AEROSPACE SAFETY

UNITED STATES AIR FORCE

MARCH 1966

AEROSPACE
SAFETY

CONTENTS

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AFRP 62-1 MARCH 1966 VOLUME 22 NUMBER 3

FALLOUT

TAME THE TIGER

In order to keep Aerospace Safety the fine magazine it is, I wish to point out the error in the article "How We Tamed The Tiger in Our Transmitter," by Mr. Scott. (Dec. 1965).

On page 17, Fig. 2 appears the inside view of an MRN-8A Glide Slope and not a VOR.

By close examination of the men in Fig 2 you will note the man making the adjustments wearing a ring and a watch, plus he has both hands on the equipment which is taboo.

The article by Mr. Scott is a very fine one and brings to light how safety-minded we are in AFCS.

TSgt Wayne A. Hagan, USAF
NAVAIDS Maint Supvr
Moron AB, Spain

C-119 PREDICAMENT?

Wonder how many C-119 drivers have been faced with the dilemma of having to use reverse thrust in taxiing or let the aircraft set overnight awaiting a tow bar? Probably not many, since, after having given this matter due consideration, you promptly decided to deliver the troops today instead of tomorrow. But, have you checked the Dash One lately? In the paragraph titled CAUTION it states:

"Ground maneuvering of the aircraft utilizing reverse thrust will be used in emergencies only."

Now I'm sure all C-119 pilots feel that you can back this aircraft safely, but let's examine this practice. First, you are violating the intent of this CAUTION note in all except bona fide emergencies. (Remember the F.E.B. is going to decide whether or not what caused you to maneuver with reverse thrust was an emergency.) Secondly, you are accepting the responsibility for the successful completion of this unauthorized procedure, and airplanes haven't become any cheaper these days. Finally, most of us will agree that it is not a simple feat to perform in this aircraft and, let's face it, the CAUTION is well taken.

So what can we do? Let the aircraft stay put? Yes. This is the answer most often suggested by our supervisors, but certainly it is not always practicable. Then we come to what constitutes an emergency. Certainly the request of the Yellow Truck boys does not fall in this category.

Our suggestion that the only practical method of helping us in our predicament is to present our limitation to Transit Alert and advise them that, except under conditions which would effect loss of life or aircraft, we cannot maneuver the C-119 utilizing reverse thrust.

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SEE-THRU CIGARETTE LIGHTER

Reference is made to the answer to the letter in Fallout (November issue) entitled "See-Thru Cigarette Lighters."

What is a fighter pilot doing lighting cigarettes? (Reference AFR 60-16, par 20 h.)

Maj John F. Nortness
Physiological Training Officer
APO New York 09220

In flight, he shouldn't.

YOUR  KNOWS

In today's modern age of exotic fuels and oils, sophisticated weapon systems, automated flight control systems, space walks and Gemini rendezvous, the time seems right for a reminder that none of these advancements has fully supplanted man and his senses of *smell, sight,* and *feel.* (The order of importance is irrelevant at this time.) Here are a few examples of everyday occurrences dealing with the sense of smell that may convince you the nose knows.

While a missile was on alert status, the launch control officer noted an ammeter driving into the red. He immediately dispatched a crew to the launch bay to investigate. Upon arrival the crew smelled an odd odor and investigated immediately. They found the nose section (missile nose, that is) to be hot to the touch; they suspected failure of the torque exciter so the missile hold power was turned off. Maintenance personnel later discovered that the torque exciter motor bearing was dry of lubrication and had frozen to the shaft, causing the motor to overheat and the torque exciter cable harness to melt in spots.

One day last summer, after about an hour of flight, a fighter pilot began to feel a big woozy and decided to check his oxygen connections while he was still able. He checked. Everything seemed all right but he wasn't satisfied, so he removed his mask. Then he could smell the fumes in the cockpit. They were not strong enough to cause his eyes to burn or to make him bleary-eyed, but he decided to go to 100 per cent anyway. He did, and landed his aircraft without a hitch. There was a hydraulic leak in the engine intake, which was corrected and the F-100 was soon ready to fly again.

Another fighter pilot, while making a low approach following an ADF penetration, noticed heavy smoke and smelled electrical fire fumes in the cockpit. The pilot declared an emergency, switched to ram air, and went to 100 per cent oxygen. The cockpit cleared of smoke, and a straight-in landing was made. Even though the light was not on, the pilot suspected failure of the main inverter; but, since the aircraft was so close to the runway he didn't switch to the alternate inverter until after touchdown. His hunch was confirmed by the ground crew. The inverter had just been installed — replacing another main inverter that had failed because of overheated bearings.

The next one happened on a cold day in January. Shortly after takeoff this fighter pilot smelled a slight odor of oil fumes in the cockpit. He reduced power to 85 per cent, and continued his climb. The oil fumes dissipated as power was reduced. Power was re-applied and increased to 95 per cent for a climb to 20,000. The fumes recurred. The pilot attempted full throttle but received only 94 per cent power and decided to enter a precautionary landing pattern from an 8000-foot high key point, at 80 per cent. Command post advised maintaining power at or above 80 per cent, going to 100 per cent oxygen, and dumping cabin pressure. On base leg the pilot realized he was high and hot (3000 ft and 240 KIAS) and decided to go around after turning final. Power was applied and a drop in oil pressure, with fluctuations from 25 to 10 psi, finally stabilized at 20 psi. A normal landing was made; after the engine was shut down, large globs of oil were observed on the left side of the fuselage. Investigation disclosed complete loss of engine oil caused by the failure of the duplex bearing oil supply tube.

Fumes detection is not limited to fighter pilots; the transport people have good noses too. Take the transport that was on a transition flight for about an hour or so when its pilot initiated an ADF circling approach. On base leg the flight engineer reported he could smell fuel fumes. The control tower was notified and electrical sources were shut down. A normal landing was made and all engines shut down as soon as the aircraft turned off the active. The crew evacuated the aircraft; by now the fumes were extremely heavy. Fuel was observed coming from every seam in the underside of the fuselage, almost the entire length of the transport. Three faulty components of the fuel system had precipitated this hazardous condition. Fortunately, the right people with the right repair equipment were on hand and soon put this airplane back in commission.

The next item was borrowed from the Flight Safety Foundation bulletin and it could be a "one-of-a-kind" story, except that there are many persons in the Air Force who enjoy hunting and fishing, and with a number of sportsmen around, this incident *could* happen again.

A crew entered the aircraft and immediately experienced sudden air hunger and hyperventilation. Investigation revealed a container of fresh game packed in dry ice that had been left aboard the aircraft all night. Sufficient dry ice had sublimated to high levels of gaseous CO_2 to cause the symptoms. If aircrews are going to fly fresh game or any other materials packed in dry ice, they should make sure that adequate ventilation is provided to prevent CO_2 buildup beyond the permissible level of 5000 ppm; also, aircrews should be aware of symptoms resulting from high-level CO_2 exposure. Don't let your kill turn the table on you.

Smell well! ★

THE BELL RANG ON and ON

Maj Henry K. Good, Chief of Safety, 9 Wea Recon Gp, AWS, McClellan AFB, Calif.

Ah, come on, fellows – you know the bell I'm talking about. It's the one that you "hear", only subconsciously. The one that says, "Hey, Buddy, you're about to get in trouble."

This particular bell just about wore itself out on two friends of mine. They both had more than 2000 hours, had been flying for many years with spotless records and they knew the rules well.

They had finally pried a cross-country bird out of scheduling and had a beautiful trip planned. Lots of flying time combined with two RON's at choice locations. The big day arrived. As they approached their bird, an airman was removing something from the nose section. "Something" was the VOR; it was inoperative and there were no replacement units on base (R-i-n-g-g). After a discussion, my friends decided to press on and use the ADF as the primary navigation aid – after all the weather was forecast to be VFR over the entire route (R-i-n-g-g). "What about those thunderstorms enroute?" "No sweat, they're isolated." (R-i-n-g-g . . . no answer.)

While taxiing out for takeoff the UHF started to cut out (R-i-n-g-g). My cross-country fixated friends discussed this as they taxied. Suddenly the UHF cleared up. "Must have been in a blind spot." "Yep, must have been." (R-i-n-g-g.)

The first leg of the flight was routine, we-l-l-l, almost routine. The "bird dog" seemed to be quite erratic, but that was probably due to the heavy static and the numerous thunderstorms (R-i-n-g-g). However, GCI did a beautiful job of vectoring them around the "isolated CB's." The next leg had fewer thunderstorms, but seemed to have a series of weak radio beacons (R-i-n-g-g). However, it's hard to miss New Orleans (the next turn point) when you head generally south from Memphis — big river, big lake, big city, all located in the vicinity (like the north shore) of a lot of salt water normally referred to as the Gulf of Mexico. A 90-degree right turn followed by some unerring pilotage soon took my friends to the next JP-4 filling station.

The pitch out and landing were marred only by a 1000-foot error in altimeter interpretation which did make for a rather high pattern and a sporty final. The ADF seemed better, particularly after landing. Besides it was after 1700 and would probably wind up "ground checked okay" anyway (R-i-n-g-g). The next leg was an easy one, only an hour thirty and after all, ". . . who could miss Albuquerque on a nice clear night? Just stay south of Route 66 and head for the bright lights when the ETA runs out."

The bell didn't ring that time, it was out of breath or whatever it is that bells run out of. The UHF started cutting in and out again during taxiing, (R-i-n-g-g) but cleared before takeoff. The ADF encountered more weak beacons and the adventurers relied more and more on the good, old gyro stabilized compass and pilotage. At ETA there were no lights to be seen except way up to the north. An attempt was made to call Albuquerque tower, but the UHF garbled and cut out. After they had flown for 12 to 13 minutes, the lights proved to be Albuquerque and the tower boomed in loud and clear. Our heroes decided that they had picked up a whooping crosswind, unforecast of course, made a few pointed remarks about the weather people and landed. They wrote up the ADF, "ADF seems weak" (the only thing weaker than the ADF was the write-up). They didn't write up the UHF since it had worked like a charm during the last few minutes of flight, on landing roll and even in the parking spot (R-i-n-g).

The radio maintenance technician read the comment and proceeded to check the ADF. He tuned in the local beacon, checked all positions; they all worked correctly and the signal was fairly strong. It shouldn't surprise you to hear that he signed the ADF off as "ground checked O.K."

The next day our heroes made a few disparaging remarks about Transient Maintenance, but made no attempt to find out what had been done and why. Takeoff was a little hairy due to a slight miscalculation of takeoff distance, a rough runway and some over-anxious back pressure on the stick. It is a tribute to the designers that the bird finally defeated gravity and the back side of the power curve, but only after scorching sage brush for a few miles. The takeoff so unhinged the troop in the back seat that he forgot to give the ADF a good check during climbout (R-i-n-g). "No sweat, I can check it on Winslow in a little while. No need to track outbound anyway (R-i-n-g-g-g-g)." The time came to tune Winslow — certainly was weak —couldn't identify it for sure due to heavy static and weak signal (R-i-n-g). The ADF needle swung in a slow, never-ceasing circle except when it hesitated momentarily to point out one of the larger "isolated" thunderstorms (R-i-n-g — Hey, fellows, come on, let's go back!). The forecast lower broken deck changed to a solid, sullen undercast and the thunderstorms grew like mushrooms. The tops that had been forecast for 30,000 were soon reaching 40,000 (R-i-n-g).

The bell rang again and again. Finally our erring eagles heard and heeded. The change was startling — once again they were professionals. They called GCI, but now the UHF was wearing the black hat — it garbled and cut in and out. Some agonizingly broken transmissions followed. One came through intact. They were informed that their IFF wasn't operating, but a tentative fix placed them south-south-east of Tucson ('way south), and then came the blow, "AF Jet 12345, this is Code Name, our weapon is bent — garble — static —."

By this time our two freely perspiring eagles were at 40,000 feet circumnavigating the almost continuous "isolated" thunderstorms. The UHF, ADF and IFF were all inoperative and the VOR was on somebody's workbench a thousand miles away. The long overdue 180-degree was made and much time passed. Shortly after they switched to the fuselage tank a hole appeared in the undercast; through the hole, a river and a town! Throttle to idle, roll over and down, down. Oops, ailerons are buzzing, speed boards, down, suddenly they broke out. The town — Las Cruces — turn direct to El Paso — the low fuel warning light had been on for an eternity. They tried to call tower on both normal and Guard — no luck — pick a runway, pitch out, turn final and the light dawns. The gyro compass is a steady 60° off runway heading; the standby, as usual a little undecided, averages about 20° degrees off runway heading.

Our two aviators wrote up the ADF, the UHF, the IFF and both compasses. IN DETAIL. They checked into the BOQ, showered, dressed and headed for the club. After spilling everything but the olives in their first pair of "Juniper Delights" they followed the bartender's suggestion and used both hands, not very delicate but highly effective. This was the second effective thing that they had done on the entire expedition. The first, when they finally wrote up their bird and all of its shortcomings.

They discussed the entire trip and decided that their airmanship had not been quite sterling. The logical conclusion to a series of flights such as theirs was a punch out or a rapid deceleration in a stuffed cloud. As they munched olives they summed up the reasons for their actions.

- Cross-country T-Birds were few and far between.
- The waiting list was long.
- There was no spare aircraft and it was doubtful that radio maintenance could have fixed their bird that first afternoon.
- If they hadn't departed on the scheduled day they probably would have lost the bird to a priority mission.
- They both needed the time.

These reasons almost cost the USAF an expensive piece of hardware and possibly a pilot or two. Tell me, readers, do any of these reasons sound familiar to you? ★

*Identified Falling Objects

Generally everything attached to an aircraft has a purpose for being there. External items include doors and panels of various size, shape and location that provide protection, access and streamlining. The functions of external tanks, pylons and similar hardware are obvious.

In the vernacular then, there are reasons for all that garbage. It follows, therefore, that the loss of any of these items not only constitutes a hazard on the ground, but possibly more serious hazards to the aircraft itself and, of course, the aircrew.

