UNITED STATES AIR FORCE • OCTOBER 1971

Aerospace SAFETY

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Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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IF THE SHOE FITS

Supervisors in the Air Force take many forms—from the veteran on the flight line with all the stripes on his sleeve to some barely-able-to-vote youngster in the back seat of a UPT trainer. Supervision is usually thought of as a boss-subordinate relationship, but the word has a far broader connotation in the Air Force.

Supervision is specific terminology in accident analysis and identification of cause factors. Inspector General Data Manual 127-1 "Aircraft Accident and Incident Classification Elements and Factors" lists 20 conditions attributable to inadequately supervised flying training or operations. In addition, there are other conditions for aircraft and airbase maintenance.

While supervision is the primary factor in only about seven percent of our aircraft accidents, it figures much more frequently as a contributing cause. For example, maintenance was the primary cause when the engines on a C-130 were run up 650 feet in front of a C-47, causing the C-47 to jump its chocks and break the tiedown ropes. The Gooney was then blown into two parked aircraft. Supervision was the contributing cause in that the wing commander authorized engine runs within the parking area, and the squadron commander failed to provide adequate guidance for engine runups.

In another case, materiel factor was the primary cause, but supervision was a contributor because the System Project Office and the contractor failed to take adequate corrective action on an EUR that identified a hazardous condition.

Now—that seven percent where supervision is the primary cause. Here are some examples:

- The supervisor in charge of a fly-by demonstration watched the weather go sour but failed to cancel the fly-by.
- Flight of fighters was diverted from the intended base of landing to a nearby alternate. However, the weather at the alternate was poor also and the fighters had no ILS capability and precision GCA was not available.
- Flight leader led flight into a thunderstorm area.
- AC allowed pilot to make an unauthorized landing.
- All levels (of supervision) in that supervision, tech data and flight manual instructions were inadequate to insure safe . . . operations.

It is evident, from these few samples, that when the primary cause is supervision, usually one individual is identified. However, the last item above indicates that this is not always the case.

Though the identification of cause factors has broadened the scope of the term "supervision," the fact is that in these accidents somebody in some type of supervisory position failed. That is small comfort to the pilot identified as the primary cause when someone else could have prevented the accident. Two cases will serve to illustrate. In one case, a gear up landing, the RSO failed to check the gear down. In the other, an aircraft was recalled to a base below minimums. Cause factor in both cases: pilot. Contributing: supervision.

Poor supervision is identified repeatedly in incidents involving maintenance discrepancies. In some of these the list of failures gets quite long. A job is not done correctly; the inspector misses it and signs off the forms; the crew chief doesn't catch it on maintenance preflight; the crew overlooks it on walk-around. Most cases aren't this blatant, but this is not an isolated example.

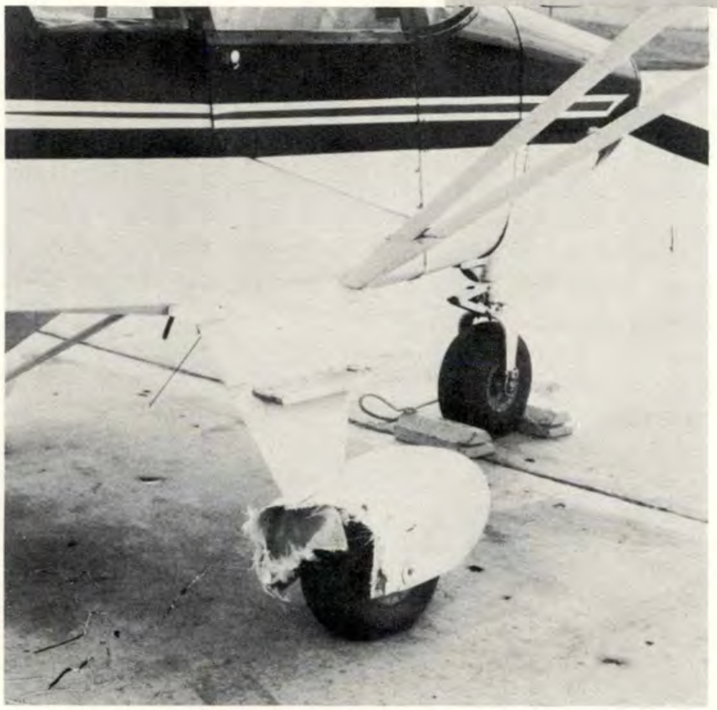
The word supervisor implies authority and that is exactly what our supervisors must exercise if they are to do their job properly and effectively. While mistakes cannot be condoned, young maintenance troops can be expected to make them. That's why men with more experience, and more stripes, are looking over their shoulders.

The same is true for aircrews. Field grade officers, by both their example and supervision, are expected to make up for the lack of knowledge and experience of their juniors. This operates throughout the military hierarchy from the young captain instructing an undergraduate pilot right up to the men with stars on their shoulders.

In our society this is an age of permissiveness. Perhaps, in some respects, that is good, but not when it comes to condoning acts of irresponsibility that may cost another person his life. Our mission is too demanding, our aircraft too complex to permit the permissive approach to permeate aircraft maintenance and flight operations.

This article was based on an analysis of accidents over an 18-month period in which supervision appeared 20 percent of the time as either the primary or contributing cause. Is the message loud and clear? ★

SEE and be SEEN



The T-33 was departing a midwestern base as #2 in a flight of two. He was about 3000 feet behind lead, rejoining, altitude 3500 feet MSL at 230 KIAS. The Tri-Pacer was climbing out of a nearby civilian airfield. He was one of five light aircraft in the immediate vicinity. Both aircraft were 3.5 to 4 miles from respective departure airfields. The T-33 was IFR under radar departure control. The Tri-Pacer was VFR. Weather was good.

Once again IFR clearance and radar control offered positive separation from *other IFR* traffic only. Radar advisories on other traffic are given to IFR traffic by controllers as work load permits, but the responsibility for clearance under VFR conditions rests with the pilot. ★

Our thanks to Major Russel G. Westcott, FSO, AFFTC, Edwards AFB, for this material.

THE EYE AND YOU

What do Pinocchio, Cyrano de Bergerac and Jimmy Durante all have in common? Big noses. What does that have to do with flying? Well, those noses could be a hazard if their owners happened to fly airplanes. Aside from the difficuty in getting an oxygen mask to fit, they would have had trouble with their vision. As long as they were looking straight ahead, everything would be okay. The time when they might find themselves a bit deficient would be when clearing the area for other airplanes.

Everyone has a built in eye defect, but because of a protruding proboscis, the defect becomes more significant. This defect is in the form of a blind spot located in the eye where the optic nerve exits the eyeball on the way to the brain. The blind spot is within the field of vision of each eye 45 degrees from center. However, we are unaware of these areas of blindness because of binocular vision. The left eye can see objects in the blind spot of the right eye and the right eye can see objects in the blind spot of the left eye. Thus we are not aware of any loss of vision. However, if something obscures one eye (such as the bridge of the nose) then this blind spot becomes a factor. At close range this is not significant. From a distance of eight or nine inches the circle of blindness is only about a half inch in diameter. Unfortunately, the farther away the object, the bigger the blind spot. At 200 feet the circle becomes six feet in diameter. At 300 feet you could fail to see a rather good-sized airplane.

Have you ever pulled out in your car at an intersection, only to hear the screeching of another vehicle braking? How could this be if you looked both ways? A door post could have easily blocked one eye, leaving the other eye operating with this blank spot.

How do you compensate for this limitation? Well, half the battle is won when we recognize that this phenomenon exists. The answer is to consciously turn our heads to bring our desired field of vision within 45 degrees of center. This, in most instances, will eliminate the problem of the blind spot. If this were the only limitation we have

Shut left eye—focus on cross, bring page slowly toward your eye and dot disappears.

with the problem of seeing and avoiding, it would be a fairly simple one. There are, however, several other factors that we should be well aware of if we are to make maximum use of our eyes.

Space myopia isn't limited to outer space. It occurs any time we are in a position where we don't have anything to focus on—in other words, a clear day where there is really nothing to see but blue sky. What happens is that, if we do not consciously focus on an object (a cloud, ground, etc.) and just stare at the open sky, our eyes relax and tend to seek a focus at a distance of 30-35 feet. If an object happens to be at this distance, it will be sharp and clear. Objects outside of this range will not be clear. The insidious thing about space myopia is that we may not be aware of it.

It's going to be tough to pick out another aircraft at five to six miles when we're all set to see something at 35 feet. The solution to this is to pick an object such as a cloud, focus on it and *then* look for your target. Fortunately, the procedure is rapid—it only takes about 1/5 of a second for our eyes to focus for distance. However, it does require this conscious act.

The object of all this exercise is, of course, to see another airplane in time to avoid a midair collision. Most of us looking out the windscreen are looking generally for some movement in the sky which will get our attention. This is not the best solution, however, since *an airplane that is going to collide with you has no apparent motion!* Conversely, *you will not cross wings with an airplane that has moved from the spot where you first saw it.* As a general rule of thumb, if you do see an aircraft which looks like a possible threat, try to keep him in sight. The ol' rule about air to air "turn into the attacker" applies pretty well in collision avoidance too.

