AEROSPACE

SAFETY

UNITED STATES AIR FORCE

NOV • 1961

maintenance and materiel

T-BIRD TIPS

Incredible—it exceeds the bounds of an extremely flexible imagination—for an aircraft, with two pilots aboard (one flying hooded, the other as safety observer), to be descended into the ground while flying VFR at night. Incredible, indeed, to have happened once. It's worse than that. It has happened *four* times during '61. Four pilots perished, four survived; and four T-33s were destroyed.

Many technical terms could be applied to factors which could have distracted the attention of the safety observer, but, in the eyes of the layman, these guys just plain made a bad mistake and paid the greatest penalty. The determination of high or low, in the proper perspective, isn't difficult for the average jock; this cannot be denied. So, the safety observer should have determined that the aircraft was low—had his attention not been distracted.

One lucky jock (he lived) stated, "I watched another aircraft pass overhead, then I felt a terrific jolt." Another said, "I was having trouble with the gear—looked into the cockpit then there was a bouncing." Mortals have yet to hear from the others. This is idiotic: four aircraft—with eight experienced pilots, practicing instrument approaches under VFR conditions—to have descended into the ground.

Jocks, before filling the safety observer slot, prepare yourself; know the approach, field elevation, obstructions, minimum altitudes and, where possible, horizon references. Above all remember: *Distractions can result in disastrous consequences.*

Fighter Division

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We thought we had the T-Bird fuel system icing problem whipped. The modified fuel control gave us immunity to icing in the control proper for a period exceeding three hours. The concerted effort directed toward proper maintenance and use of the alcohol system made for certain an operable system which would supply an adequate quantity of non-contaminated alcohol to the low pressure filter. But somehow an oversight has occurred because we are still having flameouts. So—back to the drawing board!

Alaskan Air Command—an area that has all the conditions conducive to fuel system icing—offers some valuable information. Their report is quoted:

"We have not experienced an incident of severe icing in over two years. Our belief is that accidents occur because many pilots are not convinced of the need for use of alcohol on each flight. We supplemented the T.O. to require use of alcohol each 20 minutes and before each major power change. Our flights are generally the same duration and amounts of alcohol used generally correspond. If not, the alcohol system is the suspect. When alcohol is run into the low pressure fuel filter, the filter should be flushed by running the engine. If the aircraft is not flown for several hours, a thick jelly-like substance will form that could contaminate the fuel control and cause engine failure. Best action therefore is the absolute requirement that pilots use alcohol on each flight. If the amount used is not compatible with the length of flight, the alcohol system is the immediate suspect. We recommend once again that alcohol be used 30 seconds before takeoff, 15 seconds before level-off, for each 20 minutes of flight, before each major power change, before letdown and 30 seconds prior to entering the pattern for landing."

You just can't knock success, and a record of over two years without an icing incident is supreme! But, like all things, improvements are ever in the offing. So, in addition, suggest you check for a flick of the loadmeter and if alcohol is being fed to the low pressure fuel filter, there will be a drop of one-half to one percent in RPM approximately 15-30 seconds after the alcohol switch is actuated.

SMAMA affirms that a mixture of JP-4 and alcohol will form an amber jelly-like material when alcohol is left in the low pressure filter. However, this should not prove to be a problem since the de-icing system is intended for in-flight ice removal purposes and there is no requirement to use this system after landing. Further, using the de-icing alcohol just prior to engine shut down will cause corrosion between the air adapter finger screens and the air adapters. ★ **Fighter Division**

CHOPPER CHATTER

During an aircraft crash investigation it was necessary to land an H-43B in a marshy area. Landing and approach were uneventful and the helicopter settled through a false surface of vines and weeds approximately 2 feet deep to rest on the actual surface which was wet. Upon restart and rotor engagement the ground surface area under the tail surfaces burst into flame. The fire blistered the paint on all vertical and horizontal tail surfaces. At the peak of the fire flames were ten feet or more in height and burned a ground area approximately 40 feet in diameter. The aircraft fire extinguisher, seat cushions and flight jackets of crewmembers were utilized to put out the flames. The aircraft extinguisher was inadequate. The aircraft engine was shut down and the rotor was stopped in an effort to prevent the spread of the fire and to assess damage. A restart was accomplished and showed that the ground fire is started when the throttle is rotated to the full open position. The ground surface area beneath the tail pipe glows red at flight idle and then bursts into flame. Rotor wash quickly spreads the fire. This helicopter had recently undergone TO modification which changed the angle of the tail pipe to deflect the exhaust nearly straight down. Operation of the helicopter before TOC indicated that the exhaust gases were exhausted aft and did not contact the ground, as such heat concentration was enough merely to wilt the grass. (This hazard of engine exhaust flames also exists in H-19s and H-21s.)

Tests are being conducted on a controllable gate arrangement in the tail pipe which will permit adjustment of downward deflection angle of exhaust gasses from 30 degrees to 60 degrees. If found acceptable this will be incorporated in in-service helicopters by TCTO action.

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At about 2000 feet, July 27, Lt. Glynneth W. Gordon was flying transition in an H-43 over James Connally AFB, Texas, when he spotted a burning F-89 in the landing pattern. He followed the burning jet down the runway and hovered over it as it came to a stop. The helicopter was not equipped with a firefighting suppression kit, but Lt. Gordon was able to provide enough rotor wash to beat down the flames and allow the two occupants of the '89 to escape uninjured. ★

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COVER ILLUSTRATION BY ROY GRINNELL, THE MARTIN CO., ORLANDO, FLA.

IN THIS ISSUE

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VOLUME SEVENTEEN NUMBER ELEVEN — USAF RECURRING PUBLICATION 62-1

OUTLINE

Man, never being satisfied, learned to fly. This accomplished he next persevered until he could fly at night, then in clouds. All the while he has had to go higher, faster and farther.

Being impatient as well as never satisfied, he has often taken the next step before ascertaining that the last was on solid ground. Therefore, on occasion, he has slipped. Also, man forgets. For this reason too he has slipped.

These well-documented traits provide a never ending source of worry for others, such as next of kin, supervisors, safety people and those who own the equipment man uses. There is just cause for worry. When man's traits of impatience and forgetfulness are combined with his flying the slip is often far, hard and expensive.

These are some common reasons for man repeatedly being belabored on his shortcomings. And, as long as he continues to exhibit shortcomings he can expect reminders on how to improve. This reminder, of course, has to do with winter flying. It's warranted. The chances of his not having any weather factor accidents this winter are about as improbable as non-skid snowflakes.

This outline will not teach him all he needs to know to fly safely this winter. But, if it induces him to study the winter operations section of his Dash One, to discuss winter operations with the metro men and seek information from more experienced pilots, then apply all this . . . well, it might.

• PERSONNEL

Protect yourself.

Ears, fingers, noses, toes and cheeks are highly susceptible to frostbite. Watch your buddy and have him keep an eye on you for symptoms.

Watch your step. Falls from wings, ladders, steps—even on flat ramps—are more common with ice and snow.

Pace yourself. Additional energy is required just to keep the body warm.

Recheck your survival gear. Make sure you have it all, and all of it is operable.

Stay out of prop and jet blasts. Wind speed increases lower the chill factor and frostbite can be experienced much more rapidly.

Keep dry, and if you get wet change immediately to dry apparel.

• GROUND OPERATIONS

When covers are used on such areas as windows and turrets, both the area and the cover should be dry to prevent freezing of the cover to the aircraft. During clear weather such covers should be removed to prevent corrosion from condensation.

