds that he has been left with this as the best alternative.

3. We need a sequel to this excellent article to explore what precautions management has taken or can take. As a minimum, it appears that management should:

a. Establish reasonable controls to prevent the pilot from encountering and making a "face saving" bad decision—*to go/land or not to go/land which equals go/land if in doubt.*

b. Obtain practical equipment to reasonably and accurately determine hydroplaning probability, runway cover reading (RCR), rolling friction drag (slush and snow) so that aircraft performance and controlability may be accurately determined and accounted for in takeoff and landing performance computations and decisions before the fact. Did not FAA find that the James Brake decelerometer was the most inaccurate of all measuring devices studied in their slick runway testing program a few years ago? The point here is that adequate command policy, supervisory responsibilities, equipment, and operating procedures should replace the inadequate pilot rules of thumb dealing with slick runway and crosswind operations.

c. Provide the pilot a "break" as well as a "brake" during takeoff, abort, and rollout under all legal/cleared operating conditions.

4. A command/flight supervision sequel to the pilot's point of view should do much to further explore our total safety interest in flight during slick runway and crosswind conditions. Your evaluation of this proposal would be appreciated.

Col John J. Dwyer, Jr.
1002 IG Group

Thanks for your penetrating letter and excellent suggestions. There are undoubtedly many factors in crosswind landings on slick surfaces that need to be explored further. Too late to print, we received a reply from Lt Col Lowery to Col Dwyer's letter. We will print it next month in Mail Call. Be sure and read it; you'll find it interesting.

"ARCTIC MAYDAY"

Reference is made to the excellent article "Arctic Mayday" appearing in your October issue.

On page nine of the article, the white-out conditions and lack of any reference point is mentioned. It may be of future value to point out that M-13 smoke flares can be used for staining snow (sand and other surfaces also) thereby creating a reference point. When the smoke end of the flare is held two to four inches from the surface to be stained a definite orange color will occur. This does not necessarily impede the use of the smoke as a signal. The five or six feet difference in height, caused by pointing the flare down, does not detract from the effectiveness of the smoke signal. When the smoke has dispersed a semipermanent signal and reference point remains until the surface of the snow (or other material) is altered or covered. This system of transmitting messages and establishing reference points has been used on Andean snowfields and tropic beaches for a number of years by the USAF Tropic Survival School rescue team.

H. Morgan Smith
Chief, Arctic, Desert, Tropic Info Center
Maxwell AFB AL

As Investigating Officer on the accident described in "Arctic Mayday," I have noted a minor discrepancy in the October 1968 cover. There are no HH-43B helicopters in Alaska. Rather an H-21 piloted by Major Norman Kanhoot of the 21st Operations Squadron was used in the recovery of Captain Harold Brost.

Regarding another article in the same issue titled "The Fuel Flow Gage," I feel the fuel pressure gage is the important substitute instrument for T-33 jocks and perhaps others who have this instrument in lieu of the fuel flow gage. ★

Maj Leo H. Bender
317 Ftr Intcp Sq
APO Seattle 98742

☆ U. S. GOVERNMENT PRINTING OFFICE 1969 341-213/5

WELL DONE

Captain
Philip D. Knowles

Major
Harry W. Rutter, Jr

Tech. Sergeant
Frank D. Garcia

3300 SUPPORT SQUADRON, RANDOLPH AFB, TEXAS

Staff Sergeant
Ralph K. Koovooras

Staff Sergeant
Cornie G. Lowe

3511 ORGANIZATIONAL MAINTENANCE SQUADRON, RANDOLPH AFB, TEXAS

On 28 December 1967, Captain Knowles and his crew departed Andrews AFB, Maryland, in a C-131, enroute to Randolph AFB, Texas. Approximately one hour after takeoff, with the aircraft cruising in clouds and precipitation at 8000 feet, the right engine began backfiring and soon failed completely. The propeller was feathered and power was increased to maximum permissible on the left engine. Although the electrical load was reduced immediately, the remaining load proved too much for what was later determined a defective left generator, and it also failed.

Air Traffic Control was advised of the emergency and their assistance was requested. All electrical equipment was turned off to conserve what battery power remained and the aircraft was turned west toward better weather.

Because of the heavy aircraft weight, ice accumulation and the requirement to use carburetor heat within cloud formations, the pilots were having difficulty maintaining a safe altitude. In addition, the crew was faced with a long flight to the west with limited flight instruments, no navigation aids, no communications, and the prospect of flying into darkness without lights. In the meantime, Air Traffic Control had vectored a United Airlines Viscount into position to assist the disabled C-131. The pilots joined in formation with the Viscount and were led to the McGee-Tyson Airport at Knoxville, Tennessee, where two approaches were attempted; however, aircraft incompatibility, dense clouds, and ice accumulation prevented them from being successful.

Southwest of Knoxville, the pilots encountered a break in the undercast and identified a major highway and a small town with an adjacent airport. After descending through a break in the clouds, they determined the suitability of the airport and established a single-engine visual approach. After touchdown, the remaining battery power was used to reverse the left engine and the aircraft was stopped 500 feet from the end of the 3500 foot runway. Captain Knowles and his crew demonstrated professional ability, composure, and judgment during two hours and 40 minutes of extreme emergency. WELL DONE! ★

if you're alive and conscious . . .

TAKE STOCK

. . . you've got everything you need to survive

- *INTELLIGENCE*
- *TRAINING*
- *CLOTHING*
- *PARACHUTE*
- *SURVIVAL KIT*