A recent message indicated that a unit was very concerned over the loss of three external tanks in two years. Looking at this from another angle, three such losses over that period of time doesn't seem like very many. But multiply this by the number of such units in the Air Force and by the number of items that can come off an aircraft in flight. The problem now reaches very serious proportions.

Listed below are a few occurrences representative of the kind that happen every day.

F-105. During a functional check flight at 14,000 feet and 420 KCAS, the left 450-gallon drop tank separated from the aircraft at the pylon connection.

Cause unknown.

F-102. During a climbing turn at 6000 feet, the right external tank and pylon assembly left the aircraft causing damage to the wing.

Cause undetermined, but design deficiency suspected because overcenter locking mechanism can be properly torqued when the unit is resting on dead center, which would be hard to visually detect. This is not a new problem and AFLC is working on a fix.

C-130. Aircraft was on autopilot, 190 KIAS, FL240, clear weather when buffet was felt. Pilot suspected life raft release, which was the case. The departing raft damaged both horizontal stabilizers and one elevator and trim tab.

Suspect trapped air in right inboard raft expanded at altitude enough to open the access door and allow raft to escape.

T-33. Pilot returning from low level target mission was surprised on return to base to find that the travel pod was missing.

Suspect retaining pins failed or slipped out.

KC-135. Postflight inspection revealed portion of keel beam equipment bay door missing. Crew had not been aware of anything amiss.

Probable cause was considered to be either failure of latches or failure to secure airlock fasteners.

CH-3C. This chopper was on a search mission when a cargo compartment window was lost.

Cause was thought to be temperature change of plexiglas, which caused warping, and deterioration or rubber seals due to oil spillage or leakage from main rotor head and gear box.

T-33. Imagine the pilot's surprise when he arrived at destination and found that the clothing he had placed in the travel pod was gone because the pod door fell off. Weather during the flight had been VFR with only a short period of light CAT.

Cause undetermined. One door latch was torn off and the other appeared to have come unfastened.

B-58. Tanker boom operator noticed that a panel was missing from leading edge of B-58. Screwheads remaining on aircraft indicated they had been pulled through.

Suspected cause was that sealant on panel had not adequately set and that panel subsequently was ripped off by slipstream.

C-130. While the crew was performing inflight gear checks, the right hand nose gear well door separated.

Since the door had been operated successfully many times in flight and while the aircraft was on jacks, materiel failure was assumed to be the cause.

B-66. At FL250 crew heard an unusual noise but could not determine the source. After descent to 9000 feet, the cockpit was de-pressurized and a check revealed the entrance door open about three inches. When the engineer attempted to close and lock the door, it separated from the aircraft.

Cause: Retracting mechanism pin and supporting bracket retaining screws backed off the nut plate, were elongated by wear and separated from the aircraft.

C-130. Two para-bundles weighing 450 pounds each were released on final approach to the drop zone.

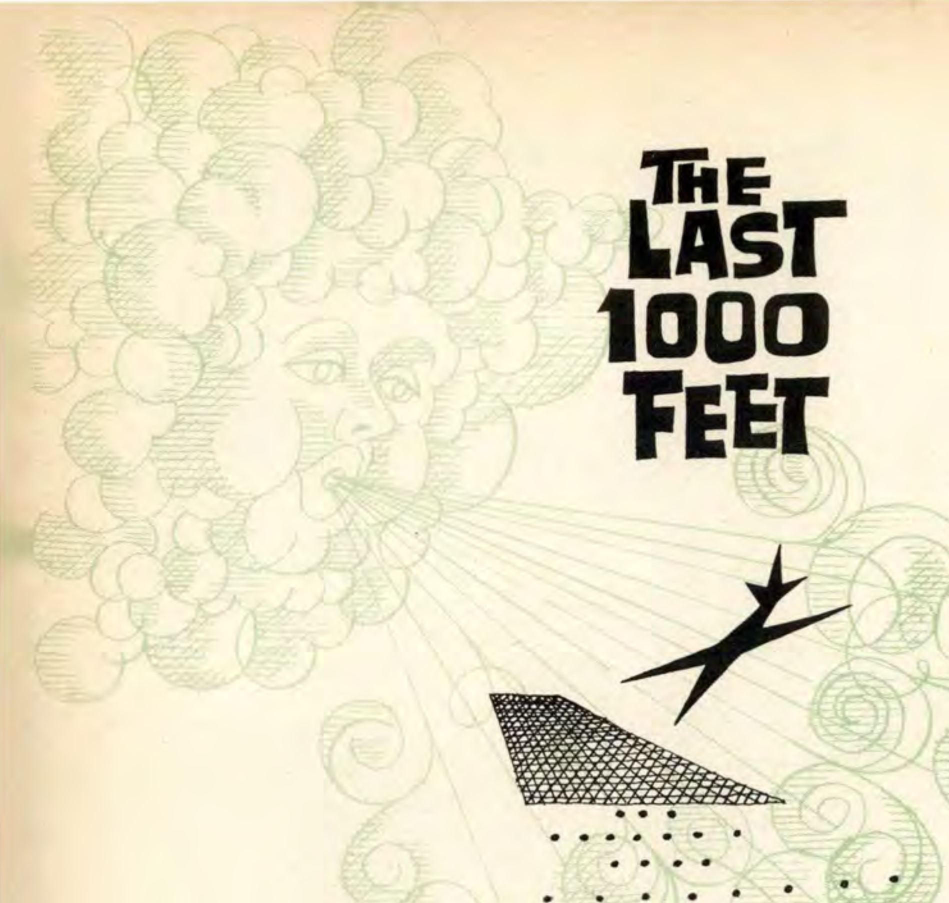
Bundles were tied down on roller conveyors so that rear bundle provided restraint for forward bundle. When rear bundle was untied in preparation for the drop no aft restraint was provided for either bundle. Loadmaster's attention was diverted which prevented him from providing restraint to forward bundle. Light turbulence and nose high attitude of the aircraft caused bundles to roll out the cargo ramp.

Unfortunately, the reason for many of these inadvertent drops is never positively identified. Usually, in fact, the cause is listed as undetermined, most probable, or suspected.

Fortunately, we drop very few items into heavily populated areas. This does not mean, however, that the problem isn't serious. There are also the aircraft and crew to consider as well as completion of the mission.

Whether design, maintenance or crew is to blame, the deficiencies leading to loss of objects in flight must be identified and corrected as early as possible in order to prevent the occasional accident that inevitably accompanies numerous like incidents. ★

THE LAST 1000 FEET



Lt. Col. Jerry Creedon, AWS Liaison Officer, Directorate of Aerospace Safety

Weather in one form or another continues to be a major factor in many aircraft accidents. But a lot of pilots might be surprised to know that wind at or near the surface contributes to more aircraft mishaps than any other weather element (lightning/electrostatic discharges excepted.) Over the past seven years surface wind has been a factor in the damage of 212 USAF aircraft. We recognize that most of these were incidents by definition, not accidents, but the large number of mishaps should cause each pilot to pause and reconsider his crosswind landing technique. We also recognize that certain aircraft are more susceptible to crosswinds than others. Nevertheless, few aircraft types are members of the exclusive "it's never happened" club.

For light aircraft the problem generally is one of overconfidence and not "flying" the aircraft to a complete stop. As Orville told his brother, "Don't fill out the form one until after the flight." As a rule it seems that light plane pilots are quite concerned about flying if excessive crosswinds are existing or forecast but most of their mishaps occur well within the Dash One maximum allowable crosswind.

In larger and heavier aircraft frequently there are one or more other factors present, which in hindsight at least, should have alerted the aircrew. Low ceilings, poor visibility, icy runways or wet runways certainly increase the probability of an accident. Drag chute deployments, where required, further enhance the problem. Incidentally, there have been several incidents this winter wherein drag chutes have failed to deploy or failed to blossom because the chute was packed wet. We doubt if anyone has figured out the retardant effect of a block of ice, but it undoubtedly is much less than a fully deployed drag chute.

Then there apparently is a problem of correctly reading Dash One crosswind component charts. The maximum gust reported is used to compute the component. Be concerned about the steady speed and gust speed spread. A large spread within the recommended zone can be more of a problem than small gusts right on the limit line.

Let's consider for a moment true wind and magnetic wind. In briefings, all weather stations issue magnetic wind concerning the local base. This is fine, just what you want, since the runway direction is referred to in magnetic direction. All landing control agencies also issue magnetic winds. All winds transmitted on teletype circuits are TRUE winds. Also, *all* forecast winds are issued in TRUE directions. TRUE wind is entered on the DD-175-1 for destination. If surface wind may be a problem at your destination you can't compute the component until you check the variation and convert the wind to true.

It should be noted that wind measurement equipment on USAF bases is standard. Anemometers are installed on a 13-foot high post adjacent to the runway and at approximately the touchdown point. Most airfields have dual installations (one at each end of the instrumented runway); however, some fields have only one anemometer installed adjacent to the midpoint of the runway. All agencies providing wind information for the base (weather, tower, RAPCON, etc.) have readouts for the anemometer in use for the currently active runway.

Since landing short is not an unheard of problem, let's review the effect of changing wind on final approach. For years pilots have known that winds tend to decrease in velocity near the ground. Studies indicate that the greatest changes in wind velocity occur between 300 feet and the ground and wind direction remains fairly constant below the 300-foot level. (Handbook of Geophysics, AFSC, USAF). Headwind gradient effects normally benefit an airplane during takeoff, because, as the airplane climbs into increasing wind velocity, the indicated airspeed increases faster than the airplane accelerates over the ground. Just the opposite occurs on landing. A strong headwind that decreases as the airplane nears the ground can cause a decrease in indicated airspeed, resulting in a lower speed over stall. Unless the deceleration is compensated for the aircraft will sink below the glide slope and land short. Bear in mind, terrain features may amplify the changing wind speed. Figure 1

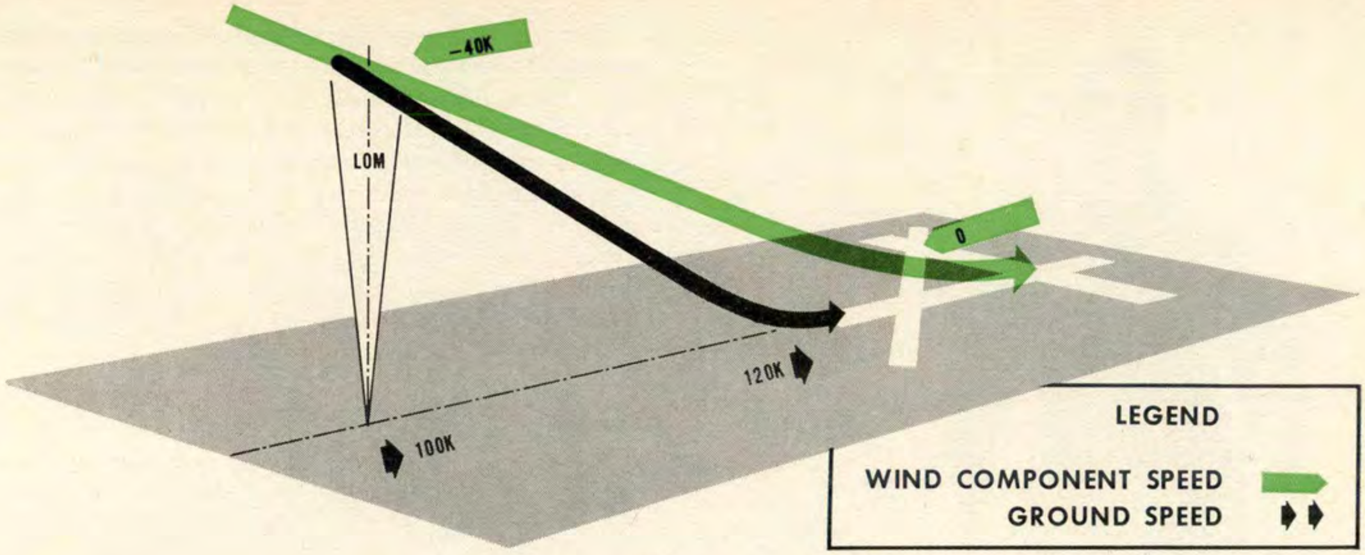


Fig. 1

clearly illustrates the problem. (Airspeed over the marker is 140KIAS with a 40K headwind. Groundspeed is 100K. When the wind decreases to zero rapidly the airspeed may decrease below the 120K approach speed.)

Now let's examine what happens when we have a tailwind at outermarker or traffic pattern altitude with a zero surface wind (Figure 2). In this case the airplane must reduce not only to proper approach speed (120K), but must decelerate an amount equivalent to the speed of the tailwind (40K) prior to touchdown. The alternative is either overshoot or higher airspeed. The root of the problem is this: Whenever the wind environment changes faster than the aircraft mass can be accelerated or decelerated, the wind variations must be reflected by changes in airspeed.

Shear can be anticipated whenever there is an inversion. Shear is also a hazard potential with frontal passage and in and near thunderstorms. Severe down drafts associated with thunderstorms warrant delaying takeoff or landing when such storms are over or adjacent to the airfield. Shear should be anticipated when taking off or landing over cliffs, water, in hilly terrain and with large buildings or trees adjacent to the runway. Normally, the severity of such low altitude wind shear bears a direct relationship to the surface wind speed. Don't overlook the help you can obtain from the weather forecaster. Check with him before takeoff and, when you suspect shear, call him before making your final approach.

Apply wind shear hazard planning for the aircraft you fly. When you have strong surface headwinds reported aim a bit farther down the runway. Ground speed will be less and roll out distance will be shortened. If shear is probable, a rather flat approach should be considered in order to transition the shear area more slowly and allow more time for correction. If taking off into suspected shear, accelerate as rapidly as conditions permit until safely above stall speed.