There's only one way to for sure avoid a midair—don't fly. Since that method isn't too practical we will have to find a better solution. With the numbers of military and civilian flying machines airborne in these times, you are bound to be in proximity to another aircraft at

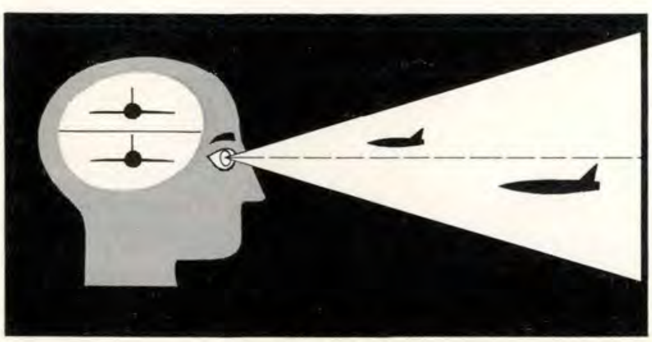


FIGURE A

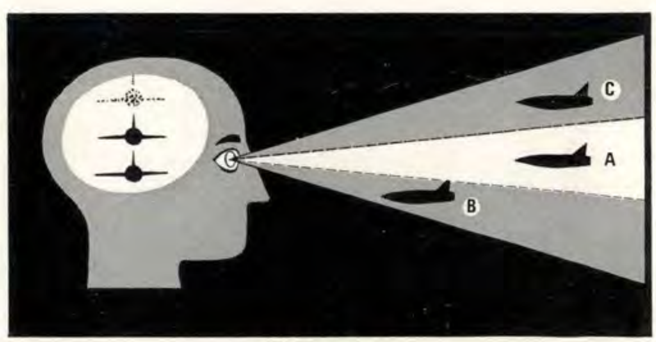


FIGURE B

This is extremely important because visual acuity is a function of the angle subtended by an object we are looking at. Figure A demonstrates that a smaller object would appear as large as a bigger but more distant object. Therefore, if altitude myopia occurs, a man might not perceive a C-5A at otherwise easily discernible distances. Figure B illustrates the decrease in visual acuity with the angular separation of an object from the cone of foveal (focused) vision. In Figure B, a pilot's eyes are focused on aircraft "A." Note that aircraft "B" is outside his cone of foveal vision and much closer. However, the pilot's mental perception of aircraft "B" is hazy although larger, while aircraft "C," at the same distance as aircraft "A," is perceived as being much smaller and more indistinct. This assumes that all aircraft are the same size; therefore, objects regularly separated by only a few degrees from an object that you are focusing on become much harder to see, regardless of their size or distance.

some time. The best answer is to keep your eyes out of the cockpit. Fly defensively; assume that *you* are the only one looking out and that all the pilots of other aircraft are out to "get you." Your chances of seeing and avoiding are greatly enhanced if you are properly using your eyes. Many pilots look out constantly, but really never see anything. One of the unusual phenomena is that the eye does not see details while it's in motion! So, for someone looking for another aircraft, the scan method is not the answer. The best way is to look in quadrants!—preferably 45 degrees at a time. Pick a sector, gear your eyes for distance vision and spend a second or two thoroughly covering that area, then move on to the next 45 degree segment. Two pairs of eyeballs are twice as good as one and if possible, get three pairs working if the space in the cockpit permits.

We always consider too that while in positive control airspace that we're safe as a bug in a rug. However, we remember the case of the T-Bird pilot who was off his altitude while in APC. His explanation after a near-miss was that he was just climbing up a few hundred feet so he could dive and "get 'er on the step."

Night vision presents its own set of problems. Everybody knows by now that the cones of the eye are used for day vision and rods are designed for night vision. Since we are short on rods in the center of the eye the solution is to look to one side to see an object clearly at night —but how far to one side? Most experts say 10 degrees. Another little helpful technique is to look *past* the object we want to see and this will give us more detail.

Hopefully, we've got the message across. We no longer fly in "empty" airspace. The dramatic increase in the number of aircraft presents a hazard which we must recognize. FAA is doing its best to help eliminate a catastrophe such as a midair, but it's up to the guy at the controls to insure we don't find ourselves eyeball to eyeball with another pilot who failed to adequately clear the area. ★

TEST YOURSELF

Cover the box at right with your hand and read the instructions below.

To the right is a scene such as would be viewed looking down from an aircraft. Concentrate your gaze on the spot labeled "Focus Here." Move your hand. Can you see the aircraft at right which represents a threat?

This test should give you some idea of how good (poor) your peripheral vision is. Remember that your eye will be focused at the same distance as this example and there is good contrast. Compare this to the varying conditions in flight and draw your own conclusions as to your visual limitations.

•
FOCUS HERE

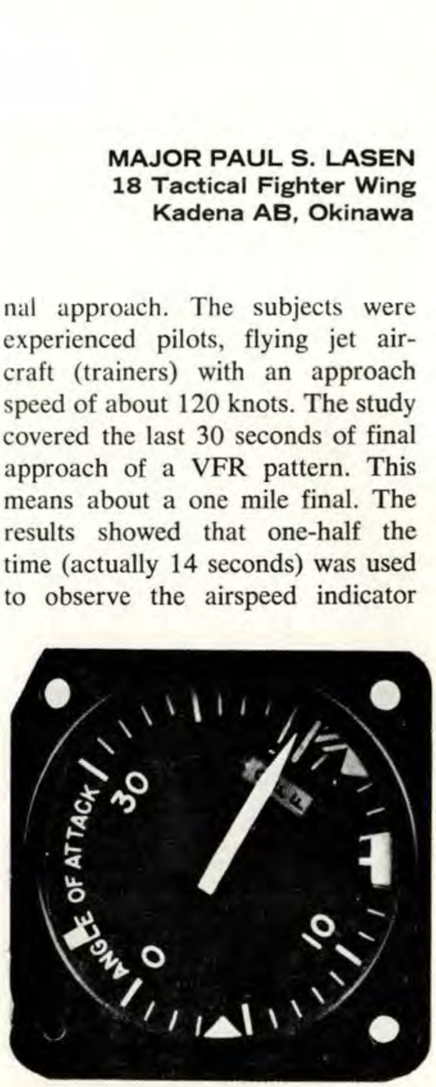
THROW

MAJOR PAUL S. LASEN
18 Tactical Fighter Wing
Kadena AB, Okinawa

Over the years, numerous articles and efforts by individuals (mostly test pilots) have tried to interest the Air Force in a different parameter of flight, namely *angle of attack*. But there has been resistance, because many of our senior officers were not truly jet-oriented. Today we have the most up-to-date management the Air Force has ever had. Officers in decision-making positions have been to SEA and are at least familiar with the latest equipment in our inventory. Now is the time for the Air Force to take a long overdue step in the field of flight and flight safety. This is the time to start our student pilots off right by teaching them to fly using *angle of attack*.

Having spent many years as an IP in Air Training Command I have seen just about every mistake that can be made and have even been able to analyze a few of the causes. However, when I left the IP game a few years ago there was one common problem for which I had no valid answer. I could never understand why so many students flew a pattern in such a way that I could tell in the base turn or early on final that the flight path of the aircraft would end at a point well short of the runway. This resulted in flying close formation with the ground until over the runway. We called them "low finals" or "dragged-in finals." The problem was more pronounced in the T-38 than the T-Bird but it was the same problem. IPs described it by saying, "He just can't see sink rate." We accurately described the result of a deficiency but had no solution. We knew the what but not the why.

It was not until some time later, while at IPIS flying a T-38 with an angle of attack system installed, that I found what I feel is the answer to the problem. Flying the T-38 on angle of attack was easier than with airspeed alone, but what was it that made it easier? I happened upon a study which looked at eye movements of pilots on final approach. The subjects were experienced pilots, flying jet aircraft (trainers) with an approach speed of about 120 knots. The study covered the last 30 seconds of final approach of a VFR pattern. This means about a one mile final. The results showed that one-half the time (actually 14 seconds) was used to observe the airspeed indicator



F-4 angle of attack indicator works in conjunction with approach indexer lights; both have been widely accepted by pilots.

A NICKEL

and focus the eye from outside into the cockpit and outside again. The other half of the time was spent looking at outside references, namely the runway.

Here was the answer. The pilot is blind half the time on final to what the aircraft is doing in terms of flight path. If this is true of the experienced pilot, then what about the student? Certainly he would be looking in the cockpit for even longer periods since his eye is not yet trained to quickly find the airspeed indicator, read it, and determine what correction is necessary.

The typical instructor is overly concerned about airspeed, and I'm sure the phrase "watch your airspeed" is still yelled a few times a day by most IPs. Dutifully the student watches the airspeed. If left to himself he would impact short of the runway but on the proper airspeed. Have you ever seen a student on his early solo rides flying slower than, or even on, the recommended airspeed? Rarely. He jacks up his airspeed a little so he can spend more time looking outside at the runway and less time looking inside at the airspeed indicator.

During any landing there are two basic tasks, (1) maintain control of your aircraft, and (2) control the flight path to the desired impact point. Using the airspeed indicator requires that you divide your time almost equally between the two. Now what about angle of attack? Why should it be any different from airspeed? Without getting into an instructional article on the differences between airspeed and angle of attack, let me just say that angle of attack is an honest parameter of flight. For a given configuration, the stalling angle of attack is always the same regardless of weight, G forces and angle of bank. That cannot be said of airspeed. A stall is possible at 400 knots or 100 knots. On the other hand, an aircraft can still be flying down to zero airspeed. If that goes by you, then get out your aero book or talk to someone who understands angle of attack. (Not all those flying angle of attack understand it completely).

The big advantage of angle of attack is the heads up display or indexer lights which allows the pilot to control the aircraft without having to look in the cockpit for information. Now he can devote almost 100 percent of his time and vision to the true landing problem, that of

on the grass...

NICKEL . . . *CONTINUED*

controlling the flight path to the desired landing point. Control becomes almost second nature and more a function of peripheral vision. The condition of flight, or performance, is being visually superimposed on the line of vision to the runway. Now the pilot has 30 out of 30 seconds to look outside and see what his machine is really doing.

Angle of attack has virtually eliminated base turn stalls and short landings for the Navy but the same is not yet true for the Air Force. That we still have a few of these accidents in F-4s leads me to believe that the problem there is simply that our pilots have not been brought up on angle of attack and sometimes lack an understanding of what it is, what it does and does not do, and how it is used.

Several years ago I had the opportunity to brief a few officers at Norton on the subject of angle of attack, and also flew with several of them in a T-38 equipped with the F-4 angle of attack system. One of them was the Chief of the Flight Safety Division, a colonel, who had not flown for two years. His experience was in the B-47 and B-52. He flew in the front seat. I didn't tell him any airspeeds and even had the airspeed indicator taped over for much of the flight. After a short demonstration of angle of attack, max climb angle, max performance turns, phugoid, stalls and the use of the indexer I flew two landings and gave him the aircraft. He made four unassisted landings that were better than those of the average UPT graduating student. Angle of attack had given him the freedom to fly the flight path that his years of flying had proven to be correct.

Although angle of attack is of most value in the landing phase, it can be exploited elsewhere. For instance, the Navy mounts three lights on the nose gear which repeat the indexer lights in the cockpit. This is easily observed from mobile and would seem to have considerable value in the training program. Another valuable use was found accidentally, due to the fact that we did not install a gear switch to cut out the operation of the indexer lights when the gear was up. As a consequence it was found that our installation in the T-38 was such that the landing angle of attack we had selected (full flaps) was also the optimum maximum angle of attack for maneuvering (flaps up). This meant that the "on angle" indication of the indexer could be used during maneuvering. Thus a visual display outside the cockpit is available for ACM, aerobatics and the like.