Have proper clearances on operating surfaces. A binding hatch can become inoperable due to differential contraction of materials.

Correct all leaks ahead of time. Materials contract in winter, aggravate the leaks. Seals and gaskets become hard and brittle and indiscriminate tightening is more likely to damage seals than stop the leak.

Use only dry air in charging accumulators.

Use lubricants as specified for temperatures expected.

Ascertain that cable rigging tensions meet cold weather tech order requirements.

If tire valve leakage occurs, the valve core may not be seating properly. If trouble persists, replace the cold valve with a warm one.

To minimize damage, recover jettisoned chutes before they freeze to the surface.

In extreme low temperatures pre-heating may be required. Consult tech orders if in doubt.

Ground power equipment must be maintained in top operating condition to meet added loads due to increased viscosities of lubricants.

Remove batteries from the aircraft during layovers at low temperatures. Never add water in freezing weather if the battery is to be left standing before charging.

If aircraft is not flown for an extended period, rotate tires occasionally to prevent flat spots.

• PRE-FLIGHT

Remove snow and ice from the exterior. If removed by sweeping, do not sweep toward control surfaces or honeycomb panels.

Remove exterior snow and ice before interior heating; water from melted ice and snow has been known to run back and freeze control surfaces. Deicing fluid is effective. Never *chip* off snow or ice.

Landing gear areas, particularly actuating cylinders, must be completely clean.

Crew compartments should be preheated to insure instrument operation and crew comfort. Partial heating can produce condensation and subsequent shorts across electrical connector pins. Continue heat to dry the condensate.

Check for ice on compressor blades, turbine blades and surrounding cases, making certain the lowest point is observed. If ice is found, apply ground heating until ice has melted and moisture has evaporated. Check for complete rotational freedom before starting.

Verify that no snow or ice is on pitot heads and static ports.

Fuel and oil areas:

All vents unobstructed.

All sumps drained.

Fuel filters inspected and free from ice.

Check batteries charged.

Operate powered controls manually to ascertain that ice is not obstructing movement before using power.

Closely monitor hydraulic systems normally usable on the ground to check for leaks or malfunction.

Check emergency as well as normal systems.

In very cold weather compressor stalls can occur, even on the ground, at high acceleration and RPM.

Check pressure in emergency air brake system and all accumulators.

Ascertain normal operation of doors, cowl flaps.

One check on lubricants is to open oil drains. If no flow is obtained, apply heat.

Plan flight around or above icing conditions.

Inspect for fluid leaks caused by contraction of fittings and seals.

• STARTING

Be sure aircraft is properly chocked and ground equipment is clear in case the aircraft slides.

FOR WINTER

Watch for an ice-locked rotor and listen. If any indication other than normal, discontinue starting and investigate.

Use normal starting procedures; in recips be particularly observant for hydraulic lock.

When engine starts, check for proper lubrication.

Don't run at high RPM until all temperatures and pressures are within limits and engine has been warmed up.

All non-essential electrical equipment "Off" until generator output is indicated.

• *TAXIING*

The less ice and snow on taxi strips and runways, the less chance of ice entering the engines. Jet blasts can throw ice and slush on other aircraft.

At temperature extremes (—30°F and lower) ice fog may result from jet engine operation. Under such conditions taxiing on runways should be kept at a minimum.

On some aircraft the rate at which steerable nosewheels can be turned is limited by the rate at which hydraulic fluid can pass from one steering cylinder to another. Lower temperatures mean higher viscosities and slower turning.

In multi-engine aircraft remember assymetrical power; nose steering may not be effective on ice.

Ruts and snow windrows can be encountered and are difficult to see when everything is white. Don't "guestimate" that you can make it.

A slight lag in braking response may occur.

Turn anti-skid off if loss of braking is experienced.

Stay out of deep snow—steering is more difficult, more power is required, the strain on the gear is increased and snow may lodge in brake assemblies with possible frozen brakes the result.

Stop and clear out engines at Dash One specified intervals as a precaution against plug fouling.

Allow more leeway when taxiing, and taxi slower.

• *TAKEOFF*

Overboost is possible with below normal ambient temperatures. Monitor closely. (Some power plants have compressor pressure limiters to keep internal engine pressures within limits.)

If runway is snow, water or ice covered, make proper allowances in takeoff and landing data planning as stipulated in your Dash One for the particular condition.

With ice, snow and slush conditions you can expect: longer takeoff run, increased stopping distance, less directional control with steering and brakes.

If takeoff is through wet snow or slush, recycle gear and flaps as Dash One directs as a preventative against freezing in the retracted position.

Plugs are more prone to break down on cold, damp days than on warm, dry ones. Verify minimum BMEP is obtained.

If drag/power conditions permit, a slight delay in gear retraction will give the wheels an opportunity to spin dry.

• *IN FLIGHT*

Use carburetor heat as specified for your aircraft. Though icing may not be a problem, carburetor heat aids in fuel vaporization at extremely low ambient temperatures.

When icing conditions exist, or are about to, use pitot heat, carb heat, wing and tail heat, windshield and prop heat, and alcohol in accordance with Dash One instructions.

Monitor electrical load closely, turning off non-essential equipment if necessary.

Actuate props, engine RPM, flight controls and other adjustable mechanisms occasionally as a preventative against freezing in a fixed position.

Engine thrust increases at low temperatures. Don't exceed normal operating limitations. Endurance will be greater than normal.

Some pressurized cockpits can fog up under certain atmospheric conditions. Flight handbook instructions on cockpit pressurization should be followed to avoid fogging.

Keep your eyes and ears open. A lot can be learned by watching and listening — especially during bad weather.

Remember to continuously cross check all flight and engine instruments. Flight indicators can become sluggish and unreliable at temperatures below —20°C. Aldis lamp heat can warm a sluggish instrument.

Slow instrument erection may be experienced in extreme cold.

Remember, when temperatures are lower than normal, actual altitude is lower than indicated altitude.

If icing conditions are encountered which affect the aircraft abnormally, notify ARTC and request a new altitude.

When possible maintain watch on intake ducts to jet engines and take appropriate de-icing or anti-icing action, whichever is required, to prevent ice build up in that area. If layers of ice gather on jet engine intake duct lips, large pieces can break off and be drawn into the engines causing compressor stall and probable flameout.

OUTLINE FOR WINTER

• APPROACH

Obtain weather, including runway conditions, in advance of letdown. Ask, if you doubt information is complete.

Monitor engine instruments closely—changes in air speed and power settings can rapidly effect operating temperatures, particularly when carburetor heat is used.

Exercise flight and engine controls during descent to ascertain normal reactions.

If your aircraft has accumulated structural ice, make allowances for a higher stalling speed.

If directed to hold, and ice accretion occurs, advise Approach Control immediately. They may not be aware of your condition.

Heaviest icing conditions (e.g. freezing rain) are frequently encountered near the surface. Don't let a trouble-free flight at altitude lead to complacency.

Landing lights may freeze over. Once extended leave them on, as heat from the bulbs may melt the ice.

Be sure your crew knows your intentions and any additional services you expect them to perform.

Higher power may be required to keep engine temperatures above low limits. Increased drag—dive boards, flaps, gear—may be necessary to stay within maneuvering speeds at these higher power settings.

Make shallower turns in an iced-up aircraft.

Snow covered surfaces look different! Runway lights, barrels, pine boughs—any contrast marker will help your depth perception. Believe your GCA or ILS (both if they're available).