It is no news that most of our accidents occur in the landing phase of flight. Perhaps some of the points brought out will help toward more professional flight planning and flight. ★

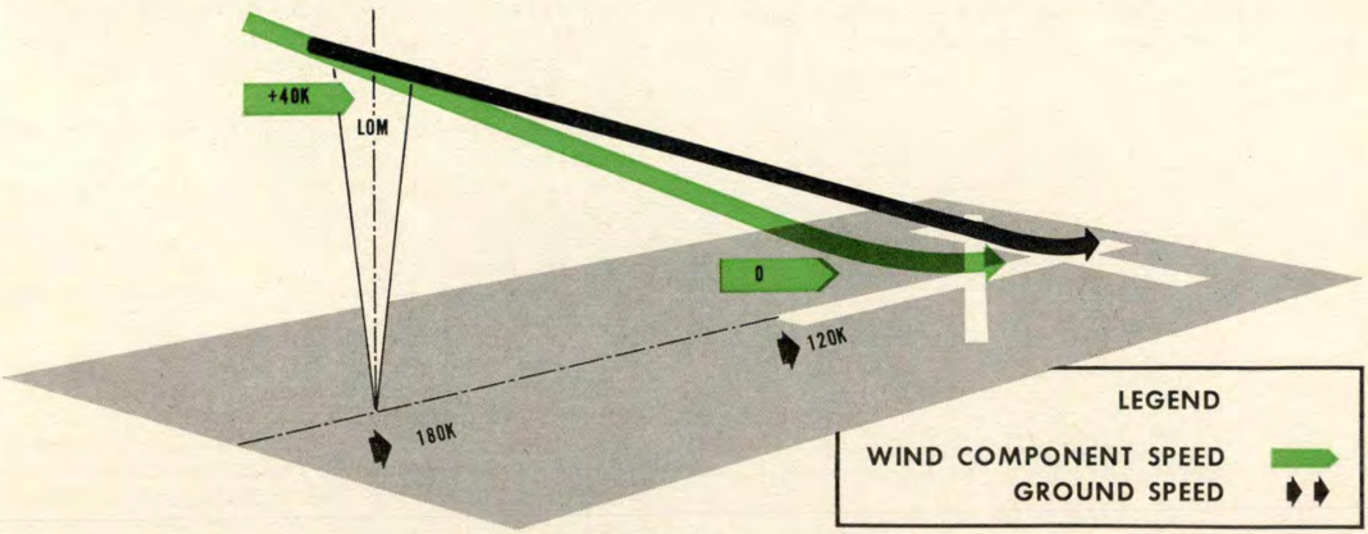


Fig. 2

Flying Status Insurance

Maj Kenneth H. Cooper, MC, USAF, Chief, Aerospace Medical Lab. (Clinical), Lackland AFB, Tex

Doctor Cooper is a specialist in aerospace medicine assigned to the Wilford Hall USAF Hospital, Lackland AFB. He is currently engaged in research documenting the role of physical fitness in maximizing aircrew responses to flight and space operations. The program he describes is designed for aircrew members and is supplemental to the officially required 5BX exercise program. The recommendations by Dr. Cooper represent his own views and are not necessarily the official position of the Surgeon General, USAF.

Annually, many more flying personnel are lost from the development of medical conditions incompatible with flying than are lost from aircraft accidents. This fact can be explained partially on the basis of better and earlier diagnostic capabilities. However, it is no longer a rarity to discover in a young airman a disqualifying medical abnormality that is usually associated with ageing. Heart disease, high blood pressure, stomach ulcers, and diabetes are only a few examples. Possibly, these conditions could be prevented or their onset delayed if the aviator had only practiced a little *preventive medicine*. The purpose of this article is to discuss some of these disqualifying medical defects and to suggest methods of preventing or delaying their onset. Perhaps, this information will help the airman improve his chances of being a career aviator.

THE PROBLEM

Heart disease and diseases of the blood vessels are the major offenders. When an airman suffers a heart attack, there is no question about his permanent removal from flying status. However, he may be completely without symptoms but have an abnormal electrocardiogram which is noticed incidentally during his annual flying physical. Finding this condition will lead to grounding just as rapidly as the well-documented heart attack. High blood pressure requiring medication is another medical problem that will produce grounding action. Stomach ulcers and diabetes also disqualify the airman but they do not approach the magnitude of the problems of heart and blood vessel diseases.

Before prevention or treatment of these medical offenders can be discussed, some of their possible causes must be identified. Heredity, stress, smoking, high caloric high saturated fat diets, and inactivity all deserve important consideration. Heredity and stress are examples of causes that are difficult or impossible to control. However, other controls which are possible should be practiced.

Cigarette smoking is an excellent example of a controllable cause. Studies have shown repeatedly that the one and a half to two packs a day cigarette smoker has at least three times more likelihood of developing a heart condition than the nonsmoker, cigar or pipe smoker, and even the former cigarette smoker. (Nicotine seems to have a toxic effect upon the heart that lasts very briefly, once the source is removed.)

Activities shown, left to right, illustrate kinds of exercises: Weight lifting, isotonic; pressure against immovable object, isometric; swimming, aerobic; long distance bike riding, aerobic.

Dietary control is also a distinct possibility, and it is important to control both the amount and the type of food consumed. A high calorie diet eventually leads to obesity which, in turn, increases the likelihood of developing many of the previously mentioned medical conditions. Even the thin individual becomes more susceptible to heart disease if his moderately low calorie diet is high in saturated fats (animal fats and dairy products primarily).

An inactive, sedentary way of life exists as another possible cause or complicating factor of many medical problems. For years it has been apparent that physically active groups of people do not experience a problem with heart disease. Of interest also is the discovery that physically active people may not be troubled with heart disease, even though they are heavy smokers and live on a diet high in saturated fats.

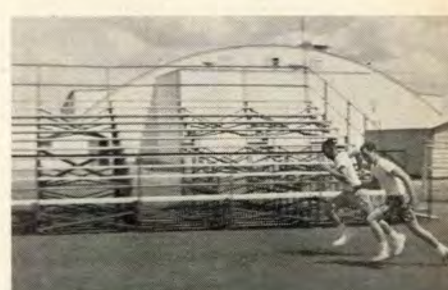
Regular physical activity seems to have a neutralizing effect on several of these harmful habits, and may even play a role in reducing the chronic effects of stress. The most dangerous combination of factors for developing heart disease consists of moderate obesity, a high saturated fat diet, a moderate amount of stress, and a completely sedentary life. If smoking two packs of cigarettes per day and a positive family history of heart disease are added, the chances of such an aviator completing 20 years on flying status are slim.

PHYSICAL FITNESS

Now that the value of exercise and physical fitness has been emphasized, it is advisable to define the term "physical fitness." It may mean merely freedom from disease or it may be a measure of physical strength. The definition proposed here, however, is endurance capacity, working capacity, or essentially the ability for prolonged work. This definition is restricted because scientific experiments have shown that a high endurance capability is most compatible with an efficient heart, lung, and blood vessel system. The body that is well trained to tolerate endurance stresses is best prepared to tolerate the emotional and physical stresses of the normal environment. For example, in an endurance trained subject the resting heart rate is very slow. However, during vigorous work, it has an enormous capability to perform and easily meets the demands of unusual environmental stresses. Even the lungs work more efficiently in endurance trained subjects. The capacity to breathe rapidly and deeply increases significantly. In general, the body seems to function more efficiently in response to endurance training. In contrast, exercises that tax the body only briefly do not produce the desirable effect of endurance training. Exercise for short periods may produce changes in muscle strength but do little for the heart and the circulation. Endurance training seems to be the most effective means of producing cardiovascular fitness. Therefore, the term "physical fitness" is restricted in this article to mean only endurance or working capacity.

PHYSICAL FITNESS TESTING

Endurance capacity or physical fitness, as defined here, is easy to assess. It can be determined by what is called a 12-minute walk-run test. A track, a straight stretch of road, or any other suitable course that can be easily measured is used for this test. The person starts and attempts to cover the longest distance possible in exactly 12 minutes by running preferably, but



Pushups represent an isotonic exercise; running in place, aerobic if continued for longer than six minutes; long distance walking, aerobic; sprinting, anaerobic.

walking when necesssary. The fitness classification is based on the distance covered, as follows:

Distance	Fitness Classification
1.75 miles or more	Excellent
1.40 miles to 1.74 miles	Good
1.15 miles to 1.39 miles	Fair
Less than 1.15 miles	Poor

If a person's performance places him in one of the lower two categories, he should not feel discouraged, for approximately 75 per cent of his contemporaries are there, too!

EXERCISE PROGRAMS

After a test of endurance capacity, usually the need for exercise is readily apparent. However, exercises can be grouped into at least four different categories (Isometric, Isotonic or Isophasic, Anaerobic, and Aerobic). Before selecting one of these exercises, it is desirable to become familiar with their characteristics.

Isometric. Isometrics are the famous exercises that contract muscles without moving anything, i.e., the 60-second-a-day type of workout. These exercises will improve muscle tone and, perhaps, strength, but only for doing isometric exercises with little, if any, heart and lung benefit. Isometrics also tighten and shorten ligaments that support joints and make them more susceptible to injury. In general, appreciable changes in a physical fitness level will not be observed with isometric exercises.

Isotonic or Isophasic. These exercises contract muscles but also flex and extend extremities. Weight lifting, calisthenics, and others belong in this category. These exercises are more beneficial than isometrics but still lack the capacity to produce all the changes desired in a cardiovascular fitness conditioning program. It is possible to become "over-muscled" as well as "over-fat" and the heart suffers in either situation.

Anaerobic. Anaerobic exercises constitute a step in the proper direction. Exercises which require submaximal to maximal effort for periods of less than 3 or 4 minutes are termed anaerobic exercises. With such short sustained exercise, the body does not have time to attain a "steady state" or a "leveling off point." These exercises include running for 1 to 2 minutes or isotonic exercises for brief periods and interspersed with frequent rest periods. Dash events in performance sports are classified as anaerobic exercises. Anaerobic exercises produce an adaptation at a lower level than aerobic exercises because the body attempts to adjust to the degree of stress imposed. For this reason, anaerobic exercises are useful but aerobic ones are better.

Aerobic. Exercises that require continual submaximal to maximal effort for periods of more than 4 minutes are aerobic exercises. Running, fast walking, swimming, cycling, rowing and cross country skiing fit this category. Evaluation of athletes so trained has shown that their body reaches a cardiovascular fitness level that far surpasses athletes trained with other types of exercises. It is also unusual for an athlete so trained to have a heart attack, high blood pressure, or any of the medical problems mentioned previously. If the maximum benefit is to be derived from conditioning, an endurance program should be followed.

A SIMPLE AEROBIC TRAINING PROGRAM

Once the value of an aerobic or endurance training program is recognized, the next question is how to institute such a program. The watchwords are: cautiously but progressively. More specifically, one of the aerobic exercises mentioned previously should be used. The simplest are walking, running, swimming, and cycling. In setting up a program, it is essential to assign each exercise a specific point value. By determining the energy expended in performing a certain exercise, the following scale is developed:

Exercise	Point Value
Running 1 mile in 7-9 minutes	5
Walking 1 mile at a 3.75 MPH speed	2
Cycling 1 mile at a 10-13 MPH rate	1
Swimming at a 75-90 feet per minute rate	1 point per minute

Using this scale, the subject may select one exercise or a combination of several. Very slowly and comfortably, he enters into the program by attempting to reach an average level of 10 points per week by the end of the sixth week. By the twelfth week, he should average 20 points per week, and by the eighteenth to the twenty-fourth, 30 points per week should be the goal.

Weeks	Points
1-6 weeks	10
6-12 weeks	20
12-24 weeks	30

Maintaining a 30-point-per-week average will enable most people to be classified in the good to excellent physical fitness category.

During the initial stages of training, exercise should be taken 5 to 6 times a week and be *slowly* progressive by all means. With improvement, the exercises can be made more strenuous and the frequency reduced to 3 or 4 times a week.

There are other good exercises that have not been discussed. If a person exercises regularly using a different exercise and can perform at a level compatible with the good or excellent categories mentioned previously, he should continue this practice. The level of fitness is what is needed regardless of how it is accomplished. Even with an aerobic exercise program, it is beneficial to warm up with a few flexing and extending exercises but a training program should not be planned around calisthenics alone. It is the abnormalities in the cardiovascular system that interfere so frequently with the continuation on flying status.

CONCLUSION

Currently, exercises are being used to rehabilitate people who are already suffering from heart disease, high blood pressure, and many other potentially grounding medical problems. However, once they are removed from flying status because of one of these conditions, it becomes nearly impossible to regain this status. A little preventive medicine practiced now will help to insure flying status for as long as an aviator desires to fly. ★

THE IPIS APPROACH

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

Q. What is the difference between an *enroute penetration* and an *enroute descent*? I have been hearing both terms lately. Capt Francis E. Dunlap, 3576 Student Squadron, Vance AFB, Okla.

A. An enroute penetration is defined in FLIP II, Pilot Procedures, as "a descent from an enroute altitude to the final approach without execution of the maneuvers prescribed in FLIP Terminal High Altitude (JAL) Charts." The FAA Air Traffic Controller's Manual, AT P 7110.1B, par. 761.1, states: "When requesting an enroute penetration, the pilot will use the following phraseology: REQUEST ENROUTE PENETRATION TO (destination airport)." Turbojet enroute penetrations are based on a rate of descent of 4000 to 6000 feet per minute.

The term "ENROUTE DESCENT" can not be located in approved FAA or USAF publications. An enroute aircraft requesting a lower altitude would receive clearance by the phraseology "DESCEND AND MAINTAIN (altitude)." Upon receiving such a clearance, you should descend as rapidly as possible, consistent with safe operating procedures.

Often the pilot desires a shallow, fuel conserving descent beginning a considerable distance from the destination fix. In this situation you should state your intentions when requesting the altitude change. The controller may or may not approve such a descent.