Now a word of warning. Our angle of attack applications in the F-106, F-105, F-101, F-104 and B-58 have been grossly inadequate. This can be traced to two main

Holes located 90 degrees apart in F-4 angle of attack transducer sense local flow pressures. Differential pressures position potentiometers to provide signals to the indicator.

areas, (1) the use of the standard vane transmitter, and (2) instruments or displays unsuited for use by the pilot. The Navy equipment, such as the probe transmitter, indicator and indexer used in the F-4, is good. It will work on other aircraft as well. The equipment is simple and reliable.

With the use of angle of attack equipment, a better product from pilot training, in less training time, is not an unreasonable expectation. Equally as important are the gains which can be expected in our safety record. Fewer short landings and fewer stall/spin/loss of control accidents should result and, perhaps, someday we'll be able to say, "That's no longer a problem." I am confident it can be done. This is a change that should have taken place 10 years ago but even 10 years late is better than never. ★

Major Lasen is a 1959 graduate of the Air Force Academy. He has logged 4500 hours of flying time of which 3000 are as an IP in the T-33, T-38, and T-39. He was a UPT instructor for five years at Vance and at IPIS for three years. He flew the F-105 at Takhli and was the Wing Flying Safety Officer for the 355th Tactical Fighter Wing in 1969-70. Presently he is with the 18th Tactical Fighter Wing at Kadena AB Okinawa.

THE I.P.I.S. APPROACH

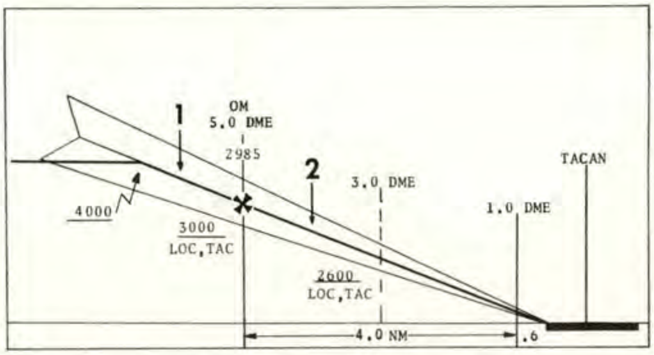
By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

Q I'm flying an ILS approach. In the event I lose the glide slope indicator, what should I do?

A AFM 51-37 states, "If the glide slope warning flag is displayed, the approach should be flown no lower than the published localizer-only altitude or, if not published, no lower than circling minimum altitude for the aircraft category." The January 1971 "IPIS Approach" confirmed this, stating, "We know of no reason why you could not descend to 'LOC' or circling minimums and continue the approach in the event you lose the glide slope indicator."

The intent of both is to permit the pilot to convert from the precision ILS approach to a compatible non-precision approach. This will normally be the localizer approach. If localizer minimums are not published, the pilot may elect to use another approach (VOR, TACAN or ADF) published in conjunction with the ILS. It is a relatively simple problem to convert to an approach on the same page of the instrument approach procedures booklet. We do not recommend selection of an approach on a different page after the aircraft is established on final approach. This would be especially important in a single-piloted aircraft.

When the pilot discontinues the full ILS approach and continues with a non-precision approach, he must comply with all restrictions associated with that approach. Blindly descending to an MDA just because the glide slope is lost could cause problems.



Consider the above TACAN/ILS approach. You have just intercepted the glide slope at 4000 feet MSL. (Position 1.) If at that point you lose the glide slope and descend immediately to MDA, you would clearly violate the final approach fix altitude of 3000 feet and the 2600 stepdown fix altitude. If the same thing happened at position 2, you would violate only the stepdown fix altitude. The results, however, could be equally disastrous.

What to do then if for some reason you lose all glide slope information while flying an ILS approach? Good judgment must prevail. Convert to a localizer or other compatible approach if one is published in conjunction with the ILS. If you must fly a different approach, we recommend that you perform the missed approach, sort out your problems with approach control and fully familiarize yourself with whatever approach you intend to fly.

* * *

Q If I am being vectored to the localizer at an altitude above the glide slope intercept altitude, when may I descend to glide slope intercept altitude?

A You may descend to glide slope intercept altitude when the controller states, "Cleared for ILS Runway ______ approach." If terrain or traffic does not permit unrestricted descent to the lowest published altitude prior to final approach descent, the controller will either defer issuance of approach clearance or issue an altitude restriction specifying when or at what point an unrestricted descent can be made. If the approach chart depicts an altitude restriction between your position and the glide slope intercept point, comply with that restriction.

* * *

Q What should I do if I am cleared for the approach while still above the glide slope?

A This should not occur as the controller is required to vector you to the localizer at an altitude which will permit glide slope interception from *below*. If you are cleared for the approach while above the glide slope, begin a normal rate descent to glide slope intercept altitude. If you are unable to safely capture the glide slope, inform the controller and request further vectors. ★

Like the Phoenix they rise and fly again

CAPT LARRY M. SCHOENHALS, AFLC

More than 1100 crash- or battle-damaged aircraft have been returned to action during the past seven years by Rapid Area Maintenance (RAM) teams of Air Force Logistics Command. Working in all kinds of weather, sometimes in hostile areas and in primitive conditions, RAM teams have patched together some near "basket cases" for flight to repair depots and eventual return to service.

While equipment and methods have changed over the years, the recovery of crash- and battle-damaged aircraft is a job as old as military aviation itself. During World War I, each squadron had to recover its own crash- and battle-damaged aircraft. However, in those days of short-range aircraft, aerodromes in France were close to the front-line trenches, and planes downed on the Allied side were usually accessible by motor vehicle.

Airplanes were often forced down over the front lines with engine problems or damage caused by enemy fire. If the pilot was lucky enough to find a fairly flat spot between the shellholes and trenches in the wooded rolling countryside, his damaged aircraft might be repairable. When this happened, the mechanics removed the wings in the field and hauled the airplane back to the aerodrome on a trailer.

The long flying distances of World War II made recovery of downed aircraft by operational squadron mechanics impossible. This problem was solved by establishing Mobile Reclamation and Repair Squadrons, which were divided into mobile teams made up of men having various mechanical specialties. They followed the combat units across western Europe and into the heart of Germany, dispatching teams to pick up downed aircraft throughout the area. Overseas depots were set up in both World Wars to handle major overhaul jobs and to repair aircraft so heavily damaged that they could not be repaired in the field.

During the Korean War, crash and battle damage recovery was largely the responsibility of the base or wing to which the damaged aircraft was assigned. Overseas maintenance depot facilities to support the combat squadrons were located in Japan.

The present crash/battle damage recovery program began seven years ago with the formation of Rapid Area Maintenance (RAM) teams to assist operational combat commands on an immediate call basis. An advance group organized at McClellan AFB, California, was

An AFLC civilian mechanic points to battle damage in the outer wing of an F-4 Phantom in Southeast Asia. Repair of such damage is often beyond the capability of bases in Vietnam and RAM teams are called in to assist.

Aircraft that crash land near back country airstrips pose interesting recovery problems for AFLC's RAM teams. Whenever possible, the aircraft are temporarily repaired and flown to a major U. S. Air Base for Depot level maintenance.

equipped and deployed to Tan Son Nhut Air Base, Vietnam, just prior to the U. S. troop build up in Southeast Asia.

RAM became a working reality in April 1965, when a team of civilian specialists responded to a Pacific Air Force request for specialized maintenance on two crash-damaged F-105s. Both aircraft had been classified as economically repairable, but the extent of damage was beyond local base repair capability. One of the F-105s was repaired on-site at Danang Air Base, and the other was prepared for shipment to a contract maintenance facility in Taiwan.

By January 1971, RAM teams had been responsible for the on-site repair of 1000 aircraft. Another 148 had been readied for shipment to contractor repair facilities in-theater and to contractors or AFLC depots in the United States. Only 26 damaged birds were scrapped.

Circumstances facing RAM teams trying to prepare an aircraft for one-time flight often call for ingenuity and improvising. At the height of the Vietnam war, four members of a RAM team from the Sacramento Air Materiel Area went into the Vietnam back country to examine two crashed C-123 Providers.

The crashed aircraft were located near a crude forward runway in the jungle, and the RAM team had South Vietnamese troops standing by for protection as they set about preparing one of the birds for a flight to Saigon and a depot-level repair job. The aircraft needed internal structural repair and its nose landing gear replaced.

Lacking airplane jacks, the men obtained the assistance of about 40 local villagers who stood in the tail of one of the planes. This caused the nose to lift high enough so that oil drums and pallets could be slipped under it. The nose gear was taken from the other wreck and installed, and a nose wheel steering cable was fashioned from common fence wire. The damaged interior supports were replaced with angle iron.

Because the aircraft could make only right turns on the ground with its makeshift steering cable, it was pushed around by hand, lined up with the runway, and a successful takeoff was made.

Ninety percent of all damaged aircraft assigned to the RAM teams are repaired within 90 days. Extensive damage and occasional non-availability of major structural components are the primary reasons aircraft repair sometimes exceeds the 90 days.

While in-theater contract facilities, such as those of Air Vietnam, Thai Airways, and Air America repair many badly damaged aircraft, RAM teams and AFLC depots have been responsible for the great majority of the aircraft returned to operational status.

When crash or battle damage is too severe to be repaired at overseas locations, RAM teams disassemble the aircraft piece by piece and package the parts for shipment to an AFLC depot in the CONUS.

Ed Adamic, Chief of the Field Services Branch at Sacramento Air Materiel Area, McClellan AFB, California, wrote the plan outlining the Rapid Area Maintenance (RAM) idea. He has spent five tours of temporary duty with RAM teams in Southeast Asia.

Fifteen basic maintenance skills are required for the RAM teams and more than 2000 civilian and 900 military personnel at AFLC's five Air Materiel Area depots are identified as having these necessary skills. Volunteers from this group alternate on temporary duty at overseas locations around the world for periods lasting from 90 to 179 days. The establishment of a ready-reserve pool of qualified maintenance personnel at each depot enables AFLC to respond within 18 hours to a request for assistance.