Don't turn off windshield heat because the field is in sight. The glass may cool just enough to fog over, possibly on roundout.

• LANDING

Brakes are less effective on wet, icy, or snow covered runways.

Know the relative advantage of aerodynamic braking for your aircraft. If brake chute equipped deploy the chute as soon as the aircraft is on the runway and below maximum deployment speed.

Jettison the chute after you have obtained the maximum aerodynamic braking but at air speed above minimum crosswind control speed.

Use normal braking techniques—anti-skid of course, if so equipped.

Reverse thrust is still effective on slippery surfaces. Apply carefully, ascertaining that symmetrical power conditions exist before using high power.

Reversing at too low a speed can cause "whiteout" from snow blown around the cockpit.

Retract flaps as soon as practical after touchdown to minimize damage from slush and ice thrown by wheels and props.

Expect ineffective nose steering—remember differential power as a steering device.

• POST FLIGHT

Watch oil temperature when diluting. If too high vaporization of fuel will nullify the effort.

Follow dilution procedures spelled out in the Dash One; then to insure proper lubrication, be sure engines are operated sufficiently long before the next takeoff to evaporate the fuel from the oil.

Remove batteries and store in a warm place if extreme low temperatures are forecast.

Have aircraft serviced immediately with fuel and oil and sumps drained of moisture.

Remove snow and ice that may have accumulated on gear and flaps, particularly all actuating units.

If the ramp is icy, verify that ice chocks are used.

Use intake and exhaust covers, engine covers, etc. to provide maximum protection from sleet, rain or snow. Never turn down hangar space.

Drain moisture from heater fuel lines and lavatories.

Leaving a window or hatch open will permit air circulation and reduce window frosting.

See that all crew members obtain adequate food and rest—more energy is required in cold weather. ★

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A number of new films have been published recently. To obtain those you desire contact your base film library. If they don't have what you want they can order the films from the AF Film Library Center, 8900 So. Broadway, St. Louis 25, Mo. Requests should contain complete title, serial number and showing date. All films are 16 mm with sound.

- ALERT IN THE PACIFIC. Ser. SFP 626. 15-min., color film of supporting units of PACAF.
- ARMORED SKY. Ser. SFP 1068. 23-min., color. Responsibility of NORAD for SAGE-BOMARC program.
- FLIGHT SAFETY. Ser. FTA 487a. 7½-min., B&W. Pilot preflight inspection of exeterior of F/TF-102.
- FLIGHT SAFETY. Ser. FTA 489a. 6-min, B&W. Emergency procedures for the F-100D, engine failure during takeoff run, on takeoff (airborne), during flight low altitude engine failure, and ejection—if time and conditions permit.
- FLIGHT SAFETY. Ser. FTA 493d. 9-min., B&W. C-123B post-flight inspection procedures, assuring safe conditions for another flight.
- MATS SAFETY GOAL. Ser. FR 156. 11-min., color. Entire staff strives for perfect flying safety record.
- BALLISTIC MISSILE & SPACE PROGRAM. Ser. SFP 1036.

WHOSE TURN?

Two T-33 jocks were making their way on an extended XC flight. Time was of essence. In the remarks section of each Form 175 was indicated minimum turn-around requested.

Subsequent to each landing the pilot in the rear seat was required to dash to operations and file the plan for the next leg. The front seat hero was required to switch the parachutes (as it was his turn to ride in the back seat) and preflight the aircraft. This procedure occurred after each landing.

On one occasion, after about the fourth landing, the rat race started again. The aircraft pulled up and stopped. Transient alert was on the ball and the refueling truck was standing by. The rear seat jock made a bee line to base ops. The other started switching parachutes as the bird was being refueled.

When the flight planner for the next leg emerged from base ops—clearance filed—he observed his cohort in the rear seat strapped in and ready to copy ATC clearance. Up to that point approximately 20 minutes had elapsed since engine shutdown and it appeared they might break a turn around record for this day.

ATC clearance was obtained and taxi instructions were requested. Both pilots remarked that 29 minutes from engine shutdown to engine start-up wasn't bad at all. In fact it was the best time up to that point.

Line up check was completed and engine advanced to 100 per cent for take-off. Everything was in the green and the engine was responding normally as they rolled merrily along on their take-off run.

As the T-Bird broke ground, and too late to abort take-off, the front seat pilot retracted the gear and took a quick look from the left tip to the right tip to assure himself that everything was Hunkey-Dorrey. Well, what duya know? What he observed was a beautiful sight—in fact, for a split second, he thought he was a member of the famous USAF acrobatic team. Yes — six beautiful trails of vapor and lighter fluid were emitting from the wings —one from each tank. It was a sight to behold. Even the tower operators were impressed with this display of airmanship.

The following is the excited discussion between our two heroes as they winged their way around the flag pole.

"Hey, Jack, did you check those caps?"

"Well, I thought I did."

"What duya mean, you thought. Did you or didn't you?"

"Well, come to think of it, the alert crew checked them and secured the dust covers so I assumed the tank caps were tightened. Would they secure the dust covers without tightening the caps?"

" You ****!!*!!!, that's the policy in this part of the country. They're always having dust and sand storms and they secure the dust covers to prevent foreign matter from entering the gas tanks. That doesn't mean that the gas tank covers are tightened."

Just about that time the inevitable embarrassing query from the tower operator came over the RT.

"AF 1234, are you aware that you are siphoning fuel profusely? Do you want to declare an emergency? What is your decision?"

Just about this time Pilot No. 1 felt like getting just a little lower in the cockpit. "Raahg, Tower, am aware of condition. Please cancel my flight plan. Will fly around in the local pattern here until we empty our tips."

It took approximately 25 minutes with dive boards down at 100 per cent RPM before a landing was attempted. The landing touchdown and taxi-in were uneventful. However, two very embarrassed and red faced jocks emerged from said aircraft—tucked their tails between their legs and made their way to the darkest corner of the coffee shop. ★

Maj Anthony Cavallo, Editor
Aerospace Acc. & Maint. Review

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USAF FILM LIST

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23-min., color. USAF speeding up its ballistic missile program. THOR, ATLAS, TITAN, MINUTEMAN, MIDAS, SAMOS AND AGENA ARE SHOWN.

• FLYING SAFETY REPORT NR 11. Ser. FR 129. 19½-min., color. ADC shows how command analyses of aircraft operational failures have reduced accidents/fatalities.

• SURVIVAL TRAINING—Parachuting. FTA 279y. 10-min., B&W. How to inspect, fit and operate chest and back chutes; to control chute and position body during fall and when landing; to avoid being dragged after landing; and to avoid injury when necessary to land in water, trees or among wires.

• FLIGHT SAFETY. F-104C. FTA 486b. 10½ min., B&W. Emergency procedures for the F-104C, including electrical failures, ejection, and fire.

• BASIC AIRCRAFT CONTROL. FTA 503. 7-min., B&W. Describes longitudinal, lateral and vertical axes about which aircraft tend to rotate; roll, pitch and yaw; and use of primary/secondary control surfaces to remove pressures that affect normal flight attitude.

• FLIGHT SAFETY RB-66C AIRCRAFT. FTA 490b. 9½-min., B&W. Starting procedures; preflight inspection of exterior and interior; engine start, pretaxi, taxi and pretakeoff checks. ★

WHAT IS A HOT SEAT?