THE USAF INSTRUMENT PILOT INSTRUCTOR SCHOOL

For those of you who may wonder just what the USAF IPIS accomplishes other than instrument flying we have prepared a brief resume of the school's activities.

The IPIS, activated in 1943, is established by AFR 53-12 and owned and operated by the Air Training Command. The school's mission stated in broad, general terms is to:

- Develop, test and standardize USAF instrument flying procedures.
- Evaluate flight instruments and flight instrument systems for the USAF.
- Train instrument instructors for the USAF and Allied Countries.

From these basic functions evolve the three major branches or sections of IPIS — Instrument Procedures Standardization Branch, Instrument Evaluation Branch, and Flight Line and Academic Training Section.

The Instrument Procedures Standardization Branch acts as the "pilot's representative" by maintaining close liaison with the FAA, ACIC and Headquarters USAF. Besides these IPIS Approach articles, their work involves FLIP, AFM 60-1, AFR 60-16 and the writing of AFM 51-37, INSTRUMENT FLYING. In addition, they participated in writing the new Terminal Instrument Procedures (TERPS). This Branch also represents USAF at all flight manual policy and command review conferences for the purpose of insuring adequate instrument flying procedures and standardizing instrument terminology.

The Instrument Evaluation Branch is the "R & D" of IPIS. They conduct operational test and evaluation of flight instruments and flight instrument systems, validate advanced control-display concepts and investigate new instrument flying techniques and procedures. To do this, the Instrument Evaluation Branch maintains close liaison with various research laboratories and engineering groups within the Research and Technology Division of Air Force Systems Command. Studies exploring the potential of (1) sharing aircraft pitch and bank control tasks between the pilot and co-pilot, (2) using command steering (flight director) information in the GCA environment, and (3) portable ILS equipment are but three of their many current projects.

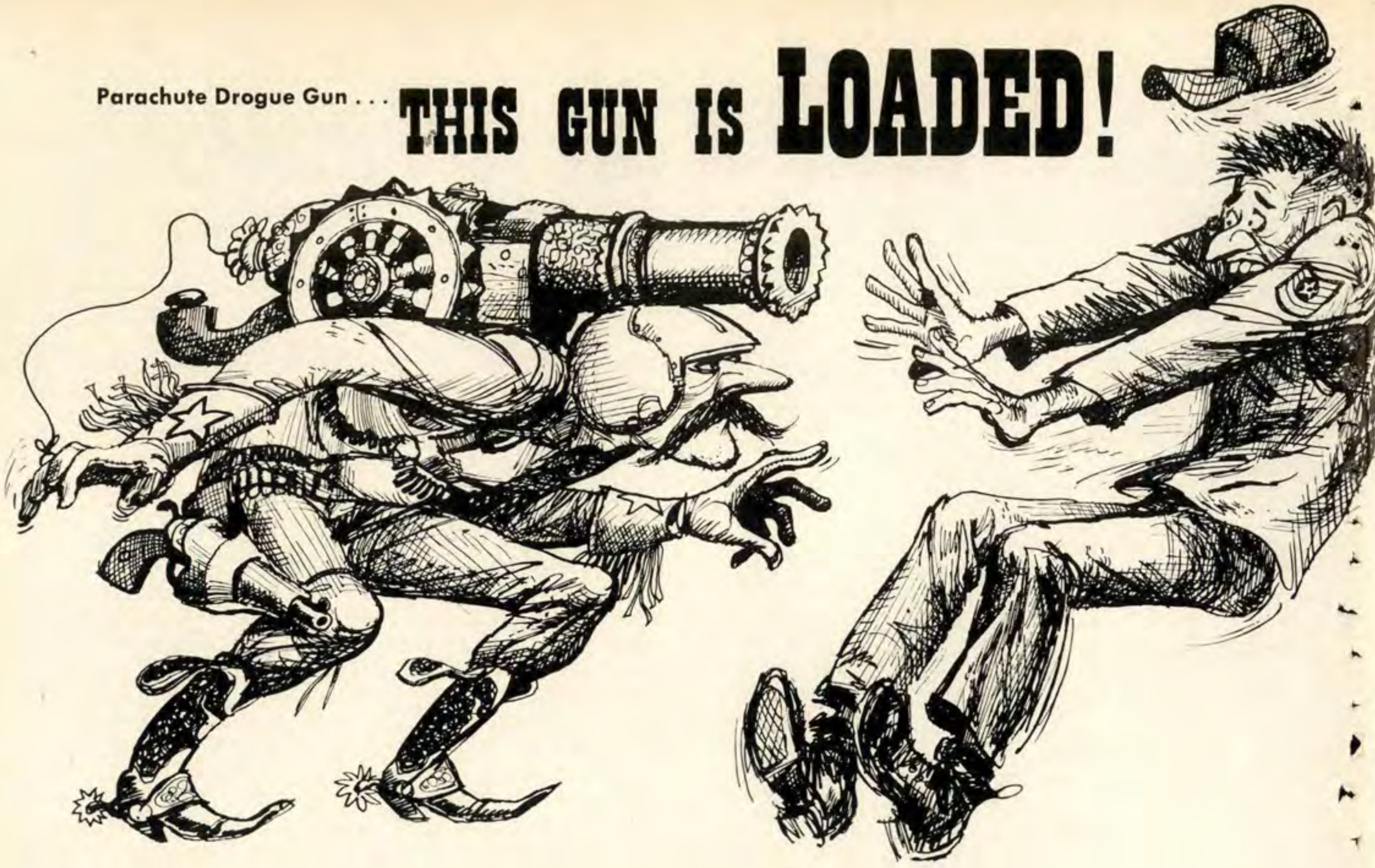
The Flight Line and Academic Section conducts the formal six-week training course here at Randolph Air Force Base. The academic instructors are responsible for teaching classes on such subjects as fundamentals of instruction, flight instruments, navigational aids, and regulations and publications. Also, these same instructors formulate and distribute the Annual Pilot's Instrument Refresher Course, with which you are all familiar.

The flight line portion is where the student puts theory into practice. The student is assigned to fly either the T-38 or T-39, whichever aircraft more closely approximates the performance of the aircraft at his home station. The course consists of 13 lessons with approximately half of the lessons devoted to instrument proficiency and observing instructing techniques used by the IPIS instructor. The student then uses these techniques and procedures, along with the knowledge gained in academics, to instruct the instructor on the remaining lessons.

Graduates will tell you, and correctly so, that another two or three hours of after duty study are required of most students if they are to gain maximum benefit from the course. Because of the short duration of the course and the large amount of material that must be covered, they will be pressed for time the entire six weeks, but after graduation the potential instrument instructor can be justifiably proud of his achievement. An Outstanding Graduate Award is given to the top two students based upon a combination of academic and flying grades. Those selected to attend IPIS should be among the unit's best pilots, both in basic instrument flying ability and in procedural knowledge. Quotas for attendance to IPIS are controlled by Headquarters, USAF. ★

Parachute Drogue Gun . . .

THIS GUN IS LOADED!



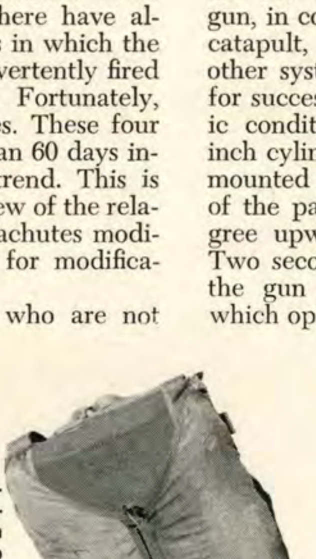
Robert H. Shannon, Safety Officer, Life Sciences Div

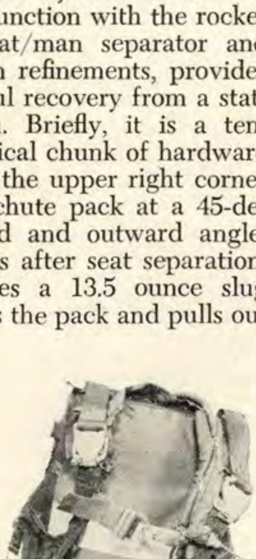
Installation of the Weber drogue gun in the B-18 parachute was started in late October 1965. As of this writing, there have already been four cases in which the drogue gun was inadvertently fired through carelessness. Fortunately, there were no injuries. These four occurrences in less than 60 days indicate a dangerous trend. This is particularly true in view of the relatively few BA-18 parachutes modified or programmed for modification at this time.

For those of you who are not familiar with the drogue gun, it was designed, tested and approved for the F-106 ejection seat. The gun, in conjunction with the rocket catapult, seat/man separator and other system refinements, provides for successful recovery from a static condition. Briefly, it is a ten-inch cylindrical chunk of hardware mounted in the upper right corner of the parachute pack at a 45-degree upward and outward angle. Two seconds after seat separation, the gun fires a 13.5 ounce slug which opens the pack and pulls out the pilot chute and a portion of the main chute.

Although the drogue gun concept of chute development is applicable only to the F-106 at this time, there is a great deal of support for the adoption of this system across the board for all rocket-powered ejection seats. Consequently, a great many more aircrews and maintenance personnel may be directly concerned. This *gun*, and it is a *gun*, must be treated with respect and caution. Even though it was designed to enhance the life saving capability of ejection systems, it could produce serious or lethal injury if handled carelessly.

In the four cases reported, three involved pilots and one a crew chief. In the three cases involving pilots, all occurred during attempted ground egress after normal flight. Brief summaries are presented.





Rear view of gun deployed zero-zero parachute pack is shown in photo at left. Red flap with printed warning (EXPLOSIVE DEVICE) gives instant recognition of zero-zero ejection system. Right hand photo shows parachute deployment cable that attaches to seat-mounted disconnect on left side of pack.

Case Nr 1

After completing normal cleanup of the cockpit following a flight, the pilot failed to pull the ditching handle to disconnect the arming cable of the drogue gun from the ejection seat. As he rose from the seat with the chute on, he felt a slight tug. The drogue gun had been armed, and it fired two seconds later into the canopy plexiglas. The parachute deployed behind the pilot into the cockpit. Cause; operator error – the pilot failed to disconnect the arming cable from the ejection seat before egress with the parachute.

Case Nr 2

The pilot overlooked the newly installed zero-zero parachute as he started to disembark from the aircraft. He felt a slight restraint, which immediately released. He then recalled the lanyard and sat back down in the seat. The drogue gun fired normally. The slug passed between the canopy and canopy rail and landed ten feet from the aircraft. Cause: operator error – the pilot failed to disconnect the arming cable from the ejection seat before egress with the parachute.

Case Nr 3

After engine shutdown at the completion of the flight, the pilot stood up in the seat to exit the aircraft. He did not pull the ditching lever to disconnect the cable assembly from the disconnect housing assembly. The result was as expected – the drogue gun fired and deployed the parachute. Cause: operator error–the pilot failed to disconnect the arming cable from the ejection seat before egress with the parachute.

Case Nr 4

The crew chief was removing personal equipment from the aircraft cockpit in preparation for towing the aircraft back to the flightline from the alert facility. It was raining very hard and the crew chief was attempting to remove the pilot's personal equipment to prevent it from becoming wet. He was not aware that the parachute was the explosive type. In other words, "He didn't know the gun was loaded." That has a familiar ring. After releasing the survival kit snaps and the personal leads, the crew chief attempted to remove the parachute, but it seemed to be caught inside the cockpit. He replaced the parachute and examined all the leads and equipment and found nothing. He attempted to remove the parachute again and after lifting it a considerable distance, the drogue gun fired, deploying the chute. The cable assembly was still connected to the disconnect housing assembly. The primary cause of the mishap was personnel error. The crew chief failed to disconnect the cable assembly from the housing as outlined in the aircraft T.O. before attempting to remove the parachute from the aircraft.

The recommendations presented in these mishaps to preclude recurrences were quite adequate and widely disseminated. They essentially involved the briefing and rebriefing of all personnel handling and maintaining the parachutes on the proper procedures and warnings as outlined in applicable technical orders. In at least one case, a possible design deficiency was indicated as a possible contributing factor. The arming cable cone should not disconnect until a 100-pound pull is exerted on the cone at a 20-degree angle. In some units subsequently checked, the arming cable cone disconnected between 20 and 47 pounds. In other words, it is probable that these inadvertent firings may have occurred with less than 100 pounds pull. This is currently being investigated by SAAMA.

It is not the intent here to belabor the personnel error aspect of these incidents. The need for complete knowledge of installed equipment, by both pilots and maintenance personnel, is very evident. This point cannot be stressed too strongly. Extreme care must be taken where explosive devices are concerned. The four cases cited here could have ended tragically. Had the crew chief been in the line of fire of the drogue slug he most certainly would have been seriously injured or killed. As for the pilots, had they been attempting to exit the aircraft after an emergency crash landing with fire present, the deployed chute could have prevented or delayed egress.

Fortunatly, no one was injured in any of these mishaps. We may not be as lucky on the next try. So, let every precaution be taken to insure there will not be another accident.

Pilot (above) in normal sitting position. Special attention must be paid to the parachute cable, as it is the triggering mechanism for the deployment gun, which is built into the chute back pack. Photo below illustrates the most common manner in which the gun deployed parachute is inadvertently fired. Pilots forget to release the deployment cable from the disconnect device, then they grab the windshield to stand up, putting pressure on the firing mechanism.

(This article was written on January 4. By press time, February 7, the number of inadvertent drogue gun firings had reached 11, indicating that the problem has reached serious proportions. – Ed.) ★

Rex Riley CROSS COUNTRY NOTES

FLAMMABLE CUPS. It was recently brought to Rex's attention that those white styrofoam cups that some of us use for coffee and also as ash trays in an emergency are flammable. So Rex did a little research (he set one of these cups on fire) and found that they do burn right smartly. And in the process a great deal of black, sticky soot is given off. It is recommended that anyone curious enough to try this for himself take it outside before lighting. We're still cleaning up the office and the girls have been giving Rex dirty looks for days. A recommendation has been made to proper authorities that the use of these cups aboard aircraft be discontinued.