RAM teams are equipped with recovery kits containing pneumatic lifting bags, jacks, block and tackle gear, and the various ropes, cables, and slings necessary to lift and move damaged airframes. They also have peculiar item kits consisting of the equipment necessary to recover and disassemble specific types and models of aircraft.

The same perils faced by other ground personnel in the combat zone apply to RAM team members. Some have lost their lives, and others have been wounded in Viet Cong terrorist bombings and in enemy rocket and mortar attacks on military installations. But overall casualties have been light, considering the extent of RAM team involvement in the combat zone.

The skill levels of RAM team members are high. Most civilian team members have 20 or more years experience in their maintenance specialty, and military members seldom have less than eight to ten years experience. This vast cumulative experience, teamed with a rapid world-wide deployment capability, has saved the taxpayers more than two billion dollars in salvaged aircraft and spelled success for the crash/battle damage recovery program and the RAM concept. ★

REX RILEY'S
CROSS COUNTRY NOTES

O CLUBS vary widely from base to base, and unfortunately so do the dress requirements. It's not unusual for a crewmember to get stuck out unexpectedly and have only his shaving kit and no other clothes aside from his goat skin. Several of the bases we visited denied us entry into the club in anything less than a coat and tie, while others allowed casual dress and flight suits at any time.

One base solved the problem by providing a special section in the dining room where those unfortunate crewmembers with only casual clothes or flight suits could eat without offending anyone. However, the problem is there and it's up to each base to determine how to best take care of crewmembers engaged in performing the Air Force mission.

ATTITUDE is still one of my main gripes. No doubt there are a number of occasions when refueling is going to be delayed for some reason or another. How much nicer it is when the transient service troop says, "Gee whiz, sir, we're swamped and will get you just as soon as possible," rather than, "We'll get around to you eventually."

Maintenance control can play a big part in the smooth flow of transient traffic. We know of one base where the first priority was any transient with a maintenance problem. Sure there are exceptions, but the attitude of the guy who dispatches the specialists can often help expedite a transient's departure.

The **THUNDERSTORM SEASON** is about at an end but the problem never really goes away. Several base ops officers have expressed concern about refueling when there is a storm in the area. The reg states that if there is electrical storm activity within three miles refueling will cease. Some bases have extended this to five miles. The determination as to when refueling should be discontinued is a tricky one. The base ops officer must keep in constant contact with weather so that a valid and timely decision can be made. There may be a rain shower on radar but no thunderstorm within 50 miles. In any case, one eyeball on the weather can often be worth 100 sweeps on the scope. It's a tricky situation at best but the most important factor is a timely decision. Wish we had a good answer.

THE

REX RILEY

Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Co
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Cal
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.

Q

Student operates K-loader as instructor watches.

Two views of cargo loading—outside the aircraft and inside.

Half of 80 hour course is spent in classroom.

Students learn to operate equipment during second half of course.

UALIFYING EQUIPMENT OPERATORS

FIGURE 1

- **Accident prevention.**
- **Basic design and mechanical knowledge of the equipment.**
- **Safety procedures, before, during and after operations.**
- **Location and use of fire bottles.**
- **Principles of preventive maintenance.**
- **Engine design and operation.**
- **Equipment operational limitations.**
- **Controls and their operation.**
- **Traffic safety.**
- **MHE operations around aircraft.**
- **General operation of MHE.**

Can you imagine what an airbase ramp would be like without material handling equipment (MHE) such as fork lifts, hi-lift trucks, K-loaders and the like?

Technology has provided us with these mechanical workhorses that smoothly transport the heaviest of objects to wherever we desire them. But we can't take our MHE for granted. Although it is fine equipment, it can and will be a source of accidents if not operated safely. The primary requirements for safe and efficient operation of MHE are (1) safe equipment, (2) adequate training, (3) cargo control, and (4) good supervision. All of these requirements are present in the program of the 63rd Aerial Port Squadron at Norton AFB, which has an effective 80-hour training course that produces MHE operators with a sound safety orientation, well on their way to becoming highly skilled MHE operators.

Half of the course (40 hours) is spent in the classroom where the student studies the subjects shown in figure 1. After completing the classroom phase, the student progresses to actual operation of the equipment, using mock loads in a training area set up to simulate the real flightline environment. Here he learns to operate the equipment under constant supervision of a highly qualified instructor. In order to move on to the real thing, the student must demonstrate the ability to

- Recognize potential hazards
- Perform pre-operational inspection
- Perform preventive maintenance
- Operate MHE under various conditions and loads
- Perform post-operational inspection and service.

Although the student is now assigned to the actual movement of cargo throughout the aerial port area, his OJT program will continue.

To monitor the training program and all operations and movement of cargo, the squadron commander has established a Safety Surveillance Program. Basically, this consists of one NCO being assigned to the cargo handling area for each eight-hour work period. The job of these NCOs is to monitor the cargo handling areas, being particularly watchful for safety violations. When the NCO observes an unsafe act he has a talk with the person involved and his supervisor, with recommendations for corrective action. At the end of each tour of duty he summarizes the events of the day in a memorandum to the commander. These reports are then used by the commander to determine corrective actions, for safety briefings and as a means by which to measure the effectiveness of the training program.

The payoff is qualified MHE operators who are safety oriented with the mechanical and operational skill to effectively perform during all phases of material handling. ★

1971
1970
1969
1968
1967
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1961

C

the

A review of Air Force aircraft accident experience, particularly for the past 10 years, indicates performance undreamed of prior to this period. The number of flying hours per year for the past decade has remained relatively constant, whereas the major aircraft accident rate has been reduced by approximately one-half, from 6.3 per 100,000 hours in 1961 to 3.0 in 1970.

To understand the significance of this we must look further back in history. The Department of the Air Force was established in 1947. That year the rate was 44. Since then the rate has gradually declined from year to year. By 1953-54 the rate had been halved and by 1959 it was below 10.

The numbers of accidents these figures represent are, perhaps, more meaningful. There were 1555 major accidents in 1947. The number rose to more than two thousand per year from 1951 through 1953, with a corresponding increase in flying hours, no doubt reflecting the Korean war years. In 1954 we got below the 2000 figure again, and in 1958 recorded 894. Since then the number of accidents has been reduced more slowly, but reduced it has been, reaching an all-time low of 200 in 1970.

Many of us took a look at those figures for last year and wondered what the future would bring. Would the numbers go back up? Had we reached the irreducible minimum—a term that has been bandied around for at least 10 years? Or did they represent solid accomplishment that forecast a continuing trend? The first six months of this year seemed to point to the latter alternative, with the number of accidents running about 25 per cent below last year.

We realize that drawing conclusions from major accidents and rates alone does not present the most accurate picture. For example, there were 5742 incidents last year, more than 2000 of which resulted in aircraft damage. Any accident prevention effort must take those into account. However, an attempt to analyze that number of incidents is far beyond the scope of this article. That is something for the statistics and analysis people to dig into in an attempt to ferret out the causes and cures, since the difference between many incidents and accidents is only a matter of degree.

How is it that, while flying almost exactly the same number of hours, we had only 200 major aircraft accidents last year as compared to 2184 twenty years earlier and 432 just ten years ago? Any explanation would no doubt be highly subjective, depending upon one's experience and degree of involvement. But let's take a hack at it (the reader is free to make his own assessment).

For one thing, we have more reliable aircraft—in the broad sense, including engines and other systems. Maintenance equipment and techniques are better than ever. Our facilities have steadily improved. For example, navigation and landing aids are much more reliable, sophisticated *and* widespread. We have better runways, arresting aids and firefighting equipment.

Weather forecasting and the means of disseminating and using the information have improved tremendously. Better life support equipment enables aircrews to perform more efficiently and, in dire emergencies, saves lives.

These are concrete things at which we can point and say "that helped."

More difficult to analyze are the somewhat abstract contributors to accident prevention, such as the application of knowledge gained from past accidents, the contributions of System Safety, and better investigation and reporting.

Aerospace medicine has made many contributions, as has the continuing education of aircrews, maintenance and support personnel. Bet-

HALLENGE

ter management of resources, both human and material, and a highly professional corps of trained, and by now experienced, safety specialists are certainly factors.

These and other factors have made our overall accident prevention effort today a far cry from what it was 5-10-20 years ago. The improvements may not seem obvious when viewed at short range, but the long range look leaves no doubt of the steady growth of expertise in aircraft operation and maintenance as well as in the application of safety management. However, lest we become complacent, it should be pointed out that many discrepancies and some gross inadequacies continue to be revealed during Unit Effectiveness Inspections, indicating that our overall management is less than perfect.

With the all-time low accident rate in 1970 and the even better performance so far this year, the question arises as to just how far we can reduce the number of accidents. Certainly we have reached a point where continued improvement is increasingly difficult. It is suggested that there is a danger present in our zeal to reach new accident lows and that we must recognize it.

We have been immensely successful, but as it becomes more difficult to continue the downward trend, the temptation to become more restrictive could be counterproductive. No doubt we could reduce the number of accidents even more. We could do this by eliminating the more hazardous elements of flight—air combat training, bombing and gunnery, formation flying, just to name a few. But in considering any such restrictions we must keep the Air Force mission uppermost in mind.

We can't afford a *safe* Air Force that can't fight!

Therefore, we must continue to explore and develop methods of preventing accidents without compromising our ability to perform our mission. This will take some doing, but the task is not so formidable as it may seem.

Our technology has demonstrated that it can produce aircraft that are highly reliable, equipped with redundant and fail safe systems, that should be relatively free from materiel-caused accidents. Therefore, it appears that our greatest opportunities lie in the human area.

The objective of every safety program we have adopted is accident *prevention*. However, one of our best prevention tools is the historical records. If we fail to heed the chapter written in the past, we ignore or negate a large portion of our efforts. The axiom that history repeats itself is so true. Year after year we write new chapters that tell us we learned little from earlier mistakes—pilots continue to bust minimums, they insist on buzzing or grandstanding, airplanes are accepted with equipment that doesn't function perfectly, but will "probably be okay." Eliminate these repeats and we can't fail to reduce our rate.

While there is nothing to indicate that we will ever return to the hundreds, even thousands of accidents-per-year-era, the coming years will test our ability to more effectively manage our resources. Because of Air Force experience with advanced systems and the application thereof, we are in a unique position to exploit both the technical and human engineering advances of the past few years.