R. L. Hayward, Sr. Design Engineer, CONVAIR, San Diego

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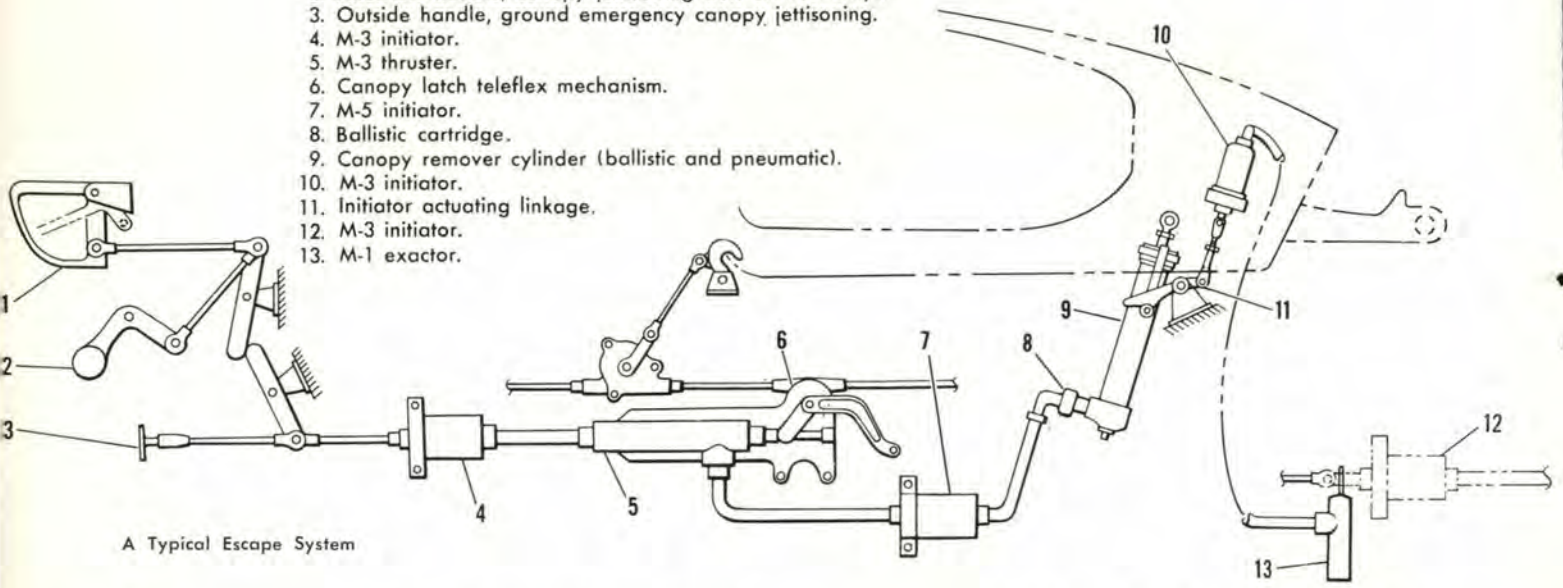
1. Canopy jettisoning handle (typical, both armrests).
2. Alternate handle, canopy jettisoning (left armrest only).
3. Outside handle, ground emergency canopy jettisoning.
4. M-3 initiator.
5. M-3 thruster.
6. Canopy latch teleflex mechanism.
7. M-5 initiator.
8. Ballistic cartridge.
9. Canopy remover cylinder (ballistic and pneumatic).
10. M-3 initiator.
11. Initiator actuating linkage.
12. M-3 initiator.
13. M-1 exactor.



A Typical Escape System

There are many misconceptions about the safety and reliability of present-day ejection seat systems. These misconceptions have been causing unnecessary loss of life and equipment. All too often crash investigators have found the seat and occupant in the wreckage with the seat safety pin still in place. The pilot considered the ejection system too "hot" because it contained numerous ballistic devices; he had heard many stories about these devices, and he felt he could quickly jerk the safety pin out if an emergency developed.

One incident of this type occurred during early operational use of the F-102. An emergency developed so quickly that the pilot grabbed the ejection handles first. He couldn't raise them so he manually released the canopy, hoping to climb out—but too much time had been lost. Better knowledge of escape systems and cartridge devices and the safety features built into them would have given him the confidence to fly with safety pins removed—and a chance for survival!

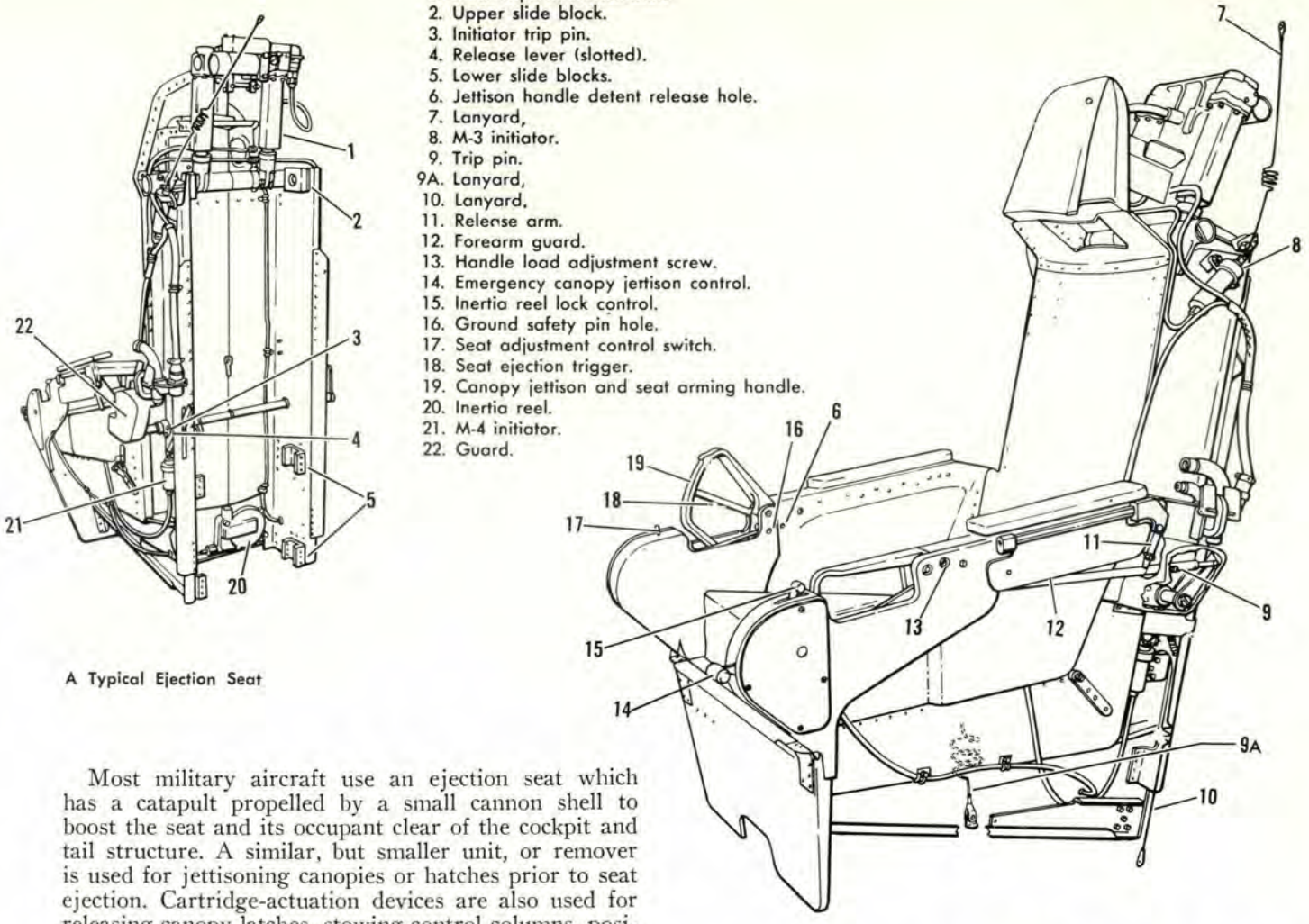
Another common misconception which can cost an airplane and possibly the life of its occupant is the belief that an emergency landing, especially with the canopy already jettisoned, may cause the seat to eject. Here is a case in point:

The pilot declared an emergency, pulled up his escape handles and jettisoned his canopy. Before pulling the ejection triggers he realized that the emergency had lessened and he wanted to land, but he knew that the canopy jettisoning had armed his seat. He felt that the seat was "hot" and might fire if he made a rough landing. He decided to try a landing, and he made a good one. Actually, the only vulnerable part of his escape system in this case had been the accessible ejection triggers, which he wisely avoided while landing. Only a crash damaging the ejection control or its linkage in the operating direction could cause inadvertent cocking and firing of the initiator.

One more misconception which might have cost the pilot his life occurred a few years ago at Andrews Air Force Base. A pilot landed after reporting a fire. He was unable to open his canopy; and when fire and rescue teams arrived, he frantically waved them off when they tried to use the outside canopy jettison control handle. He also refused to use his own canopy jettison control. Fortunately, the fire was quickly controlled and he held his parachute over his head while firemen chopped the glass out of the canopy. He reported that he thought the canopy would go straight up and come down on him unless he had airspeed to take it aft. The canopy on this aircraft was the type that is hinged at the aft end and is driven upward and rotated aft by the canopy remover until the hinge bolts are sheared and the canopy spins aft to the tail section area.

These are but a few of the incidents that are jeopardizing lives and equipment due to a lack of complete understanding of escape systems and cartridge-actuated devices, and of the safety features designed into them to prevent inadvertent firing.

The following information is offered in an attempt to provide a better understanding of a typical escape system and its cartridge-actuated devices, which you sit on if you are a pilot or will handle if you are a maintenance man:



A Typical Ejection Seat

Most military aircraft use an ejection seat which has a catapult propelled by a small cannon shell to boost the seat and its occupant clear of the cockpit and tail structure. A similar, but smaller unit, or remover is used for jettisoning canopies or hatches prior to seat ejection. Cartridge-actuation devices are also used for releasing canopy latches, stowing control columns, positioning seat buckets, and any other function which needs to be accomplished rapidly and automatically as part of the preparation for seat ejection during an emergency.

During the first few years of service use of cartridges in the seat system, a great deal of experience was gained, sometimes at the cost of life and equipment. This experience resulted in many improvements over early ballistic devices and led to the establishment of rigid specifications for design and testing.

• *Cartridge Devices*

The cartridge-actuated device contains an explosive cartridge which, when fired, provides high pressure gas which can be used to drive a piston to do work or can be routed through high pressure hose to actuate other units in the escape system. These make it possible to provide the pilot with a completely automatic escape system which merely requires him to pull a handle to fire the first device. From there on, the system operates on its own. It is also true that one early type of seat catapult widely used in the early 1950's failed to fire so many times when needed, and fired so many times when not needed, that stories about it still cause some pilots and mechanics to relate it to our present, improved catapults. Most of the accidents with this early catapult were caused by the vulnerability of the series of levers, bellcranks and cables transmitting motion from the ejection control along the side and up the back of the seat to the trip lever of the spring-loaded firing pin at the top of the catapult. The experiences with this type of installation resulted in the insistence on use of cartridge-actuated devices and transmission of power through hoses, wherever possible.

As a result of those early years of experience, improved methods of safetying have been developed for the two basic types of firing mechanisms. The mechanically actuated units are not cocked until the pin is pulled at the time of firing. The gas actuated units have their firing pin piston locked in place until gas pressure is applied.

Some of the most rigorous of the extensive test requirements for these units are the drop tests from six feet onto a concrete floor to test the safety of the firing mechanism and the stability of the propellent; then the ninety test firings at temperatures from minus 60 degrees to plus 200 degrees. Then there is the accelerated aging test where loaded units are kept in 200-degree ovens for days. This test simulates long periods of desert or tropical heat.

• *Mechanically Actuated Cartridge Devices*

The initiator is the most commonly used unit which is fired manually or mechanically by physically pulling

the actuator pin from the end of it. *It does not contain a cocked firing pin.* This is a very common misconception. The firing pin is actually locked a short distance away from the cartridge by a ball locking device, and no amount of shock or impact can unlock it.

The initiator used to initiate the canopy and seat system is usually located as near as possible to the ejection control handle in order to shorten and simplify the mechanical linkages required to pull its firing pin. Only the operation of the linkage between the ejection trigger and the first initiator can fire it. It might be compared to an uncocked automatic pistol, which cannot be fired until the bolt has been drawn back to cock the firing pin spring.

A mechanically actuated initiator with a delay fuse is also widely used, mostly for disconnecting automatic lap belts on ejection seats. They are tripped by a cable lanyard to the floor or by a trip arm striking a lug during ejection, and contain a cartridge with a one- or two-second time delay fuse to allow separation from the aircraft before automatically opening the lap belt.

Some cable or lanyard cutters are actuated mechanically by cocking the firing spring as the unit is actuated, in the same manner as initiators, but most are gas operated.

• Gas Actuated Devices

The other cartridge-actuated devices used in the system are nearly all independently powered, but actuated by the gas pressure from the initiator or the preceding unit in the sequence. This means that each has its own cartridge which provides the correct amount of pressure to do its task.

• Internal Stowage Locks

Cartridge-actuated devices employing a driving piston to provide an actuating force also include a shear pin or a mechanical lock feature. Each holds the piston in a stowed position until sheared or unlocked by the first build-up of gas pressure from its own cartridge.

• Catapults

The seat catapult was the first ballistic device used to help the pilot get clear of the tail structure. It is a 4-foot long tube with a piston within, which is attached to the seat. When a cartridge is fired within the tube the piston drives the seat and occupant up a pair of guide rails and free of the cockpit. This general type of catapult has been in use since the end of World War II.

The most outstanding change to catapults has been the addition of rocket power, which was first added to improve fin clearance on the F-102 and F-106. The piston within the seat catapult became a tube filled with rocket propellent which was ignited only after the seat had been catapulted to the end of the guide rails by the basic catapult cartridge. As the seat left the guide rails and the catapult piston left its outer housing, the piston became a rocket motor with a burning jet nozzle, driving the seat and man higher to clear the fin structure, and forward to ease the deceleration forces. This combination rocket-catapult principle has improved the escape capability in a number of military aircraft and has provided the first practical device for separating heavy and bulky capsules from aircraft for pilot or crew escape.

The new escape system on the F-106 employs only the rocket motor feature to drive the seat upward and forward after other ballistic devices rotate the seat to a feet-first position above the cockpit. Conventional catapults, rocket catapults and rocket motors are all activated by the gas pressure method described above.

• Other Devices

A common type thruster is a cylinder 8 to 12 inches long with its own cartridge, which is fired by gas pressure from an initiator. For example, it is used, to override the mechanical unlatch system to release a canopy or hatch, for positioning a seat bucket, or moving a control column prior to seat ejection.

The next major unit is the canopy *remover,* which is fired as already described and which applies enough force to the canopy to rotate it and release it from the airplane.