PROBABLY EVERY Air Force pilot knows what AOCP stands for, but think again. That "P" could stand for Personnel or Pilot. And when an aircraft is out of commission due to damage caused by personnel error, it is a lost airplane for as long as it takes to repair the damage.

What Rex is getting at here is that we continue to have those nasty little accidents that put our birds in the shop when they ought to be flying missions. Here's an example: As the aircraft attempted to turn 180 degrees on a congested ramp, the right wing heater pod struck a concrete column. The weather was good and it was broad daylight. Problem: No wing walkers!

LIVES THERE a soul who at some time or other hasn't burgled his own piggy bank and then when he needed a couple of extra bucks it wasn't there?

Well, so it is with Guard Channel, 243 and 121. 5 mc. These channels were set aside for *emergencies,* not for indiscriminate chatter. We all know this but violations continue. Pilots do their share of cluttering up these channels, but it's probably a tossup as to who is the worse culprit, pilots or controllers. Pilots ought to be particularly sensitive to keeping the emergency channels clear, after all they might be in need some time. And while controllers don't face the threat of a sudden emergency that could find them bailing out or needing immediate assistance for a safe recovery, they do have the responsibility of assisting the man in the air. In fact, that is their primary responsibility. Chattering on Guard Channel is not compatible with that responsibility.

FORMATION FLYING is exacting and requires constant attention to the task. As pointed out in an article in the September, 1965 issue of AEROSPACE SAFETY, most mishaps that occur during formation flight result from pilot inattention and sometimes the result is disastrous. Recently a pair of F-84's were tooling along and Lead called for his wingman to join up. While closing on Lead the wingman was momentarily distracted by another aircraft, and as he glanced at it, the left wingtip of his aircraft struck the right wing of Lead.

After checking each other and making a flyby past mobile, the two pilots determined that the aircraft were controllable and landed safely. Both wingtips were damaged and an aileron of one was bent. Time to repair was estimated at 80 hours, a costly moment of distraction that could have been much more costly.

EFFICIENT HEATER. Here's an item that should be read by all T-39 drivers, so pass it along to your friends who fly the bird.

After about one and one-half hours of flight the pilots of a T-39A began to smell an odor indicating an electrical fire. This was followed by light smoke. After checking all instruments and circuit breakers and finding nothing amiss, the pilot switched off the footwarmer, which was installed IAW T.O. 1T-39-758. With the footwarmer off, the smoke and fumes dissipated.

Source of these irritants was the pilot's helmet and helmet bag that he had stowed under his seat in front of the footwarmer. The heater produced enough heat to scorch the bag, deform the helmet and melt the styrofoam pad inside.

This aircraft was the only one equipped with this heater, but you should have this equipment on your bird soon. Remember, don't place anything under the seat near the heater-blower duct. And if you smell fumes you might check there first.

BAD BULB – An unsafe gear indication will always make a pilot nervous, but thorough knowledge of the aircraft systems should keep the adrenalin at low pressure. When the pilot of an F-102 didn't get a light in the right main gear, apparently his only thought was that the gear was unsafe. So he used the emergency system and got a safe indication. Then secondary hydraulic pressure failed. An emergency was declared and a safe landing was made.

The report indicates the only real problem was that the pilot did not try the press-to-test feature to detect a defective bulb. Apparently the secondary hydraulic system failure resulted from a shuttle valve failing to seat, although it later checked out okay.

FIRE IS probably the most feared hazard around aircraft, yet we continue to have fires resulting from carelessness and lack of suitable precaution. Rex is passing on the following in hopes that a similar mishap might be prevented from happening elsewhere. A trash can was used for draining fuel and the can was left where it could be reached by the aircraft starter exhaust. The result, of course, was a fire. During the investigation this was determined to be the immediate cause, but there were, as usual, several contributing factors:

- The engine run-up supervisor permitted an unsuitable receptacle to be used as a fuel drain can.
- There was inadequate lighting.
- The run-up supervisor had no positive means of communication with the forward fire observer.
- There was no directive prescribing the use and positioning of drain cans during engine starts.
- An airman who was not highly qualified was permitted to perform engine run-ups.
- Supervisory personnel had not established a standardized procedure to inform the engine operator of a fire.

Needless to say, action was taken by the unit to correct each of the deficiencies cited above. How about your procedures? If you aren't sure, better take a look. ★

Patiently the barrier waits. It must be ready when a pilot needs it.

The Friend On The End

William M. Purcell, Barrier Project Officer, AFFTC, Edwards AFB, Calif.

Picture, if you will, a pilot who has aborted his takeoff at rotation speed. Here is a man guiding his multi-million dollar weapon system toward the end of the runway at 180 knots calling, "Barrier! Barrier!" Now the moment of truth has arrived. It's too late to ponder the problems of barrier maintenance. A 25-ton aircraft is using up the runway at the rate of a football field a second, with only the barrier standing in the path of disaster. Now everything has to be right. The maintenance that the barrier has been receiving is about to be put to the test.

This picture that I have painted is not hypothetical. It can and does occur on a daily basis. No runway is immune. Aircraft overrun 12,000-foot runways the same as they do 7000-foot runways. The best weather coupled with a long runway will not prevent an aircraft overrun. They run off the runway end without warning or regard to time of day or season of the year. There is no pattern or trend in aircraft overruns; they are random emergencies. The arresting equipment is placed at the runway end to keep these random emergencies from becoming random catastrophies.

The responsibility for seeing that the barrier is ready when a potential catastrophe presents itself falls squarely upon the shoulders of the maintenance personnel. So let's consider some generalities of maintenance, especially barrier maintenance.

Even though the pilots' need for the barrier is not predictable, the barrier's need for maintenance is quite predictable, and experience tells us that the barrier needs more maintenance attention during the winter months. The nature of the barrier's use places a certain amount of strain on the maintenance operation. The barrier stands patiently at the runway end for indefinite time periods. One Air Force base had six barrier penetrations in five days; others have never had a barrier contact. In any case, the barrier must be kept in a state of constant readiness.

The first and foremost aspect of barrier maintenance rests with the technical orders. The T.O.'s must be kept current and available to the mechanics. The best T.O.'s in the Air Force are of very little help if they are out-dated or hidden in a desk drawer. But even if the T.O.'s are available and completely current, the barrier mechanic has to read them. He has to go through them carefully and critically until he understands what is expected of him. Information is available on any aspect of the barrier operation but only if the people with the answers are aware of the questions. Another important thing to consider is that no T.O. can be improved until the engineers who wrote it are aware of its deficiencies. It is better to correct the T.O. before an accident than to try to explain what happened to an accident board.

Another very important aspect of barrier maintenance is for the people charged with the maintenance of the barrier to be familiar with the systems, and this can be accomplished only by spending some time with the system. A maintenance mechanic, in this respect, is very much like a theatrical performer. He must rehearse so that when the time comes, he can perform.

Now for some particulars of barrier maintenance. Here is a list of things to keep your eye on, especially during the winter months:

Arresting Cables or Runway Pendants

The arresting cable must be carefully checked on a regular basis. Broken or flattened strands and corrosions should be noted. The replacement criteria in the T.O.'s should be followed to the letter. Regardless of what the cable may look like, or the seeming waste involved in replacing it, do what the T.O. says. Remember: it is far better to discard a seemingly useful cable than to have that same cable fail during an arrestment. The proper cable tension must be maintained to assure reliable hook engagements. Repeated taxing over the arresting cable will cause the pretension to decrease. The pretension must be right or the chances of a successful hook engagement are reduced and the possibility of aircraft damage during taxing over the cable are increased.

Cable Supports

The cable supports are the heart of the arresting hook engagement concept and therefore must be in good condition to allow reliable engagements. The condition of the cable supports is particularly critical when the engaging speeds increase above 120 knots. Poor cable supports reduce the chances of successfull engagements and the results of an unsuccessful high speed engagement are disastrous. So when a cable support starts to look the least bit "dogeared" or cracked around the center or just does not stand upright while supporting the cable, replace it.

MA-1A Nylon Net Engaging Device

The MA-1A nylon net engaging device is a simple appearing device, but don't let it fool you. The MA-1A net is unforgiving; it has to be right or it won't work. The heart of the net is the slack in the arresting cable. If the cable is too tight or too loose, somebody is going to be disappointed when he drives his aircraft into it. There must be four feet of slack in the arresting cable. The procedures for providing the proper slack and for checking the slack are clearly stated in the T.O. So get it right. In addition, the nylon is seriously weakened by sunlight. So again, follow the nylon net replacement criteria in the T.O. to the letter.

Another important thing to keep an eye on is the shear pins used on the MA-1A. I have found all sorts of wires, nails, pegs and pins and even bolts used instead of shear pins. The condition of the shear pins is important, too. Here again, use the T.O. to get it and keep it right.

BAK-6 Water Squeezer

The BAK-6 water squeezer is a simple, reliable barrier, but it, too, requires conscientious maintenance. The tubes must be checked for proper water level, and anti-freeze mixtures. The mixing procedures are of utmost importance especially during cold weather. If the water level is too high or if the anti-freeze is not in the proper proportion or not regularly mixed, the system may freeze solid. If the water level is too low, the BAK-6 may not stop the aircraft. The entire system must be constantly checked to be sure that everything is free to move.

A case in point comes to mind. At a northern base one February an F-106 engaged the BAK-6 at the end of a 12,700-foot runway at about 80 knots. One tube of the BAK-6 was frozen solid. The 106 came to rest sticking out of a snow bank. The investigation disclosed that a regrading project diverted surface water into the BAK-6 tube where it froze solid.

BAK-9 and BAK-12 Barrier Systems

Because of the similarity of the two systems, we'll consider them together. The BAK-9 and BAK-12 systems are very reliable systems; however, they are not maintenance-free. The hydraulic levels and pressures must be checked regularly. If the hydraulic level is too low, the barrier will not stop the aircraft. For example, an F-105 at a European base engaged the BAK-9 at about 130 knots. The BAK-9 was low on hydraulic fluid so the proper brake pressures could not build up and the bird did not stop in the overrun. The aircraft ended up minus some very important landing gear.

If the systems will not maintain the pretension pressures, the arresting cable will not be held under the proper tension and the chances of a successful hook engagement are greatly reduced, especially at high speed. The tape connectors must be carefully checked for proper installation and for cracks after every engagement. The use of the automobile tire casing around the tape connectors as shown in the T.O. will significantly reduce tape connector problems. The nylon purchase tape must also be carefully checked for small cuts and excessive wear. In the early days of the BAK-9 it was discovered that European field mice found the nylon BAK-9 tapes make excellent nesting material. A rodent repellant treatment on the tapes will solve this little problem but keep your eyes open. The replacement criteria in the T.O. must be followed to the letter. The subsurface tubes and pulleys must also be checked for foreign objects and freedom of operation, especially during the winter months.

And speaking of the winter months, here are a few things to keep in mind. Water that enters small areas and then freezes is a source of constant trouble. The presence of ice and snow in the barrier area will change the drainage patterns so that what was adequate drainage during the fair weather months may no longer be adequate in winter. It is far easier to keep water out of the equipment than it is to get the ice out after it forms. Another thing to watch: if the equipment is installed in subsurface pits, the sump pump must be kept in commission and the pump outlet must not freeze closed or the pit will fill up with water. This situation has occurred, much to the surprise and disappointment of the people involved. Situations where cyclic freeze-thaw conditions occur for a period of time are also pure trouble for barrier maintenance personnel.

In addition to the specifics, there are countless little things to check and double check. Things like proper shear pins, proper lubricants, fluid levels, preservatives must be watched closely.

Barriers are not maintenance free, but with the proper tools and techniques, the maintenance of the barriers can be accomplished quickly and efficiently. As a general rule, barrier maintenance is no different from any other maintenance; simply do what it says in the T.O. and when there is a doubt, find out. In this manner, the barrier will be ready when a pilot needs it. When a pilot needs the barrier, nothing else will satisfy him. ★

Insurance anyone?

Maj George H. Tully, Chief, Flight Safety, AFSC, Scott AFB, Ill

For readers of AEROSPACE SAFETY, this article should probe the storage portion of your brain and perhaps recall the similar write-ups entitled, "Look for the Lightning Bolt" or "Who Checks the Controller." These were published to familiarize you with the Air Force Communications Service Air Traffic Control Service Evaluation Program. To insure that we're all on the right track, here's a little review on the subject.

AFCS is responsible for providing air traffic control on all USAF bases world-wide. To do this job, we stack up manpower and equipment-wise as follows:

Controllers	5542
NAVAIDS	578
GCA's	125
RAPCON's	70

Impressive figures, aren't they? In addition to the large numbers involved, world-wide locations of the command facilities and people are also quite impressive. Crank in airspace problems of the various overseas areas, inter-facility (USAF to Foreign National) coordination, training time to facility-rate newly arrived controllers, etc. and you'll soon realize that the USAF Air Traffic Control business is big business — and — extremely important business.