We call this *management*. Our capability to perform any required mission, with the least number of losses due to accidents, will be the yardstick against which our ability to manage will be measured. ★

Ops topics

CATCH THE DRIFT

The two-ship flight of jet fighters was accomplishing a pre-briefed formation full-stop landing after a range gunnery mission. All went smoothly throughout the approach until just after touchdown. Prior to drag chute deployment, the wingman, who had been positioned on the upwind side before starting the approach, drifted left and allowed wingtip contact between the two aircraft. Neither aircraft was seriously damaged, but the potential was certainly there. The runway in use was 150 feet wide—plenty of room to be safe.

RIGHT ON!

"The aircraft made a very smooth landing, and the nose gear was lowered bently to the runway."
—from a recent aircraft incident report.

WHAT INSTRUMENTS?

The following incident is almost unbelievable. The aircraft was a C-130 and the task was a four-day trash-hauling mission in an overseas (non-combat) area. The two crews involved must have set some sort of record for low-priority, high-risk pressing.

Narrative from the first flight crew:

"Before takeoff all throttles were advanced to flight idle, at which time the number four engine instruments indicated completely abnormal engine performance. Torque varied from 5000 to 18,000 inch pounds; RPM from 80 to 104 percent; and fuel flow from 700 to 2500 pounds per hour. This occurred slowly over a ten second period from the low to the high readings. The torque and fuel flow were always high when RPM was low, and vice-versa. Additional throttle movement did not rectify the situation, nor did placing the TD switches to null or the prop controls to mechanical. Once started, the situation would correct itself in 30 seconds to a minute. *This abnormality occurred six times in four days, during which 13 takeoffs were accomplished. The last of the six incidents resulted in a flameout.*"

After the flameout, the engine was checked over by maintenance personnel at an en route base. They were unable to duplicate the malfunction and the aircraft was released for flight; the next aircrew was thoroughly briefed on the malfunction.

The next day, prior to the second takeoff of the day, the engine again acted erratically and flamed out. After re-start the engine operated normally and the aircraft was flown to the home station. There maintenance found that the negative torque system plunger in the propeller valve housing was sticking in the actuated position.

If you can read the instruments and understand them, but choose to ignore the information presented, not just once but continually, that's just plain bull-headedness. The epitaph might read, ". . . with complete disregard for his own personal safety, *and that of his passengers and crew. . . ."*

An addendum to the report states, "Other than instances described herein, engine operated perfectly. . . ." We wonder how many accidents that statement would fit.

THAR SHE BLOWS!

MAJ DAVID H. HOOK
CF, Directorate of Aerospace Safety

The T-33's canopy stuck in the full-open position, so the back-seater attempted to troubleshoot by checking the canopy circuit-breaker. He pushed his checklist aside from where it lay on top of the right console, and reset the canopy circuit-breaker to insure a positive connection.

Whether or not that fixed the canopy motor was not reported, because when he retrieved his checklist (it came free with a light tug), the canopy catapult fired, ramming itself into the cockpit floor. The canopy stayed on the aircraft.

The accompanying photograph shows how the metal binder on the checklist snagged one or both cables from the alternate jettison handles. Snagged in this manner, a pull of only 15 pounds is required to deliver a 30-pound pull at the initiator. Thirty pounds and a fraction of an inch of travel were all the initiator needed to do its job.

Booby traps like this are not confined solely to our older aircraft. Aircrews and maintainers must always be alert to detect hazards that have previously gone unnoticed or unreported. FOD involves not only loose objects but also snagged clothing, watches, rings, and things.

FLIP CHANGES

Los Angeles and New York TCAs: Effective 16 September 1971, the Terminal Control Areas were expanded to include Los Angeles and New York. Graphics are included in Section II FLIP Planning North and South America, dated 16 September 1971. In addition, an outline of the TCAs is shown on the FLIP Enroute Low Altitude US L-3, L-24, L-25, L-28 and Los Angeles Area Chart.

UPWIND, DOWNWIND

The cargo-type prop aircraft was being flown on a pilot upgrade mission—day VFR. Several instrument approaches were made in VFR conditions, followed by a series of touch-and-go to runway 26.

On the fifth touch-and-go pattern the IP commented that the windsock indicated a slight tailwind, and the crew noticed a tumbleweed rolling slowly down the runway. Touchdown was normal, but slightly hot. The aircraft ballooned, and in the ensuing "recovery" entered a porpoise. Both nose tires were slipped from the wheels, and the severe vibration threw loose equipment around the cockpit and knocked off the pilot's glasses and headset. The IP applied reverse thrust and the pilot got on the nosewheel steering; eventually the aircraft was stopped, still on the runway. Three main tires had blown, and there was visible damage in the nose well area.

Weather in the area is significant. In five minutes the wind shifted from 290 at nine to 110 at 21; almost a twenty-knot tailwind factor on runway 26.

Significant also is the fact that on each downwind the tower advised the crew of the rapidly changing wind conditions. (In fact, the tower was in the process of changing the active runway when the incident occurred.)

The investigator said that the IP shouldn't have allowed the pilot to get into a porpoise, and we certainly can't disagree. However, he also said that the pilot used improper techniques while landing with a tailwind, and that flight examiners in the organization had been requested to put special emphasis on techniques pertaining to landing with tailwinds.

There are many instances when landing with a tailwind component is the sole course of action available, and there are certainly some valid techniques which make the downwind landing more tolerable. But in this case, the very best technique would have been to turn the airplane around and land the other way.

CROSS-HANDS TECHNIQUE

The helicopter crew—pilot and instructor pilot—were on a night training flight when they began having trouble with the interphone. The pilot could receive interphone transmissions from the IP only when the IP used the "call" position on his wafer switch.

Because of the interphone difficulty, the IP, holding the aircraft in a hover, elected to maintain cyclic control with his left hand and reach across the center console to adjust the collective friction (on the pilot's collective stick), rather than direct the pilot in the right seat to make the adjustment. During his attempt to adjust the collective friction, the IP let the aircraft enter an abnormally nose-high attitude at low altitude, and the helicopter crashed.

Crew coordination is a subtle thing, and its significance grows to massive proportions during critical phases of flight. This pilot's basic error was in not attaching sufficient importance to the partial failure of the intercom system.

Like snakes, the little things hide in the grass until you make yourself vulnerable.

TIPTOE THRU THE TREETOPS

The HH-53 was making a takeoff from a remote training site. Immediately after takeoff, at about 70 feet AGL, the pilot made a left turn to depart the area. Shortly thereafter the crew chief reported a whistling noise in the cabin, so the crew returned to home base and landed. There they found dents in four main rotor blade tip caps. Returning to the remote training site, they found that the aircraft had chopped approximately five feet out of the top of a pine tree.

This was an incident-damage considered insignficant. But suppose, just for a moment, that that pine tree had been a telephone pole, or had had a steel cable attached to it. Ground level operations have a fatal attraction for pilots, and only the most professional of attitudes is protection against the disaster that this sort of operation invites. There's no room in our business for any other attitude.

CLOSE QUARTERS

The jet trainer trailed the "follow me" truck to the parking ramp, following the yellow taxi line. The taxi line terminated about 50 feet from the edge of the ramp, and the pilot then diverted his attention to the airman who was directing the aircraft parking. He started a sharp right turn at low speed, watching the airman for guidance, and the left wingtip struck an oxygen cart parked along the edge of the ramp.

Primary cause: pilot factor, of course.

Contributing cause: lack of a wing-walker.

We've surely heard this story before; seems like everyone's using re-runs this summer. ★

IT'S... YOUR MANUAL

SQDN LDR DONALD MELVIN, RAAF
Directorate of Aerospace Safety

Frequent complaints have been heard from the field regarding the quality of the data contained in aircraft technical manuals, especially flight manuals. From time to time inaccuracies do occur, but in the majority of cases the responsibility for these rests with the users. For example, investigation of a recent fatal accident revealed that a serious discrepancy existed in the flight manual regarding the use of the carburetor heat control. This had been known to the operating unit for some time, but no action had been taken to clarify the Dash One information.

Two main avenues are used to amend flight manuals; AF Form 847, and Major Command Review Conferences. The functions of the program and the responsibilities of the various organizations affected are contained in AFR 60-9.

Commands are not using these avenues to their fullest advantage. Command participants at conferences should be the most qualified available and adequately briefed on the command position. If not, the conference tends to degenerate into a forum of personal opinions, and produces a product which is inevitably the target of criticism and adverse comment immediately after publication.

The AF Form 847 should be used for rectification of discrepancies and routine recommended changes. However, the standard of forms submitted in many cases leaves much to be desired. In some instances, inadequate or poorly researched and documented proposals have been coordinated through all command levels, only to be followed by a flood of additional proposals once published. Users have submitted changes without due regard to the impact on other sections of the manual or on other technical orders. Aircraft which are widely dispersed throughout the inventory, e.g., C-47, are the subject of recommendations which apply to only a specific task in a specific location, but its inclusion as proposed would affect all aircraft. Some recommendations, especially from accident investigation boards, tend to turn the Dash One into a Basic Flying Manual by proposing lengthy discussions on minor techniques, etc.

In some instances the Flight Manual Manager will detect and rectify these mistakes before the publication stage. These managers are highly qualified and motivated individuals who, in many cases, have extensive flying experience in the aircraft concerned. However, it cannot be disputed that, especially with the newer weapons systems, the operators are eminently more qualified to ensure that proposals are correct in every aspect.

Therefore, the quality of the manual is directly proportional to the diligence with which the proposed change is researched, the quality of command participation at conferences and the promptness of action taken to rectify noted anomalies. With proper management of the first two aspects, the last will require absolute minimum effort. ★

Tech TOPICS

BRIEFS FOR MAINTENANCE TECHS

egress system

There has been an increase in recent months in the number of egress initiators accidentally fired. The probable cause most often listed is personnel error. In one case the supervisor failed to insure that the checklist was used; in another, someone failed to insure that all safety pins were installed before beginning seat removal action.

One recent incident where two initiators were fired within the same system in a short period of time reads as follows: The egress team arrived at the T-38 to accomplish the phase inspection work cards. After the supervisor determined that the front seat was dearmed he gave instructions for the seat to be removed. When it was approximately two-thirds of the way up the tracks the seat belt initator fired.