• Exactors

In some airplanes the escape system contains a canopy interlock which prevents the seat from being fired until the canopy is gone. The need for this is, obviously, to provide a clear path for the seat. The simplest kind of interlock in use is the installation of an exactor or safety pin extractor on the side of the seat firing initiator, which is operated by the ejection control trigger. This provides a safety pin in the initiator, which prevents firing the initiator and the seat until the canopy is clear. As the canopy jettisons, it actuates a second mechanically fired initiator to provide pressure to the exactor to withdraw the sear pin. Now the seat is "armed" but this does not mean that it is "hot" or unsafe.

The ground safety pin for the canopy and seat system was pulled by the pilot before takeoff. The seat arming pin (exactor) has been retracted automatically by the canopy jettisoning. Someone, or something, still has to pull the pin from the seat initiator to send gas pressure to the catapult before the seat will fire. Ejection triggers are usually protected in some manner or positioned within a loop handle in order to avoid inadvertent firings, or they will have detents or some kind of downlocks to prevent them from bouncing up by themselves. It takes 20 to 60 pounds of pull to release downlocks and raise ejection triggers or handles, and this is the action which cocks the first initiator prior to firing it on most seats.

After a canopy has been jettisoned independently by the alternate canopy jettison control in the cockpit or by the outside emergency control, the seat is no "hotter" than any one initiator with the ground safety pin removed. The pin still has to be pulled to fire it. The trigger or handle on the seat still has to be raised to fire the initiator; therefore, the pilot must install the seat safety pin as usual before scrambling from the cockpit in order to avoid trouble if he snags the ejection trigger. Ground rescue personnel can safety some systems more rapidly by separating disconnect units or cutting the hose to the seat catapult prior to entering a cockpit

for rescue operations. This can be done without reaching over the seat.

Most of the cartridge actuated devices discussed so far have been proven and in general use in military aircraft for a number of years. The following are some of the more recently developed units designed for an ever-widening variety of tasks:

- Larger thrusters capable of raising a seat and man a predetermined distance, or to rotate a seat and man and hold him in a horizontal position as in the new F-106 rotational seat.
- Stabilization booms for seats are now available to eliminate tumbling. They consist of a series of telescoping tubes which are extended by the internal expansion of gas from a cartridge.
- A footmeter in the F-106 seat employs a cartridge and its gas to rotate a shaft with cables and cranks to position the feet and legs for ejection.
- Another rotary acting power unit driven by a cartridge is the new seat/man separator installed in F-104 upward ejection seats and now being retrofitted in other Century Series aircraft. The unit turns a drum to wind up a strap which is routed down behind the parachute and under the seat pack and attached to the front edge of the seat. After ejection, when the automatic lap belt is fired, it simultaneously fires the separator and the strap is pulled taut to snap the man from the seat to provide positive separation and speed up automatic parachute deployment.

All of these newly developed devices use one or the other of the two proven methods of actuation—mechanical or gas fired—and have undergone the rigorous qualification testing necessary prior to installation.

A note to maintenance personnel: The gas operated units can only be actuated by pressure; therefore, avoid use of air on any hose unless it is out of the aircraft and both ends unattached. The safety pins provided for the mechanically actuated units are very effective and prevent the actuating pin from being pulled.

At this point it is necessary to mention a condition existing in early type initiators, which could be hazardous if combined with misadjusted initiator linkage. If the actuating pin is pulled out as much as .09 inch, the safety pin can be inserted behind an internal locking collar and appear to safety the initiator, but actually would not lock the actuating pin. The pin could still be pulled to cock and fire the initiator.

It is unnecessary, and is actually unsafe, to disconnect mechanisms or hose fittings in addition to using safety pins in an effort to make a system "extra safe." Too many times our airplanes have come back in for maintenance and a hose has been found still disconnected. An "extra safe" step that *is* recommended during maintenance is the use of safety wire to hold the safety pins in place. This will prevent safety pins from slipping out of the unit.

• Review

Now, let's review a bit. Manually or mechanically actuated initiators are inert until cocked by pulling their actuating pin. Booster initiators, thrusters, cutters, removers and catapults are gas operated. The firing pins are locked in place and cannot be moved without gas or air pressure being applied to the inlet port. These are the most important safety factors built into the cartridge devices.

Each airplane has some differences in ejection controls. Pilots, understand your escape system. Use common sense precautions. Your personal equipment man can set up a seat for you periodically, with initiators removed, so you can practice for rapid ejection or for ground emergencies. In an emergency you must remember the training for the airplane you fly today—not the one you flew last year. ★

• o •

The Federal Aviation Agency is sponsoring a post card type questionnaire for the purpose of determining problem areas in the air traffic control system. Recognizing the benefits that may accrue from this program, the Air Force is encouraging all pilots to participate.

The cards, which are self addressed and require no postage, will be distributed to air carrier operations offices, military base operations offices, FAA flight service stations, and aircraft sales and service offices at municipal and private airports.

The cards will be simple in design, merely requiring the pilot to report a specific problem he has encountered in the ATC system. This could include, but not be limited to, such items as excessive delays, unusual procedures, complicated clearances, inadequate weather information or pilot briefing.

Only factual information regarding the complaint is asked for, the date, time (Z), location, and aircraft/trip number, followed by a short description of the incident. Then drop the card in any mail box. The cards should be available at military base operations November 1, 1961.

SEEK DATA FOR BETTER AIR TRAFFIC CONTROL

FEDERAL AVIATION AGENCY Pilot Questionnaire-Air Traffic Services	Budget Bureau No..... Approval Expires.....

In order that we may have current information on problem areas in the Agency's air traffic services we request your cooperation in providing us with information pertaining to excessive delays, unusual procedures, complicated clearances, inadequate weather information or pilot briefing, or similar occurrences you experience.

Date..... Time.....(Z) Location .....

Aircraft/Trip No. ..... Problem .....

.....

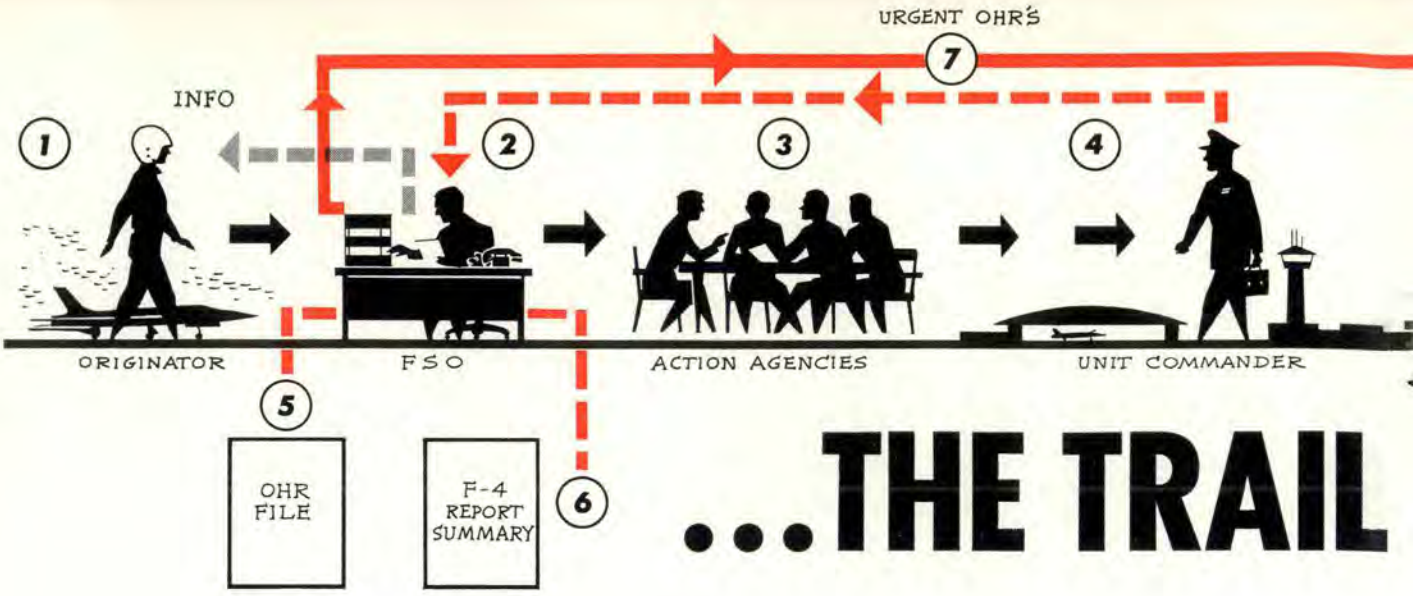
.....