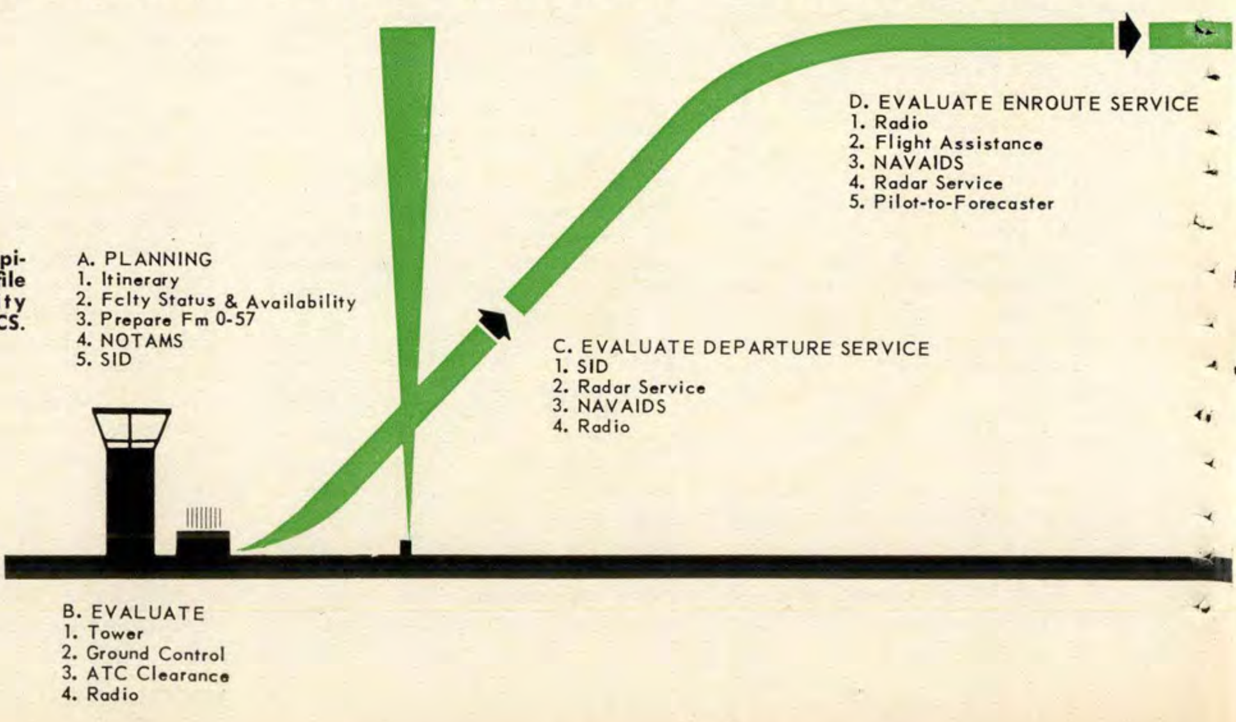
Factors have appeared over the past few years that have affected our operation. Long term NCO's who had spent 20 years in the ATC business began to retire. Many of these were our primary supervisors. Long-term flight facilities officers began to be released from duty via the 20-year program. Overseas commitments fluctuated, making planned moves of proper skill level airmen and NCO's a problem. These and other factors combined to create a probable decrease in the quality and effectiveness of the service we, in AFCS, are obligated to provide.

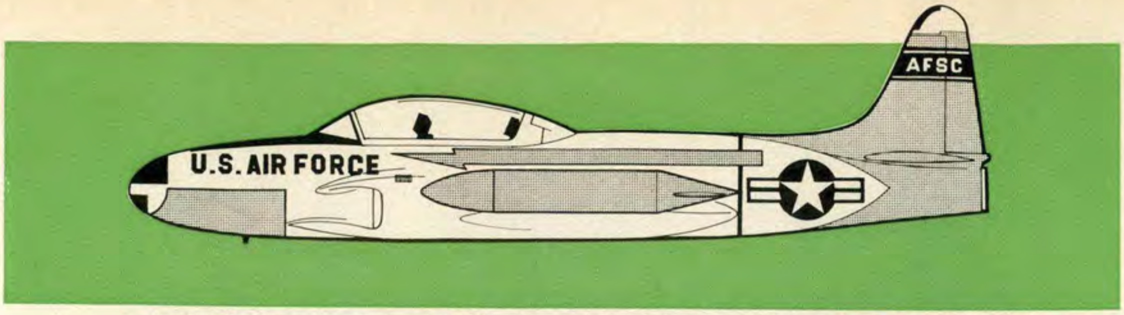
The preceding background produces a big question! "What did AFCS do in the management area to insure strong professional continuance of the vital air traffic services required?"

Several methods of operation were considered. To make the tale short and to the point, we activated a "service evaluation" program. We manned the pilot spaces involved with jet-qualified air traffic control officers. We acquired nine T-33 aircraft with which to do the job world-wide. Special equipment? — Not much! A distinctive anti-collision type paint job on the bird and a small portable tape recorder in the rear cockpit. That's the size of it. With these nine aircraft (five in the ZI; the other four in overseas areas), each USAF terminal facility has been evaluated at least once each 45 to 60 days for the past three and one-half years. It's a

Fig 2

Drawing depicts typical mission profile flown by facility check pilots of AFCS.





Anti-collision paint causes T-33 facility check aircraft to stand out in a crowd.

big job, done with a minimum of people and equipment, but a proven tool in checking our air traffic control quality and professionalism. Needless to say, safety of flight is the paramount consideration on all evaluations.

To describe the mission, we'll use an example. Let's take a look at our 1866th Facility Checking Squadron based at Scott AFB, Ill., and responsible for 128 ZI locations. Since unit activation, they have accumulated over 4000 service evaluation sorties with over 8000 flying hours. Three aircraft leave Scott every Tuesday morning. A typical mission profile might be: Scott to Clinton Sherman, evaluate and debrief; Clinton Sherman to Walker, evaluate and debrief; RON. Second day, same procedure—Walker to Laughlin; Laughlin to Carswell; RON. Third day, Carswell to Barksdale; Barksdale to Perrin; Perrin, return to Scott. The other two mission aircraft dispatched have headed NW, NE, or SE and accomplished a similar circuit. A three-day mission – six base evaluations, two RON's, and about 12 to 14 hours flying time is accompished. Add on six arrival debriefings (one to two hours each), and you can see it's quite a chore.

Each evaluation is debriefed on arrival. Minimum personnel debriefed are the AFCS Flight Facilites Officer and the base FAA representative. Additional attendees range from base flying safety and operations officers to wing operation officers. Upon crew return to home station, each evaluation sortie is put into written form and forwarded to the unit for corrective action as necessary. You might compare this overall effort to an ORI. Although of only 30 – 45 minutes duration (on the facility, excluding enroute time), the evaluation is actually a no-notice ORI of the particular terminal air traffic control complex.

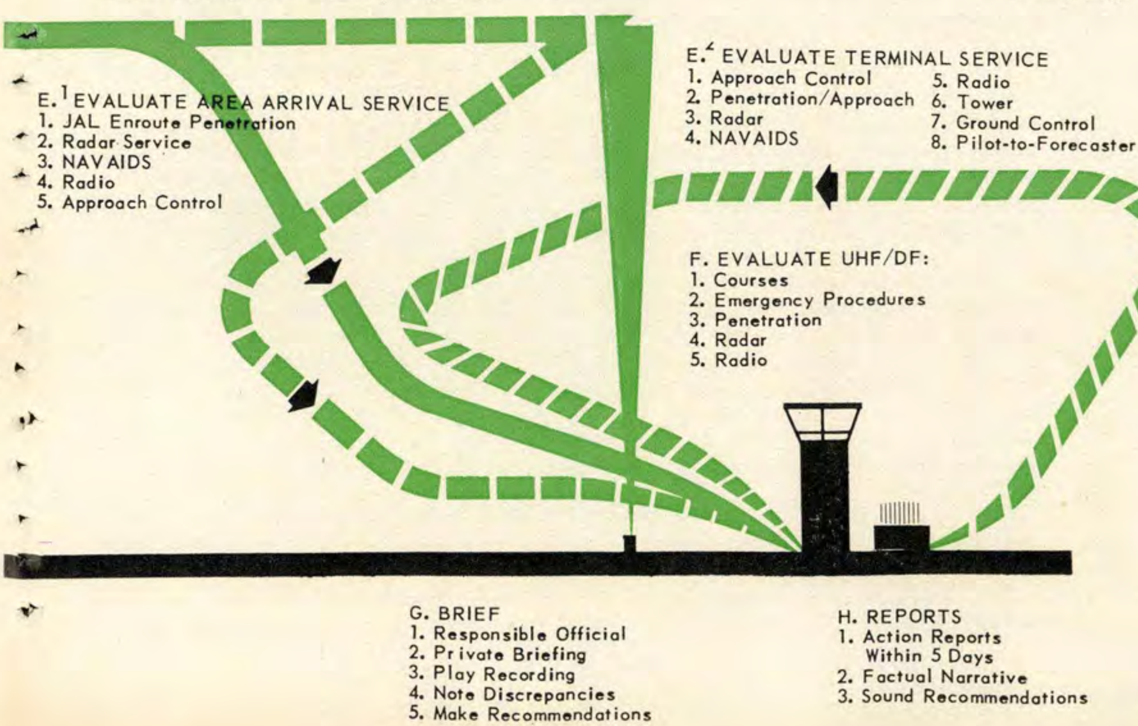
For a picture portrayal of the mission, see the diagram below.

So, without running this tale into the ground, that's a brief description of our program, why we have it, and the accomplishments to date. What have we learned? Have improvements resulted? To cite a few:

1. Better coordination between facilities; i.e., GCA, tower, RAP – CON, etc.
2. Improved supervision of trainees.
3. Better communications quality.
4. Better emergency procedure response.
5. Standardization of air traffic control procedures.

Incidentally, don't let this article lead you to believe that the AFCS Air Traffic Services normally provided are sub-standard or inadequate. We're proud of our air traffic controllers and the service they deliver. They're a dedicated and hard-working group who realize the responsibilities of their duties.

"Insurance Anyone" may seem like a strange title for an article of this type. A little thought may prove otherwise. AFCS is providing you with insurance – free insurance. No premiums to pay, no due dates, or any other requirements. Through our command service evaluations and professionalism in our air traffic service, you, the USAF Aircrewman, are being assured of safe, efficient handling on each and every flight. ★



FAA ADVISORIES

Walter J. Wrentmore
FAA Liaison Officer
Directorate of Aerospace Safety

LOOK, ACT AND LIVE. To military pilots it must seem that air traffic appears to be approaching a density comparable to that of some of our highways.

This should not come as a surprise, for the General Aviation aircraft fleet is growing like the proverbial weed, a growth which is expected to continue. The definition of General Aviation aircraft encompasses all civil aircraft except for the air carriers. This growth has resulted in an increase from 53,890 active aircraft in 1954 to 95,372 as of September 30, 1965. Total aircraft operations at FAA facilities during calendar year 1965 were a record 37,370,000, an increase of nine per cent over calendar year 1964. Of this total 26,209,000, or 70 per cent comprised activity by General Aviation aircraft, an increase in this category of 14 per cent. By comparison General Aviation aircraft accounted for only 11 per cent of the 12,860,000 aircraft handled by FAA facilities on IFR clearances during the year. Statistical figures shown are projections for the fourth quarter based upon data compiled for the first three quarters ending September 30, 1965.

Obviously, statistics such as these can only indicate that the majority of General Aviation pilots conduct their flying activity in VFR conditions. Some file VFR flight plans; many do not, despite the fact they are encouraged to do so. The only requirement, insofar as VFR flying is concerned, is compliance with basic VFR weather minima and cruising altitudes as outlined in Federal Aviation Regulation, Part 91. In complying with the aforementioned regulation the VFR pilot is as justly entitled to the use of airspace from the surface to 23,000 feet as is the pilot operating at an assigned altitude on an IFR clearance.

Thus, a pilot flying at an assigned altitude of 9000 feet, operating under an IFR clearance, is subject to encountering VFR traffic at either 8500 or 9500 feet, depending upon direction of flight and providing basic VFR weather conditions exist. VFR traffic may likewise be encountered at all altitudes, under the same conditions, while they are climbing to or descending from cruising altitudes. Add such factors as altimeter error and variations in pilot techniques and the potential for a collision, or near midair collision, can be substantially increased unless pilots are alertly scanning the skies and immediately take avoidance actions as outlined under right-of-way rules.

Bear in mind this is not a one way street, for the military services in recent years have invaded the bug smasher domain with high speed jet aircraft conducting much of their training activity along low level VFR routes, operating under essentially the same basic visual flight rule criteria. This poses a considerable traffic hazard to the small plane pilot, for not only is he faced with the possibility of collision, but he must also face the realization that severe damage can result from an encounter with wake turbulence from a high speed jet aircraft.

Ground radar is not the cure-all to the collision avoidance problem, and research efforts over the years have so far failed to produce a satisfactory collision avoidance system. The Positive Control environment, Flight Levels 240-600, has benefited users of this airspace tremendously, has resulted in more efficient control of traffic and a continual decrease in incidents. Remember, however, even the aircraft using this airspace have to ascend and descend, as do General Aviation and military aircraft operating in low altitude airspace, thereby creating an environment of heaviest congestion in and around terminal areas.

The only tried and proven method of collision avoidance is constant vigilance and use of good common sense by every pilot and crewmember. Constant surveillance, vigilance and alertness can lead down the road to successful accomplishment and happy retirement, rather than to the Bureau of Vital Statistics. ★

Missilanea

LOOSE SCREEN — An AGM-28 was placed in Combined Systems for a calendar inspection checkout. The engine screen was installed by a fully qualified combined systems crew. Walk-around inspection of the missile had been completed and no discrepancies noted. After completion of combined systems checkout, the screen was found to be loose in the engine-inlet. When the screen was removed, damage to the engine-inlet diffuser was discovered.

Obviously a case of personnel and supervisory error: improper installation of the engine-inlet screen and an inadequate inspection by supervisory personnel. Since the engine diffuser is very fragile, it is necessary to exercise extreme care in the installation of engine screens and engine-inlet protective covers.

WATCH THAT TUG — Preparations were being made to remove from a hangar an AGM-28 which was mounted on an H2-33 trailer. The MB-4 tug was parked about four feet from the missile. When the tug operator started the motor, the tug immediately moved in reverse towards the AGM-28 and two airmen who were at the tongue of the trailer waiting to hook it to the MB-4. The tug operator attempted to apply brakes, but his foot struck the accelerator as the brake pedal was depressed. The moving vehicle knocked one of the airmen into the AGM-28 missile exhaust cover which caused minor damage to the missile exhaust cone cowling. The airman was admitted to the hospital for observation and later returned to duty.