The M-12 initiator safety pin was improperly installed. The pin had been installed around the linkage instead of through the initiator safety pin hole. Seat removal was completed and the seat was taken to the egress shop for replacement of the fired initiator. During in-shop maintenance, as the right-hand leg brace was raised, the M3A1 initiator in the left hand leg brace fired. The cause (of this second initiator firing by the same team) was failure to follow the step-by-step procedures in the TO.

More care, caution and careful adherence to the TO during egress maintenance will reduce the number of initiators fired inadvertently.

brake fire

It's no big thing, but the action taken as the result of the near-accident described here shows that maintenance types **can** get action to correct a bad situation.

Just after touchdown the pilot commenced light braking action. The left brake began to fade rapidly. Directional control was maintained with full left rudder and right brake while speed was reduced to 35-40 knots. At this time tower advised the pilot that the left brake was on fire. Both engines were shut down and the crew evacuated the aircraft immediately after it stopped rolling. Quick response by the fire department limited fire damage to the wheel and gear door assembly.

The cause of this near disaster was maintenance: the brake had not been properly installed and the pressure plate was installed backwards.

TO 1B-57B-2-2, page 5-68, depicts a caution note in regard to correct brake installation; however, this caution note did not appear with the step-by-step instructions on page 5-69 and 5-70.

An AFTO Form 22 was submitted by this unit, approved by the AMA, and the warning note has been added to the appropriate pages.

short screws

During climbout an A-37 began to buffet as it passed through 185 knots. Buffet continued as airspeed reached 200 knots. The aircraft was slowed to 170 knots and the buffet ceased. Another aircraft joined up for a visual inspection and confirmed a loose inspection panel on the left lower stabilizer.

Once the bird was back on the ground, maintenance found all but four of the screws missing from the panel. In fact, one screw fell from the aircraft after it taxied into the parking spot.

The screw that fell to the ramp was three-eights inches long; those remaining in the panel were 15 thirty-seconds inches long. TO 1A-37A-4 calls for a ten-thirty-two flat head screw 19 thirty-seconds inches long to secure this panel. It is probable that all the screws had been too short, and that those missing had vibrated loose and fallen out in flight. Review of the aircraft records did not reveal any recent work in this area. A new aircraft just delivered was checked and eight of the screws in the same panel were 15 thirty-seconds inches long and four were 17 thirty-seconds inches long. None complied with the TO requirements.

Correct hardware is essential. When in doubt, recheck the Dash 4; it won't let you down.

the bare facts

Just after takeoff for a day combat sortie the pilot felt a bump as he started a right turn. He looked over his shoulder and saw a large splash in the water. An immediate check of all weapons switches confirmed that all were in the correct position. After join-up, wing confirmed that the right outboard MER was missing.

The pilot could not determine what had caused the inadvertent jettison. He proceeded to the jettison area, released the remainder of his load and returned to base.

It didn't take the maintenance team long to determine the problem. They found a wire bundle in the conventional weapons relay panel that had not been properly secured as required by the TO. The wire bundle had chafed against the wall of the panel until bare wires were exposed.

battery explosion

A crew chief had been instructed to run up and leak check his T-37. After an FOD check and walk-around inspection, he climbed aboard the aircraft, started the engine (with external power) and taxied to the run-up pad.

Following a leak check by his assistant, the crew chief advanced power to 100 percent. After approximately 30 seconds an explosion occurred in the battery compartment area. The engines were shut down. There was no evidence of fire following the explosion.

The explosion was caused by the accumplation of trapped gasses in the battery compartment because the vent lines were disconnected. Inspection of the lines showed them to be free of any restrictions. During review of the aircraft forms, it was found that the battery had been changed just prior to the incident.

Battery gasses are highly explosive as was proven here. Wet cell batteries evolve hydrogen gas. In the gaseous form, hydrogen and air mixtures are very flammable. Hydrogen air mixtures containing as little as four percent or as much as 75 percent hydrogen by volume are readily ignited. When hydrogen air mixtures are confined, the mixture is shock sensitive and can detonate. Therefore, the hazard in a confined condition is extreme.

Gaseous hydrogen and oxygen mixtures are flammable over the range of four to 94 percent hydrogen by volume.

In view of the above data, proper ventilation is an absolute necessity.

the high price of FOD

The photograph above is a grim reminder that FOD can cause an aircraft to crash.

During liftoff after a normal approach to a touch and go, the aircraft pitched up excessively, climbed sharply, then nosed over into a dive and crashed.

The cause was traced to the screw shown. It worked its way into the horizontal stabilizer flight control system, caused excessive stick pressures and binding, and finally jammed the horizontal stabilizer in the nose down position.

FOD prevention must be a 100 percent effort. Any less can be catastrophic.

MORE

Tech TOPICS

hot FOD

Immediately after takeoff, Nr 3 overheat warning light illuminated, then immediately changed to a fire indication. The engine was shut down, fire agent was discharged and the light went out. After an uneventful return to base the engine was checked and a burned rag was found between the left engine door and the starter valve. Maintenance had been performed in this area prior to departure.

This incident would not have occurred had the maintenance personnel completed their job, which includes removing all equipment, tools, rags, etc., prior to releasing the aircraft for flight.

man and prop

Much has been written and said concerning the many hazards of daily flightline operations. Safety on the ramp requires the efforts of each and every man.

When we talk of ramp safety, the first things that come to mind are jet intake and exhaust, since these areas are a continuous hazard. But we also have another age-old hazard: propellers. Prop type aircraft have been around a long time and a lot has been said about their dangers. In spite of this we still have accidents. One occurred during ground maintenance. A C-119 was being ops checked after maintenance, when a sergeant who had been leak checking the engine walked into the rotating propeller. Fatigue contributed to the sergeant's lack of mental alertness. He had had only four hours sleep in the past 24 hours because he was employed in an off-duty job.

Another accident occurred when a crew chief walked into a rotating prop after parking an OV-10. Contributing causes in this case were poor ramp lighting and local procedures in that aircraft were chocked before props had stopped spinning.

It is the supervisor's responsibility to educate and re-educate his personnel in the potentially hazardous areas of the flightline operation. Mental alertness, proper lighting and sound operational procedures keyed to safety oriented personnel will go a long way toward eliminating this type of accident.

F-4 lost

The F-4 crew heard a muffled explosion followed by a right engine fire light. The wingman confirmed fire in the aux air door area and along the bottom of the aircraft.

The engine was shut down, mission aborted, and the crew headed home; however, they were forced to eject five minutes after the initial explosion due to the intensification of the fire.

Investigation revealed that the right engine had been started pneumatically, although a cartridge was installed in the breech. Stray voltage ignited the cartridge during flight and the starter disintegrated, rupturing the fuel feed elbow, which resulted in a fire. Maintenance bought this one for allowing the aircraft to be started pneumatically and flown with a live starter cartridge in the breech. A contributing factor was failure of the tech data to warn against pneumatic starts with unfired cartridges installed.

torque topics

We continue to receive incident and/or accident reports with the cause listed as improper torque. The proper torquing of any item is one of the most critical phases of maintenance.

One incident which occurred on a T-38 turned up 163 hours after the work had been accomplished. The report reads, "Number two oil pressure fluctuation from 35 to 45 psi followed by pressure drop to 10 psi. The engine was shut down in flight."

The culprit was stripped threads on the oil return line connected to the main gear box housing assembly. The O-ring seal was also found damaged. The assembly had been overtorqued during prior maintenance.

In another incident the right engine overheat warning light illuminated during initial climbout on a functional check flight following periodic inspection. The throttle was retarded to idle but the light remained on. The engine was shut down and a single engine return to base was uneventful.

The reason for the light was a loose clamp (PN 4265-2815H) on the refrigeration unit, which allowed hot air to escape and contact the fire warning control box assembly.

1T-37B-2-2 gives the proper torque for this clamp, but it is evident that proper torque was not applied.

The responsibility for insuring proper use of torque tools rests with the supervisor. Don't go along with the mechanic who believes that "turn 'em down tight and another half turn" will do the job. Insist that all items be torqued in accordance with tech order specifications.

for want of a clamp

During operational check of the cartridge starter on number eight engine, the cartridge appeared to fire normally; however, no RPM was evident. A visual inspection revealed cartridge exhaust smoke coming from all seams and openings of the engine cowling.

Toward the end of cartridge burnout a minor explosion was heard. Visual inspection revealed damage to the starter transfer tube and upper and lower panel assemblies. Further inspection failed to locate the starter transfer tube attachment clamp. It was determined that the clamp had been left off during TCTO 1B-52-1994.

This error cost the maintenance team approximately 83 additional manhours for repair, degraded the wing's operational ready rate and caused a lot of red faces.

After-the-fact changes have been made in this unit. In the future all starters will be operationally checked, using the universal tester, prior to installation on the aircraft.

T-37 throttle torque

A T-37 was involved in an incident which, fortunately, didn't result in any damage.

As he started into a Cuban 8, the IP in the T-37 noticed 98 percent RPM on the right engine with full throttle selected. He retarded the throttle and advanced it full forward again but obtained only 92 percent. The mission was aborted.

Cause factor: improper torque of the throttle linkage jam nut. Although saftied, it had worked loose, allowing the ball joint to back off misrigging the linkage. Proper torque goes hand in hand with safetying. Safety wire can't substitute for proper torquing.

rush job

During an alert launch of two F-100s, the wingman noted a flight control failure light during the end of runway check. Two crew chiefs and the alert supervisor arrived and started removing the hydraulic access panel from the lead aircraft. The lead pilot got their attention and sent them to the second aircraft. They immediately serviced the flight control system and sent the birds on their way.

When the flight returned to base the hydraulic access panel on Lead and the flight control system service panel on Wing's aircraft were missing.

The maintenance crew in their haste to get the birds off on an alert mission failed to properly secure the panels.

Don't let the pressure of an alert launch, or any job, rush you into causing an unsafe condition. Do the job correctly even though it takes a little longer.

crossed wires

The functional check flight for number two prop governor change on a C-131 went well until number two engine was shut down in accordance with the checklist. The prop feathered okay but failed to unfeather. An emergency was declared; an immediate return to base was uneventful.