.....

(Should the problem be too lengthy, a letter may be submitted)

Check category - ☐ Air Carrier, ☐ Military, ☐ Gen'l. Aviation

No signature required – Drop in any mail box ...Thank You.....



...THE TRAIL

Some years ago a nationally known magazine ran a monthly column entitled "Why Don't They" which contained many hints from housewives, office workers, professional people, etc., on gadgets that would make everyday living more enjoyable if such gadgets were invented and marketed. Later, the same magazine carried another column called "Now They've Done It" which narrated new inventions to be made available to the public for a fee. No doubt, many of the items, which varied from can-openers to back-scratchers, would never have been developed had someone not pointed out the need for such an item.

We have a close parallel in the Air Force, for there are few pilots and support personnel who, at one time or another, haven't uttered something like "This is a helluva way to run a railroad; why don't they do thus and so!"

Now the best way we have found to correct some poor procedure, policy, design, or what have you, is to make one's ideas known to responsible personnel or agencies. One useful tool for doing this is the Operational Hazard Report, or OHR as we commonly call it.

We in USAFE sincerely believe that the OHR program has contributed appreciably to the decrease in our major aircraft accident rate. The one factor which we believe has made the program a success is the requirement to *let the OHR originator know what action was taken on the recommendation contained in the OHR submitted.* True, it may take several weeks to process an involved OHR requiring comments by several staff agencies, or Air Traffic Control agencies, but eventually the OHR originator will be notified officially of action taken to correct whatever annoyed him.

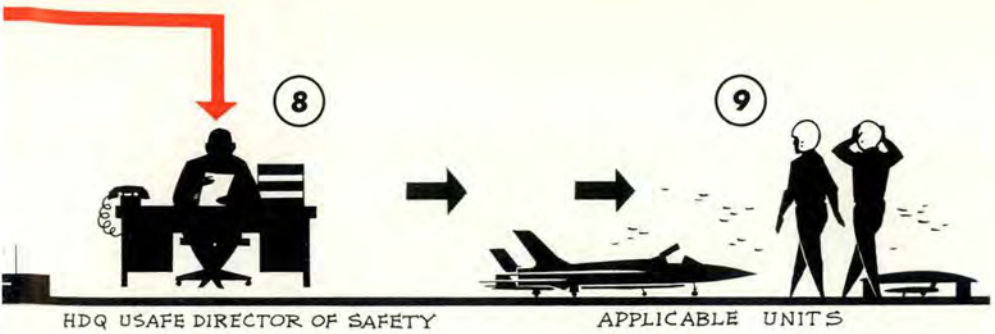
USAFE Supplement 1 to AFR 62-7 covers in detail the submission and processing of OHRs; however, since regs are such dry reading, a brief description may be in order. Under normal circumstances, the OHR begins at unit level. Forms are readily available in the aircraft, in the back of the DD Form 781, in Base Ops and squadron ready rooms, alert shacks, etc. The form, once completed, is routed initially to the base Flying Safety Officer. He reviews the report and routes it to the proper agency or agencies that are in a position to take corrective action. The report is then sent to the *unit commander* who either endorses the corrective action or returns it to the agency involved for *additional action.* Once the unit commander is satisfied that the situation has been corrected, the OHR goes back to the Flying Safety Officer who, in turn, notifies the originator if the OHR was signed.

If corrective action is beyond base level capability, the OHR is forwarded to the next higher echelon of command . . . be it air division or numbered Air Force. If it takes major air command action, then the report comes to Hq USAFE. In all cases, the OHR originator is eventually notified of the action taken. Almost everyone will agree that an individual will be encouraged to submit other OHRs when the need arises if he knows that his efforts to complete the form will generate action. Nothing could be more discouraging than to submit an OHR and never know whether anyone ever read it or if it was thrown into the nearest waste basket.

OHRs have been submitted on just about everything imaginable. The majority concern near collisions, oddball IFR departures, navigational aids, airfield conditions, scheduling procedures in flying training sections, and the like. The near collision reports were most helpful in preparing a near collision study within USAFE during 1960. One crew submitted an OHR on, of all things, a base operations snack bar. The transient crew became ill after having eaten several hamburgers at the local greasy spoon. In short order, the doc, base commander, and several others got in the act and the situation in the snack bar was quickly corrected. The example of the snack bar is rather unusual, but it does show that results can be obtained when responsible personnel are adequately advised. The fact that the system provides for documentation of the corrective actions taken also helps.

Now you probably wonder what happens if one chooses not to sign the OHR. Well, it's processed in the same manner and, after all corrective actions have been indorsed by the commander, it is filed in the Wing FSO's office. Anyone can visit the FSO, ask for the OHR file and find the one he submitted but did not sign.

The OHR of such an urgent nature that it may affect the safety of other units flying similar aircraft is transmitted by electrical means. In these cases action is expedited to insure fast corrective action.



Lt Col James W. Bradford
Chief, Flight Safety Div.
Headquarters, USAFE

OF AN O·H·R·

To exchange accident prevention information, USAFE employs a monthly Flying Safety Activities Report . . . better known by its reports control symbol as the F-4 Report. This is a mandatory report submitted monthly over the Unit commander's signature to higher headquarters and to all units within the command operating similar aircraft. For instance, all tactical fighter wings exchange F-4 Reports, as do interceptor wings, transport wings, and strictly support wings. The F-4 Report covers OHRs of common interest, such as drag chute failures with reasons for failure, new accident prevention ideas, changes in procedures, and the commander's comments on various subjects or problems of current interest.

One example will illustrate how our F-4 Report works. An OHR of command wide interest involved the flight of an F-105 from the ZI to Ramstein, Germany on 24 June. An acceptance inspection of the aircraft's personal equipment revealed that the seat kit had some serious deficiencies:

- The lid was not locked.
- Emergency release handle was not locked in correct position nor was it safety wired.
- There were no survival components (especially the life raft) in the kit.
- The kit displayed a small piece of brown paper safety wired to the handle with the notation, "this kit is not packed for service."
- Underneath the kit were two maps, toothpicks and other assorted trash.

The pilot flew this aircraft across the Atlantic with his life vest as his only piece of survival equipment. The aircraft was a spare for the flight and utilized at the last minute, which may explain how the above could have happened.

This OHR was forwarded to the appropriate AMA for action. The information contained in the OHR was disseminated throughout USAFE by way of the F-4 Report.