Personnel error by the tug operator was chalked up as the primary cause of the mishap because he had released the brake, failed to disengage the electric clutch, and failed to move the gear selector level from reverse to neutral before starting the engine. A contributing cause was an incorrectly wired breaker safety switch which prevents engine start with the transmission engaged.

It is recommended that operator checklists be installed in towing vehicles and all MB-4 tugs be checked to insure that the breaker safety switch is wired correctly.

Maj Edward D. Jenkins
Directorate of Aerospace Safety

WING WALKERS WANTED — An AGM 28 "Hound Dog" was being towed into a maintenance facility. The tug driver was carefully judging his clearance to the door casing and his *one* wing walker was doing all he could to assist. Nevertheless, the right wing tip contacted the casing. Why? Primarily due to an insufficient number of wing walkers. AFM 127-201, Figure 11-6, paragraphs 18 & 19, state that at least three guides will be used. In addition, AFM 127-101 (formerly AFM 32-3) Chapter 8, Par 0804. 2(4) (c) and (d), states that when towing near obstructions, a wing walker will be used for each wing and a supervisor will be located in the front where he can see *both* wing walkers and the tug driver.

It would be in the interest of all AGM 28 units and depots to apply the same criteria to the "Hound Dog." Then we stand a better chance of defeating the old, well-known towing law: "If the wing can physically contact an obstruction, it eventually will."

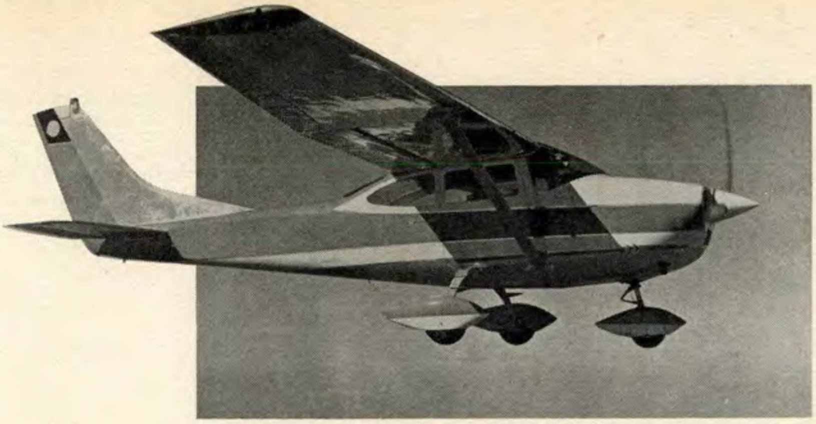
Capt Robert A. Boese
Directorate of Aerospace Safety

BARGAIN DAY — OR, $5000 FOR A .25c FUSE. Dump one more Bullpup! It has been said that every time "history repeats itself," it does so at a higher price. The aircraft missile launch and control system checked okay, the missile loading was good, and the inflight command link check was made.

When the missile was launched, it would not respond to the pilot's control actions. Although the aircraft and missile crystals were correctly mated, the range monitor showed that no command signals were being transmitted from the launch aircraft.

After the aircraft landed, the sharp investigation team had the malfunction isolated, and the cause determined in a matter of seconds. The malfunction was a blown RF amplifier fuse. The cause — personnel and supervisor error. TCTO 12R3-2ARW73-501, dated 13 Mar 1963, was not complied with. This TO required the fuse to be changed to one of a higher amperage rating. An expensive missile was wasted, valuable pilot training lost, and history has repeated itself. "For want of a nail, the shoe, the horse, the rider, the battle, the kingdom was lost." For want of the correct .25c RF amplifier fuse, the $5000 missile was lost. ★

Maj H. M. Butler
Directorate of Aerospace Safety



How are the little guys doing?

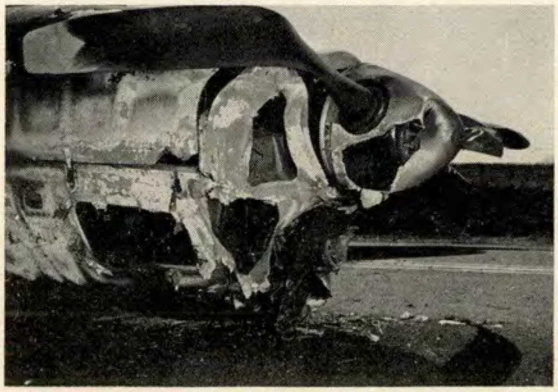
This article started out to be a quick look at Air Force aero club performance during 1965, a sort of how are they doing? Do they need to improve? And how best to realize needed improvements. Then when we began looking at the figures, the task appeared to become more complicated.

First, we discovered that about half of the clubs qualified for a no-accident award. This was happy news until we found that the total number of accidents and incidents exceeded that of the previous year. Fortunately, the increase was in the incident category; we had fewer mishaps classified as accidents. (Any mishap resulting in more than $300 damage, a fatality or serious injury or fire in flight is reportable as an accident.) Accidents were down about 25 per cent but the number of incidents more than doubled. Most alarming was that the number of fatal accidents increased and the number of fatalities almost doubled. As for the primary cause, pilot factor increased for total accidents and incidents but decreased when only accidents are considered. Maintenance factor remained very low (two) while materiel failure increased considerably. (For purpose of analysis, accidents and incidents will not be differentiated unless so stated, and numbers given will include both of these categories.)

Perhaps it is not surprising, in view of the number of students in the aero club program, that nearly half of the mishaps occurred on the ground or in the air in the vicinity of the runway. This includes all kinds of things such as taxiing into a ditch, a pile of dirt or a soft spot; gear-up landings and gear retraction on the ground; running into other aircraft or obstructions; ground loops and similar occurrences. These mishaps indicate that instruction in some clubs may not be all it should be since a number of these involved student pilots. Reinforcing this conclusion is the fact that three accidents occurred during simulated forced landings.

Poor judgment was indicated by several accidents, four of which resulted from fuel starvation. There wasn't much excuse for three of these; they simply reflect poor fuel management. But poor judgment was indicated in other ways: for example, the fellow who started the engine of his bug smasher with the tow bar attached. New props are expensive. Then there was the man who climbed off the wing and into the prop. The aircraft was a T-34 and the pilot assumed that his passenger, another aero club pilot, would deplane in the normal manner, that is, off the rear of the wing.

Sad aftermath of an aero club accident. T-34, right, is main offender in gear up landings.



To his surprise, the man decided for some reason to go off toward the front and he was struck by the propeller.

The fatal accidents are, of course, the most distressing. There were six accidents in this category, with 14 deaths. (One pilot had been missing for two months, as of this writing, and was presumed dead.) The cause factors add up as follows: maintenance — one, undetermined — one, pilot — four.

One of the most difficult problems of a voluntary organization is maintaining discipline among its members. Ninety-nine out of 100 may be responsible individuals who obey the rules and work for the betterment of the organization. Then that other one per cent can ruin the whole show. This is particularly unfortunate for an aero club because of the cost of aircraft and the hazards that accompany flagrant breaking of the rules.

Unfortunately, some of our fatal accidents occurred when the pilot deliberately violated an aero club regulation: the rule concerning night cross-country flying. Weather was also a factor.

By regulation, aero club pilots not possessing an instrument rating are forbidden to fly outside the local area at night. While some of the rules seem over-restrictive, this is one with which we can find no fault.

In an effort to prevent violation of this and other rules, rather elaborate precautions have been prescribed: pilots must file a cross-country itinerary with club officials well in advance of the intended flight. Then, prior to departure, they must file a DD 175 and produce a completed Form 21a in order to receive clearance for the flight. A briefing by the clearing officer is also required.

Once the pilot has left his home field, there's not much anyone can do to insure that the rules will be obeyed. (Several means of accomplishing this are currently being considered.) Two who broke the rules after leaving home found out the hard way that there is a reason for rules:

• The pilot possessed a private license and had approximately 450 hours of flying time. He had filed an itinerary and apparently followed it until about half way home on the return trip. After refueling at a civilian airport, he filed a VFR flight plan that would take him over some of the most hazardous terrain in the country. Takeoff was shortly after dark for this 3 plus 50 leg of his trip. The last communication with this man was about five minutes after takeoff. He has not been heard from since and no wreckage has been found. It is thought that the aircraft crashed in a mountainous area and that the wreckage is probably covered with snow.

This pilot had limited night experience, was not instrument rated and attempted to fly over a mountainous area that is sparsely populated and where there are very few lights. We can only speculate as to what happened, but it is reasonable to assume that he may have become disoriented or that, in the event of an engine malfunction, he had practically no chance to accomplish a safe landing.

• One month later to the day, a young officer and his wife were killed when their light aircraft crashed into the side of a mountain at night. Departure from their home station was during the day with a refueling stop a few hundred miles down the road. Somewhere there was a delay and takeoff from the refueling point was at 1910. This pilot was in radio contact with an FSS only a few minutes before the crash. Apparently the aircraft was flown into the mountainside with the occupants being unaware of the hazard ahead. Weather probably was a factor also. The pilot had only 250 hours and no instrument qualifications.

These two examples illustrate the seriousness of the hazards existing at night in remote areas — something experienced Air Force pilots appreciate but which inexperienced pilots may not recognize. This, of course, is one reason for the ban on night flying for pilots who do not have an instrument rating. Another reason is that with a single engine aircraft, when the engine quits, there is no reserve and at night this is essential.

We all know that breaking a rule does not in itself cause an accident. But for some strange reason, some of us fail to realize that many rules are made for the purpose of erecting a barrier against a hazard. Most of us are gamblers, but when you bet your life, you've also got to realize that there are bound to be some losers.

We wish we had a sure-fire way of preventing these disasters, but we haven't. Obviously piling on more rules that say "thou shalt not" won't solve the problem. And threats don't seem to be effective against the man who is willing to bet his life. If he wins, who will know he broke a rule? If he loses, he has already paid the ultimate price.

As for the type of accidents and incidents that predominate in aero club flying, we think something can be done. Instructors can prevent many of these with closer supervision of students and by imposing higher standards. We simply can't afford the marginal student who very possibly will become the marginal pilot. ★

Poor fuel management caused this accident. Pilot and passenger were lucky to escape without critical injuries.

Veteran accident investigators express . . .

Some thoughts on accident investigations

It is fortunate that only a relatively small number of Air Force personnel become involved in the investigation of aircraft, missile, nuclear, ground, explosive or other type of accident. Even fewer are the crew members, operators, or users who become the unwilling subjects of these investigations. What of the investigator? The investigated? The investigation? Do they always measure up to the high ethical standards expected in the United States of America?

No man, machine, condition or environment should be presumed to have been the cause factor at the time an accident investigation effort begins; these varied entities are merely the bits and pieces and clues to an intricate and puzzling detection problem. How many times have you heard the expression, "Bring in the guilty party and well give him a fair trial"? This is the last thought which should be in your mind if you are an investigator. It is a challenge to you personally to seek, sort out, and analyze every facet that seems to have some bearing on the mishap. After each possible avenue has been explored and categorized as to its effect on the accident, then, and only then, are you ready to make an intelligent assessment of the cause. It is your moral and ethical responsibility to do this job right, regardless of the consequences. Your duty is that of both judge and jury and there is little right of appeal by a "guilty" human when one is charged with responsibility for causing an accident.

Now take stock of yourself, Mr. Investigator, USAF! During that last accident you worked on, did you dig into all aspects of the mishap and examine every piece of evidence until it was possible to honestly separate the pertinent from the extraneous? Or did you chase down the big and apparent clues and come to an easy and quick conclusion because the cause appeared to be obvious, or you were in a hurry to get home?

What about the witness statements? In almost every instance it is possible to get far more "expert" witnesses than can possibly be used. So how do you get rid of the extra statements they make? Some repetitious ones can go. Some which have no bearing as the investigation develops can go. Those that don't agree with your thoughts *do not go,* at least not for that reason. A word about statements: they should be the private thoughts of the witness, expressed in his own words in narrative form. (They may be in poor grammar but for Pete's sake don't edit!) Questions and answers are not normally considered part of a witness statement!

How about TDRs, URs, laboratory analyses, stress data reports, photographs, wreckage diagrams, local directives and SOPs and many other bits and pieces of information? Gather and evaluate them carefully, then include or exclude them to show what happened to support the decisions of the investigating board.

Formal board proceedings and witness group activities should be recorded as they occur, with minutes taken of what transpires during each meeting. When did the sessions begin and end? Who attended? Who were the witnesses? Was the purpose of the investigation explained to each witness? What questions were asked and by whom? What were the answers? These are a few of the areas in which the board really does not have any choice about what it reports – it should be a verbatim transcript. If there are industry representatives assisting the board, the record must show when they were in attendance, their status there, and the extent of their participation.

Finally, the analysis of all evidence should lead to one of ten possible cause factors with a proper and definitive statement to get the details across: "The primary cause of this accident was . . . factor in that. . . ."

Take the time to document information properly. Allow the witnesses to read and sign their statements after the typists have made them ready for reproduction. Have the group reports signed and validated by the people who are supposed to do this, not just someone who is handy. A word of caution: only USAF personnel are authorized to sign any portion of an accident report. Industry personnel are authorized only as advisors or consultants and are not allowed in any board meeting where deliberations leading to findings, recommendations or other final actions are being considered. (It goes without saying that personnel involved as witnesses and operators have no business in these meetings, either.)

A final thought: When you are conducting an investigation by yourself or as a member of a large board, keep in mind that you are dabbling with the career and the hopes of a fellow member of the Air Force. Treat him at least the way you would want to be treated if the situation were reversed. There is no firm time limit on the investigation of accidents – there are no bonus points for speed. If it takes 10 hours, 10 days or 10 weeks to get the job done, take the time. Extensions of suspense dates are granted when needed, provided you are not dawdling. The total and final objective of investigation of USAF accidents is to learn what went wrong so that proper and timely action can be taken to prevent recurrence. *We want to prevent accidents from happening. We don't like to investigate and explain them!* ★

FLIGHT TESTING – 1966

Maj. Milton J. Uzelac, Chief, Flight Test Group, AFLC

There are many very competent crewmembers performing flight tests, but, due to the lack of established procedures, each troop develops his own way of getting the job done.