Maintenance discovered that during the governor installation the electrical cannon plugs for the pressure cut-out switch and reverse and unfeathering solenoid had been crossed. The red cross in the 781 Form had been cleared by an authorized inspector, who failed to note the crossed cannon plugs. Wonder how they could have missed that during the operational check? ★

how to handle

GENERAL

Teflon hose assemblies should always be handled with extra care to prevent excessive bending, twisting, and kinking. Dragging hoses on concrete surfaces, using them as climbing handles and bending them to fit into cramped storage areas must be avoided. Kinking of Teflon hose occurs more easily in larger sizes and in very short assemblies. Extra care should be exercised in handling and installing all Teflon hose assemblies. NEVER STEP OR STAND ON TEFLON HOSE.

PROPER STORAGE

Prior to installation, Teflon hose assemblies should be capped with appropriate dust caps and stored in an area free from dust or other contamination. Do not use cramped or otherwise confined storage areas. If long lengths of Teflon hose are coiled for storage, a liberal coil diameter must be provided to insure against kinking. Never coil Teflon hose so that the minimum bend radius is, or can be, exceeded.

INSPECTION

1. Internal: Inspect internally for evidence of tube restriction due to collapse, wire braid puncture, or other damage.

2. External: Inspect Teflon hose assemblies for excessive wire damage consisting of two or more broken wires in a single plait, six or more broken wires per assembly, or per lineal foot whenever assemblies exceed 12 inches in length. Assemblies with excessive damage should be replaced.

CHAFE PROTECTION

Chafe guards of Teflon or Vinyl sleeve material should be used any time there is a possibility of chafing. Chafing may be caused by routing of the hose assembly or by tight locations. Assemblies should be routed to avoid sharp corners, if possible.

PREFORMED HOSE ASSEMBLIES

Teflon hose assemblies tend to preform to the installed position on hot fluid lines. Always permit the assembly to take its own lay when being removed or stored. When shorter bend radii are required, the assembly may be preformed at the factory. Factory preforms are secured into shape prior to shipping. Extra care should always be exercised when handling preformed hose assemblies, whether they are new lines or lines removed from an installation. Never attempt to straighten a preformed hose.

A convenient method for the handling of preformed hoses is shown in the accompanying detail drawing. Tie wires securing the hose in its preformed shape are installed at the point of preform. This prevents straightening or kinking of the line during subsequent handling. The tie wires should remain installed during proof pressure tests. Remove them just prior to installation.

Do not use the Teflon hose line for a handle when accessories or components are removed from engines or aircraft.

TIPS FOR PROPER INSTALLATION

1. Attach the hose to the most inaccessible end of its routing first. Finger tighten only, so that the hose is free to turn during installation.

TEFLON hose

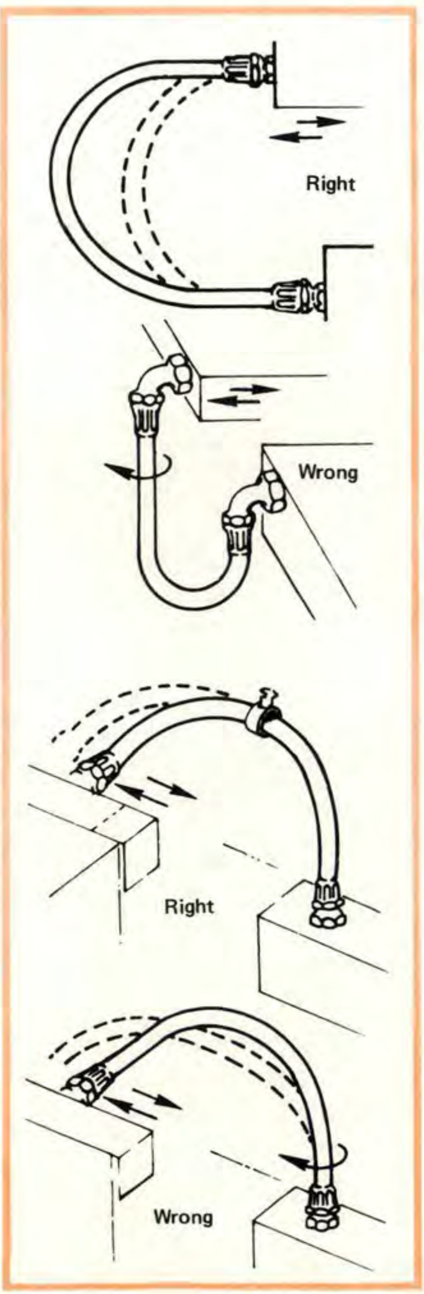
H. M. COOKE
Staff Engineer
Stratoflex, Inc.

2. Attach the other end of the hose in the same manner.

3. Properly orient the hose along its routing and install the required line support clamps.

In securing the line support clamps, care should be exercised in distributing hose slack between the hose connections and the clamps. Do not bend or force the hose to a sharp angle at any location. Be sure that gradual curves are used for all routing. Installation of clamps must never restrict travel or cause the hose line to be subjected to tension, torsion, compression, or shear stress during flexing cycles. Installation of undersize hose support clamps must be avoided.

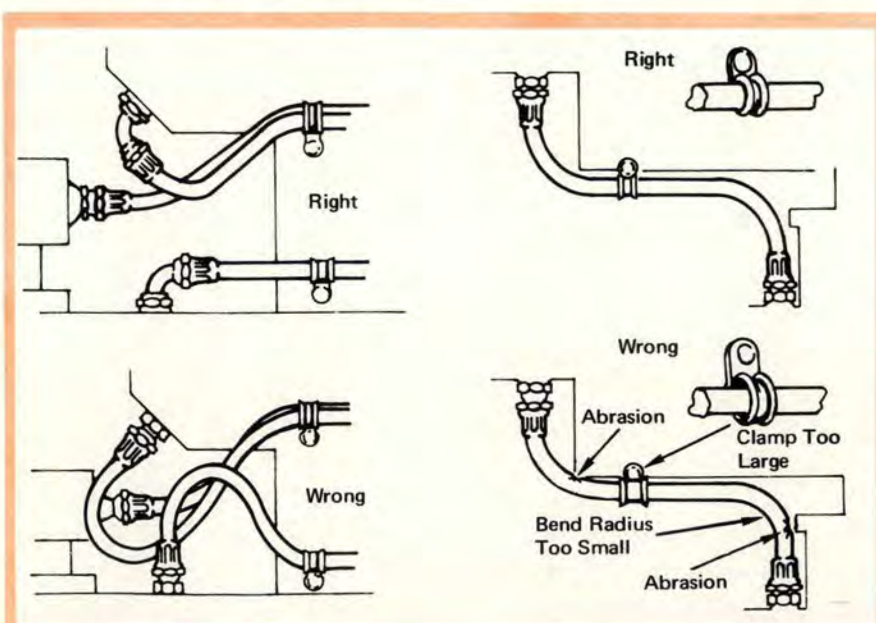
4. Torque the fitting connection and clamps to the recommended values.



INSTALLATION

When installing Teflon hose, assemblies should be positioned so the flexible portion of the hose extends at least one and one-half times the hose diameter before starting the bend. Two wrenches should be used to tighten end connections to prevent twisting of the hose or overtorquing of fittings. One wrench should be used to hold the nipple hex while the other is used to tighten the swivel nut. On hose assemblies that do not provide a hex for holding, extra care must be taken to prevent twisting of hose. ★

(Vought Maintenance Digest)



NUCLEAR SAFETY AID STATION

ALARM SECURITY, AND YOU

Alarm systems are designed to detect intruders trying to penetrate secure areas. When they don't perform as designed, then security, and in this case nuclear safety, is degraded. As a result of wear and improper maintenance, wind was able to move the doors on a storage building sufficiently to cause the alarm to ring. It became normal procedure to reset the alarm by wiggling the door. The discrepancy came to light when a two-man policy violation occurred in conjunction with one of these "false" alarms.

If you are depending on an automatic alarm to maintain security, don't lose that confidence by allowing poor maintenance. Report such discrepancies and have them repaired immediately.

FLASHING LIGHT

A routine and common Dull Sword is the one that reports a light on the Minuteman control consoles which is momentary or is extinguished by use of the inhibit switch. The most common reported are "enable," "launch in process," and "missile away" lights, although there are others. The majority are explained as caused by transient signals due to lightning in the area, missile test, or spurious voltage spikes. Faulty electronic drawers are also a cause. New equipment is now available to help trace down these transients, but they must first be reported to build up a data file. Your assistance is solicited in reporting the transients promptly with as much detail as is available to you.

LOAD CREW?!?

After all the years we have had load crew training, load crew certification, checklist discipline, etc., it would seem that never would a three-man crew attempt to function as a four-man load crew. Well, it happened in 1971 and here is a list of discrepancies that occurred during an unloading operation:

a. Supervisor permitted three men to function as a "load crew."

b. "Load crew" failed to install initiator cartridge safety pin.

c. "Load crew" failed to insure proper lanyard removal.

d. "Load crew" failed to check off steps as they were performed.

e. TAIL CONE BLEW OFF AND THE WEAPON PARACHUTE DEPLOYED.

Let this be a warning. If it happened once—it can happen again, and the next guys may not be lucky enough to avoid injury.

Dear Toots

What do we do or how can we run an aircraft that is on a red cross? It is a problem area on an H-43 helicopter when we change a collective limiter and it requires a leak check after installation. To properly leak check the item, it must be physically checked with the seat and panels out, since it is located under the copilot's seat. My question is, can we run an aircraft on a red cross and be covered?

When a pilot's or copilot's seat is removed, it is a mandatory red cross. I am following TO 00-20-5, page 1-1, para H.

We could install the seat, sign the red cross off, run it, put it back on a red cross and check it after the run, but if we do it that way, how can we assume the leak (if there was one) didn't come from another area, since there are other lines in that area?

Big question—can we legally run an aircraft on red cross?

MSgt Pat Bowers
Det 12, 43 ARRSq
Randolph AFB Texas

Dear Pat

Good to hear from you again.

TO 00-20-1 states that a red cross indicates that the aircraft is considered unsafe or unfit for flight and that the aircraft will not be flown until the unsatisfactory condition has been remedied. It also states that the use of the red cross symbol has been established to insure inspection of the work performed and/or accomplishment of a review of all related maintenance records for completeness and accuracy by an inspector or supervisor who is authorized to clear red cross symbols.

In answer to your question, yes, you can run an engine while the aircraft is on a red cross, provided that all systems affected during engine run are operative—hydraulic, electrical, etc.—and in your case, provided that the Chief of Maintenance does not have a policy where he requires both seats to be installed with two men at the controls.

Toots

Dear Toots

TO 4T-1-3, para 6-4D, states that tires which pass the 12 hour leak test will be marked as acceptable for installation. If storage or shipment of the tire is necessary prior to installation, the tire pressure will be reduced to 20 psi. Tire assemblies awaiting installation are not considered storage.

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

My question—if we have to send a tire assembly cross-country for a bird which is down at a transient base for a tire change, must we deflate the tire assembly prior to placing it aboard one of our fighter type aircraft for delivery?

Puzzled Sergeant

Dear P. S.

I talked with the OPR for TO 4T-1-3. They say yes, the tire assembly must be deflated for all air shipment.

Toots

EXPLOSIVES SAFETY

THE EGRESS SYSTEM GUN IS LOADED

Mishaps involving inadvertent firing of explosive initiators during periodic maintenance and inspections of aircraft seat and canopy ejection systems are increasing.

Reports indicate that these firings are attributed primarily to personnel error. Maximum emphasis should be placed on the importance of proper training and care in all phases of handling, installing, removing and using cartridge/propellant actuated devices associated with emergency escape systems. All commanders and supervisors must place increased emphasis on existing safety programs to preclude inadvertent firings of explosive initiators.

Pertinent factors to be stressed are:

Hazards: Supervisors must assure that all personnel are thoroughly familiar with hazards involved when working with or near explosive cartridge/propellant actuated devices, and that pertinent technical data and safety directives are complied with at all times.

Standing Operating Procedures: SOPs will be made available covering handling, installing, removing and inspecting propellant actuated devices.

Seat and Canopy Removal and Replacement: Accomplish in strict compliance with applicable aircraft maintenance handbooks.

Safety Standards: Insure that strict safety standards are enforced to prevent accidental ejection of aircraft seat and/or canopy by maintenance personnel.

Ground Safety Pins: Insure that prescribed ground safety pins are properly inserted and flagged in each initiator during the time the aircraft is undergoing periodic or other type inspection, or maintenance.

Orientation and Familiarization Program: Establish a continuing orientation and familiarization program to insure that all personnel, directly or indirectly associated with the safety requirements of these systems are fully aware of the hazards involved.

Explosives devices should be afforded the same precautions and respect as a loaded gun. . . .

They can kill, maim, and destroy! ★

UNWANTED CARGO

The C-130 was outbound from Vietnam after an in-country troop transport mission. After several hours enroute, one of the passengers, resting on a pile of seatbelt straps, grew tired of a lump poking into his backside and began rearranging the pile of straps. The "lump" turned out to be a very sinister-looking projectile!

The passenger notified the loadmaster, who notified the aircraft commander, who came aft and made a *very* careful inspection of the object, and then diverted immediately into the nearest military facility with an EOD team available.

The EOD team was waiting when the aircraft landed. They identified the projectile as a 40mm grenade and removed it from the aircraft.

The in-country missions had involved troops with full combat packs, and the grenade was probably left behind unintentionally. The off-loading of the troops had been made with engines running, and the usual close inspection after troop off-loading had been degraded. When the aircraft was re-configured for cargo, the projectile was unnoticed and inadvertently covered by the extra straps.

This incident need not have been associated with Vietnam. Our "workhorse" cargo planes carry troops all over the world—including the U.S. Anytime somebody boards the airplane with something that shouldn't be left behind, a careful inspection of the cargo compartment is in order. ★

Aren't You Glad You Use . . .

SOAP

GE Jet Service News

Are you using SOAP regularly? You should, you know. In fact, it's required. And we're not talking about your personal hygiene, but the Spectrometric Oil Analysis Program.

This program has been in operation for several years now, and has proven to be a worthwhile maintenance tool. It's the ideal kind. If used and interpreted correctly, it helps you to detect trouble before it becomes serious trouble.

With SOAP, the condition of enclosed mechanical systems is monitored by the Air Force through spectrographic and spectrophotometric analysis of lubricating fluid samples taken routinely from each system. The wear particles produced from the contacting surfaces of moving parts is evenly distributed within the lubricating fluid. Because the particles are sub-microscopic, they remain in suspension in the fluid. The analytical results obtained from one sample to the next provide information about the type and amount of wear taking place. Abnormally wearing components can therefore be detected long before they fail.

Your engine TOs and TO 43B2-1-9 and 42B2-1-10 give specific information on frequency of sampling and interpretation of results.

After a sample is obtained, it's sent to a SOAP lab. A couple of different devices are available for determining the content of wear-metals in the fluids. They're based on the determination of wavelengths of light produced when a sample is burned in controlled conditions.

Metals when burned produce light energy. Each basic element radiates light of a wavelength characteristic of that element and each is different. The amount of light is proportional to the amount of an element present. The SOAP labs burn your samples and are able to tell how much, in parts per million, of various elements are present.

They are particularly interested in the content of iron, copper, magnesium, chromium, aluminum, silver, tin, and titanium, because these are the common metals in gear boxes and bearing areas. A one-shot analysis tells little. But trends developing over a period of time or a jump in a metallic content indicates that action should be taken to find out why and where.

There are several things that you can do to help. Keep meticulous records. It does no good to know that a sample contains a high concentration of iron and copper if you don't know from what engine the sample came.

Keep the sampling equipment clean, and don't introduce material from outside the lube system while you're doing the sampling. A little sand (silicon) isn't going to help in an analysis.

Keep the sampling devices out of the system. More than one engine has been wiped out because the lube passages were plugged with a sampling bottle or bottle cap.

We've barely scratched the surface and the TOs will fill you in, but the message is loud and clear— Use SOAP! ★

MAIL CALL

COMMENTS

While preparing a letter to you on one article, another article of equal interest appeared in the August issue. Here goes on both articles:

a. In the October 1970 issue an article in Tech Topics, entitled "Down Time," caught my eye. It concerned an A-37 pilot confronted with the problem of his seat bottoming out during his first range pass. The disturbing part was the bit about "the pilot *installed the pins* and readjusted the seat" *and continued* on in the gunnery pattern. Unnecessary occurrences such as this, loaded with potentially hazardous possibilities, give any Safety Officer heartburn. The resulting loss of a canopy in this occurrence only reinforces a procedure that has been proven many times over. If something mechanical goes wrong with the bird, take it home and get it fixed.

b. In the August 1971 issue an article appeared on page 13 that I am intimately familiar with. The second article, an F-106 accident, took place during my tenure as Flying Safety Officer at that installation. I left the base, under honorable conditions, about a month later, and at the time the report indicated that the big culprit was materiel failure and not maintenance. The pin bag was improperly positioned; however, nothing was found during the resulting tests to identify the pin bag as the cause factor. Lab analysis of the eyebolt assembly indicated *no* bending associated with the failure. A pure tension failure was indicated.

I enjoy reading your magazine very much. It is a fine publication that you can be duly proud of.

Maj Edward Larson
Chief, Specialized Safety and Flight Operations Div
DCASR, San Francisco

Thanks for writing. We agree wholeheartedly on the A-37 comment. As we have stated many times, if you have a problem with a bird, get it back on the ground and let Maintenance take care of it.

As for the F-106 article, you are right—up to a point. When you departed that duty station, all indications were that the primary cause was Materiel failure; however, later investigation pointed to Maintenance as the primary factor.

* * *

AERO CLUBS HONORED

49 Air Force Aero Clubs were recently honored by the Federal Aviation Administration for flying accident-free in 1970.

Bergstrom AFB, Texas, received its fifth consecutive award. Arnold AFS, Tennessee, and Vance AFB, Oklahoma, were honored for the fourth consecutive year. Receiving awards for three consecutive accident-free years were Air Force Academy, Colorado; Grissom AFB, Indiana; March AFB, California; and Whiteman AFB, Missouri.

Aerospace Safety magazine adds its congratulations. Well Done!

CONTROLLER EXTRAORDINAIRE!

SSgt Richard L. Wines, air traffic controller, now assigned to the 2054th Communications Squadron, Sheppard AFB, Texas, is a million dollar controller—in fact, a 43-million dollar controller.

As mobile radar approach control crew chief and air traffic controller in the 1998th Comm Sq at Korat RTAFB, Sergeant Wines "saved" 19 crewmembers in 15 seriously imperiled combat aircraft valued at over $43-million. Quite a contribution to accident prevention, wouldn't you say?

U.S. GOVERNMENT PRINTING OFFICE 1971 789-121/2

UNITED STATES AIR FORCE WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major BERNARD W. McCAFFREY

9th Tactical Reconnaissance Squadron, Bergstrom AFB, Texas

During a low-level mission, Major McCaffrey spotted two large birds directly in front of his RF-4C. Although he at once alerted his navigator and took evasive action, a bird penetrated the canopy and destroyed the integrity of his ejection system. The drogue chute was dislodged from the seat and forceably deployed into the airstream. The violence of the deployment and wind blast jerked Major McCaffrey back into his seat with sufficient force to crack his helmet, strip off its visor and housing, and leave him temporarily dazed. His oxygen mask shifted over his eyes and shattered plexiglass caused superficial lacerations and bleeding. This further disoriented him. When he became reoriented, he decided against ejection. After regaining control of the aircraft, which was now at 4000 feet in an 80-degree bank, he rolled wings level and then evaluated the damage. His canopy was missing except for the lower right side. He attempted to contact his navigator but was unsuccessful. Moving the rear view mirrors, Major McCaffrey discovered the rear cockpit ejection tube was extended to the eject position. After appraising his situation, he decided to return to Bergstrom AFB. Using emergency checklist procedures, he contacted Austin Approach Control which gave him vectors to home plate. Major McCaffrey then requested that another RF-4C inspect his damaged aircraft. Because of his injuries and risk of greater damage, he decided not to engage the barrier and made a successful straight-in landing. Postflight inspection revealed that Major McCaffrey's parachute was missing with his shroud lines blown rearward into the rear cockpit and along the fuselage. Portions of his chute were found around the bellows probe on the vertical stabilator. Major McCaffrey was not aware of the parachute malfunction. If he had elected to egress, he would have been a certain fatality. After the bird impact, the disoriented navigator was unable to communicate with Major McCaffrey. He ejected and sustained major leg injuries.

Major McCaffrey quickly evaluated the risks, recovered from a hazardous flight situation and saved a tactical aircraft. WELL DONE! ★

DON'T SIMPLY TOLERATE
THAT WHICH IS NOT RIGHT,
CHANGE IT!