Recognizing that the quality of the flight test relates directly to the knowledge and experience of the individual conducting the test, Air Force Logistics Command is attempting to resolve the problem of standardized inflight system analysis by developing a Functional Check Flight Procedures Manual (FCFP). The objective is to marry engineering and flight test experience in order to determine the best way of insuring that each system is capable of fulfilling its design function. Once implemented, the combat effectiveness of USAF weapons systems can only go one way – up.

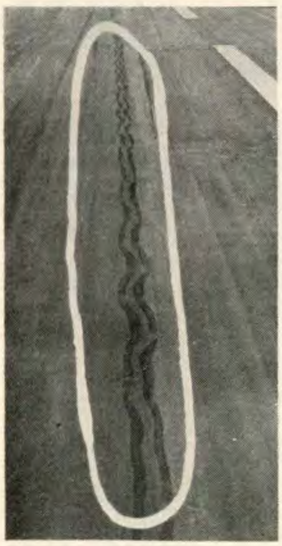
The initial step was to call upon experienced test pilots from all major commands. Opinions were voiced. Ideas were thrown on the table. The result was a set of procedures for thoroughly checking out each system of each aircraft. These procedures were then published in a new tech order known as the -6CF-1 or the FCFP.

It works like this. If you are a quality control test pilot flying F-105's, you will find your guidance in T.O. 1F-105D-6CF-1. When AFLC completes the project, one of these publications will exist for each type, model, and series aircraft in the inventory.

You might want to call the Dash Six the flight test Pilot Handbook but that's really not right. The Dash One tells us how the aircraft is to be flown. Coupled with it, the FCFP tells us how to check each system. If you think you have a better procedure for analyzing a system, we would like to hear about it. Submit an AFTO Form 22 and let AFLC have a look at your idea.

The new -6CF-1 publications will also provide an excellent training manual for the young buck who has just been selected as a squadron FCF pilot. Whether an old hand or a new troop, all test pilots and crewmembers should find the new approach a valuable aid in providing quality maintenance and a safer flying machine for the pilots who perform the operational missions. ★

Aerobits



VOODOO WATUSI. Not to be outdone by her female compatriots in the "human" race, the Voodoo has come out with a dance of her own. For those of you who haven't been aboard when she has gone into her shimmy, you can take it from those who have—it is wild!! It's a real go-goer and sure shakes loose the radar system or ballast in the front end. Normally she also gets hard to manage because she gets so worked up she shears her scissors and loses all front end control.

Many of the Voodoo medicine men surmised that she started acting up because she didn't like her new moccasins. However, the Chief Witch Doctor at Ogden disagreed. He said the problem was that the medicine men down on the line were not making sure the moccasins were matched in wear and tear and pressure air. The chief also smoked out a signal to check the forward leg closely for looseness in the joints and issued a supplemental T.O. prescribing correct tolerances.

Apparently, the medicine men have heeded the chief's warning because there have only been about five "Watusi" incidents since September. However, she may be hibernating, and if the braves relax and sit back and smoke their pipes the "old gal" will break loose and really give some unsuspecting pilot a real go-go. This emotional gyration is extremely hard on the hearts of our aging crewmen.

Maj Donald R. O'Connell
Directorate of Aerospace Safety

INCREASED FLYING hour programs, full training schedules, heavy, mixed ordnance loads and rapid turnaround times are all imposing backbreaking requirements on maintenance and armament people.

This situation has been well publicized and those agencies charged with improving it have programs in being. In the interim, however, commanders must impress their pilots with two vital safeguards for accident prevention. These safeguards are needed to supplement maintenance and armament efforts and to provide a double check.

First, the pilot's aircraft preflight must be even *more* thorough than in the past. More time and effort should be devoted to examining all necessary areas of the aircraft, especially the armament racks. After engine start, particular attention must be paid to temperatures and pressures to insure everything is in fact "in-the-green." It should not require much selling to minimize the "hurry-hurry" attitude during preflight. After all, the pilot's life does hang in the balance.

Secondly, discrepancies discovered prior to takeoff should be carefully analyzed. Normally, any departure from the desired parameters outlined in the technical orders is cause for an abort. Why take a sick bird into the air? The reading that may be only a little less or a little more than right—is wrong! Accident records often tell the story of the small problem prior to takeoff that seems to grow into a giant shortly after leaving the confines of the airfield.

A point to ponder: how many pilots have spent their last few mortal moments regretting the haste of a preflight or the reluctance to abort?

Lt Col Eugene P. Sonnenberg
Directorate of Aerospace Safety

U-3A ICING—Although the U-3A is restricted from known icing conditions, this is no guarantee that the bird won't ever pick up a little.

Last winter a pilot on final approach had trouble getting the nose up and recovered only by applying full power and raising the gear. Elevator control was regained only after repeated reversals of elevator control pressure by both pilots. Ice had built up on the leading edge of the elevator tip horn and restricted elevator travel. The clearance between elevator and stabilizer tip is only one-eighth to one-forth inch, so it doesn't take much to hamper elevator movement. In this case the binding was not evident until the gear was lowered and the aircraft began a rapid descent. Recommended action is to get on the power and raise the gear.

DRAG CHUTE PACKING—During the landing of an F-100D, the pilot was unable to deploy the drag chute until the handle had been pulled four or five times when the airplane was almost stopped. Inspection of the drag chute control system indicated that it was properly rigged. However, inspection of the drag chute itself revealed that the flap of the pilot chute bag which was over the pilot chute was torn and ragged. In an effort to duplicate this malfunction, the drag chute was repacked and reinstalled on the airplane. When the pilot chute pin was pulled, the pilot chute spring caught in the ragged flap and prevented the pilot chute from deploying. This incident illustrates the folly of using worn or defective equipment.

North American Aviation Inc
Operation and Service News

LANDING GEAR WARNING HORN CUTOUT BUTTON (T-39A, B). Many inquiries have been received concerning the use of the landing gear warning horn cutout button to test for proper operation of the landing gear warning circuit while the airplane is on the ground. This practice is definitely not recommended. The button should be used only for what it was designed to do, silence the horn, and here's why, accompanied by a bit of background information.

When the warning horn cutout button is pressed with the airplane on the ground, inflight gear warning operation is duplicated. That is, the warning horn sounds, the gear handle light flashes, and a pulsating signal is heard in the headset.

Pressing the cutout button when the airplane is on the ground allows essential bus power to be directed through the K580 landing gear warning horn control (LWHC) relay, through the K579 landing gear warning horn (LWH) relay, through the gear handle (position selector) pins "E" and "D", and through the gear handle warning lights to ground.

If one looks at the landing gear position indicating and warning system diagrams in the "T-39A Wiring Data and Diagrams," T.O. 1T-39A-2-8, it would appear that the K580 relay becomes energized, disrupting power to the horn and the intercom system, and that the K579 relay will not energize because of polarity being reversed. But quite the opposite is true. These are non-polarity-type relays. Normally in parallel, they are in series when the gear warning system is utilized as described above. The K579 relay incorporates a 500-ohm coil and will sense a sufficient voltage drop to become energized, However, the K580 relay, incorporating only a 200-ohm coil, does not sense a sufficient voltage drop to become energized.

In summary, the horn cutout button should never be used to ground-test the gear warning circuits because polarity on the K579 relay would be reversed and surges of excessive current flow would be imposed on the landing gear rectifier diode that could result in its subsequent failure.

North American Aviation Inc
Operation & Service News

Aerobits

F-105F KILLER ITEM. The F-105 man-seat separator is a valuable piece of equipment to the pilot. But to have this value it must be properly installed, properly rigged, and properly used. Otherwise it can become a man-killer.

The man-seat separator mechanism on the front seat of the F-105F has a small finger-like trigger that slides vertically in a track which is mounted on the right side of the bulkhead immediately behind the seat. During vertical seat adjustments this trigger slides freely up and down within the track. When the ejection seat is fired, the trigger travels upward with the seat and contacts a trip plate at the end of the track. As the seat continues upward the trip plate forces the trigger and its linkage downward which in turn fires the gas initiator located just behind the pilot's right shoulder.

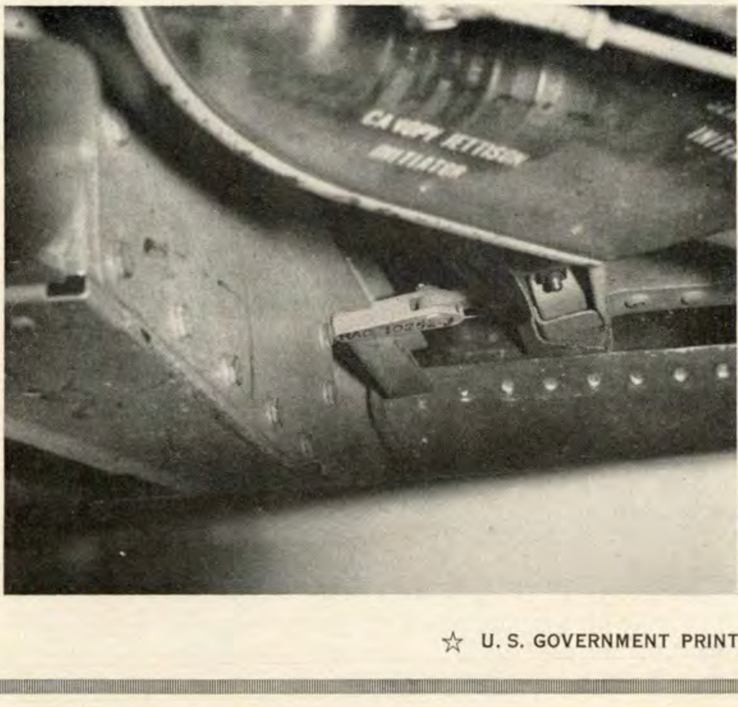
That's how it works if properly installed, rigged, and used. The accompanying photo shows one that was not properly installed or rigged. Notice the trigger (labeled RAC 10252-3) is on the outboard side of the track. Notice also that all further upward movement of the trigger has been stopped by the edge of the sheet metal adjacent to the track. *The piece of sheet metal now is serving as the trip plate* and on this particular seat, *a further upward seat adjustment of one-eighth inch or less would have fired the lap-belt and man-seat separator!!*

The real knee-knocker here is that this was the third flight on this bird since the seat was installed. Any one of the three pilots could have detected this item with a single glance.

Also, the egress system people may be completely innocent of any wrong doing. The design of the trigger allows it to rotate upward approximately 90 degrees to allow it to clear the trip plate during seat removal. But this same design could allow the trigger to be rotated upward and pulled out of the track unintentionally by a hastily retrieved map (the map case is immediately adjacent to this area), shave kit, or any other of a million items we pilots choose to stuff in a cockpit.

Our engineers are working on a fix but it takes time. There could be another out-of-track trigger in your squadron right now. And although this one is peculiar to the front seat of F-105Fs, it's well worth your attention unless you know you can hack a sudden full-forward-stick, three negative G maneuver at the outer marker!

Capt John F. DuPriest
SMAMA, McClellan AFB, Calif.



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WELL DONE

1ST LT. ROBERT L. SHEPHERD JR.

85 AIR TRANSPORT SQUADRON, TRAVIS AFB, CALIF.

Lieutenant Shepherd and his crew departed Tainan Air Base, Taiwan, in a C-124 enroute to Tachikawa Air Base, Japan. During liftoff, Nr 2 engine backfired and power was reduced to 40 inches on that engine. The engine was scanned and checked during the climb and appeared to be operating normally. Power was restored and climb to level-off at 9000 feet was completed without further incident. Shortly after level-off, Nr 4 started backfiring severely and the scanner reported gray-white smoke coming from the cowl flap area. Lieutenant Shepherd ordered Nr 4 propeller feathered, and as it was being feathered, a rapid drop in oil quantity was noted by the engineer. Lieutenant Shepherd requested a change in flight plan to Taipei, Taiwan, where adequate support could be obtained. About 5 to 10 minutes later, the Nr 2 engine oil temperature started to rise with a drop in oil pressure. Nr 2 also had a loss in torque pressure and the oil temperature continued to rise. The rise could not be stopped, so Lieutenant Shepherd ordered Nr 2 propeller feathered. Lieutenant Shepherd obtained clearance to 5000 ft minimum enroute altitude for the airways and started a slow descent. During this time GCI radar was contacted and Lieutenant Shepherd made the decision to have "Stargazer" vector him to the nearest suitable landing field. A vector was given to Hsin Chu Air Base, 25 miles away, which had a 10,000-foot runway. Lieutenant Shepherd maintained a slow rate of descent and had the field in sight at 4000 feet, eight miles from Hsin Chu TACAN. In the descent, the two remaining generators started to overheat. Lieutenant Shepherd had already turned off all unnecessary electrical equipment but it was not until passing 3000 feet that the auxiliary power units would come on the line. Below 4000 feet, GCI control was lost due to terrain features. Lieutenant Shepherd elected to continue the slow descent VFR, doing a 360-degree turn to lose altitude, and placed the aircraft on a proper final approach. He made a full flap VFR night landing without further incident. A check on the ground revealed both Nr 2 and 4 engines to be frozen, an indication of complete internal failure. Lieutenant Shepherd's sound decisions and prompt action on the part of the crew prevented the possible loss of several lives and a valuable aircraft. WELL DONE! ★

SURVIVAL RADIOS

Your survival may depend on your personnel radio. For best results don't point the antenna at the search aircraft.

POINT ANTENNA UP

Maximum capability results when aircraft and survival radio antennas are both vertical, so point the antenna straight up.