For any system to work properly there must be order, and the various steps must be followed religiously to maintain that order and assure proper functioning of the system. The flow diagram heading this article illustrates the flow of OHRs from originator to action, with provision for notifying the author of action taken.

In summary, we believe the exchange of information among units is vital to any accident prevention program. Further, the OHR is a step in the right direction toward correcting the sometimes seemingly insignificant factors which so often appear in aircraft accident reports under the heading of "contributing cause factors." ★

WELCOME, my foot!

"Yes, sir!" I said. What ya' gonna do. He outranked me. He was bigger than me and was he mad! That's what I call a real triple-threat.

He had seen me print my name on the 175, grabbed my arm and dragged me outside. For a second there I thought he must be a cannibal with a penchant for freshly disjointed arms. When he got me out in front of Ops he whirled me around and pointed up over the door. "See that?" he demanded. I nodded. There was one of those big Duncan and Heinz signs—you've seen them—like an oversized coupon with nutty sketches all around the border, all framed and plexiglassed in.

"You know how to get in touch with those two, don't you?" The way he put it, I'd have said, "Yes, sir!" if he'd asked if I could jump over the building. I might have made it too, when he let go of my arm, but he stomped on my left foot. Ever seen a flat foot—I mean on top?

He needed both his hands to unravel a wad of paper. Finally I recognized it as a 175, or rather, what was left of one. "See that," he yelled, shaking it so close in front of my face I started to get black eyes from the carbon paper.

"Yes, sir!" I said. I was trying to concentrate, but my foot was hurting too bad.

"I made that out six hours ago. All I wanted was fuel. A 20-minute ground stop. Where do they park me—so far out in the cotton-pickin' boondocks I have to hide my chute for fear the boll weevils will get it. They got a visitin' dignitary comin' and they can't have any loose transients toolin' around their ramp. Then the tower tells me there'll be an indefinite wait, as vehicles are all tied up for the ceremony. I'd have walked in, but I was so far away and it was so hot I figured I'd never make it without a canteen and a camel.

"I finally got in—hitched a ride with an installations type who was out ridin' perimeter fence. Ya' know, he seemed happy to have someone to talk to. Anyway I'm jumpin' up and down mad and I'd have really cut loose, but the AO was off somewhere with the clearance officer drinking coffee and congratulating each other on how well they'd gotten through another VIP arrival. I woke the duty airman, told him if it wouldn't be too much trouble I'd like some fuel right away—my bird was over with those rusted-out Gooneys—and went into flight planning. Guess what: because of the big arrival ceremony they have put everything away. I'll bet if the pencil sharpener hadn't been screwed to the wall they'd have hidden that too. There wasn't a thing in sight but polished desk tops. They'd even cut the dirty measuring string off their wall map.

"Well, I scrounged around, found a 175, copied my flight plan backwards and 'guesstimated' the takeoff data. I tell you, I'd have gotten outa here if I had to do it by flappin' my arms. Then, guess what?"

Gad, I would have if I could, but all I could think of was to wish my foot would turn numb like my arm.

"I got out to my U-3 just as a big yellow truck is ready to leave. I said, "You didn't"—pointing at the JP-4 fuel markings on the truck and he catches on real quick. He nods and says 'I did,' real sorrowfullike. He got real nervous, said it was the first time he'd ever seen a pilot bawl.

"Well, I told him Cessna hadn't designed the Blue Canoe for turbojet fuel, LOX, solid propellants and such, so, get a defueling rig, drain, purge, and give me a load of good old fashioned aviation gas. The only thing he did right was give me a lift back to Ops. Ya' know I don't think a man could survive out there for long.

"And that's it." He moved his size 13 brogan, but all I could do was stand there and try to breathe gently until some of the pain subsided.

"I want you to get a hold of those Dunc'n and Heinz guys and get them straightened out. They should get out here and get this base straightened out, or rip their coupon down."

I promised him I'd do what I could, finished clearing, went to my bird, made sure MINE had JP-4 in its tanks and left.

Well, I tried to pin these mythical characters down but I've always felt the Aerospace Accident & Maintenance Review troops gave me a bit of the old runaround where this pair is concerned. However, they promised me they'd pass the word, and that the two top-hatted connoisseurs would look into this matter.

Actually, they were pretty decent. They noticed my limp and my one arm in a sling and had me sit and have coffee. None of them seemed busy anyway so I stayed.

One—I took him to be the leader 'cause he acted like he had the most time to visit—related how the Duncan and Heinz team told him they rate a base. First, he said, they note how professionally Approach Control, GCA, tower and ground control handle communications and how clear their instructions are. They see how long it takes for the "Follow Me" to show up and whether or not they keep the proper distance, maintain a safe taxi speed, park so there's plenty of clearance, have wing walkers where needed and use approved signals. Are transient alert people on the ball? Do they ask what service is needed, advise if there will be any delays? How's the maintennace—do they check systems out then make repairs, or are they just "quick change artists?" Do they have ladders available, and transportation? Is the AO on hand to welcome arrivals and does he know his job? Can he answer questions? They check on facilities in Base Operations. Are they clean, well marked, adequately equipped and roomy?

Are the people in Ops, transient alert, refueling and transient maintenance alert and helpful? Do they have Tech Orders readily available and do they know how to use them? What's the supply situation? Do you get the idiot treatment—is the regular man on duty, or is he out for coffee, chow, checking his mail, at the BX? If standard services aren't available are there NOTAMs to this effect?

Some gal came in with coffee all around. After we got the cream and sugar passed, this guy went on. "They check on transient quarters for officers and airmen, the snack bar and chow halls—everything a transient would normally encounter. They also observe morale of the troops. Is everyone cheerful, anxious to please, enjoying his work?"

I asked how transients can let this Duncan and Heinz duo know about the bad bases. I didn't want to ever get the arm and foot bruising routine again.

This guy explained that they have an agreement to list all the D&H recommended bases and would be glad to pass on field-submitted recommendations to that mythical pair, both good and bad. Just write to Duncan and Heinz, Care of the Aerospace Accident and Maintenance Review Magazine, Deputy Inspector General for Safety, Norton AFB, California.

How's that? You also want to know the location of the base where the foot crusher had his trouble. You want to be sure and avoid it. Well, I don't dare disclose that. Anyway, this magazine guy said he was sure Duncan and Heinz would get right out and check on it.

Say, I can give you this much of a tip though. If you see an Ops building with a big vacant coupon case over the door, take a good look at the sidewalk—there should be a left footprint there. ★

Head in sling with sling hooked behind neck so that eyes face hook.

Push arms up and through the sling, keep your eyes facing the hook.

SLING SAVVY . .

Relax and enjoy the ride. The hoist operator will now do the rest.

Keep hands clasped. Don't reposition yourself. Don't look down.

Sweeps arms out and downward, forcing sling down under armpits.

With sling under armpits and arms down, clasp hands across waist.

The rescue sling shown in these pictures is an essential piece of equipment carried aboard rescue helicopters. Literally thousands of people, military and civilian, have been saved through its use. However, there have been tragic cases of people lost because they failed to get into the sling properly, then fell back into the water or onto the ground. These pictures are to show the single most important requirement for the rescuee—GETTING INTO THE SLING PROPERLY. From this point on the chopper crew will do all the work. Don't try to help! Let the man aboard the helicopter pull you in and remove the sling. Study the pictures. Someday, if you must be rescued, you can help save yourself by following the steps shown here. ★

DON'T TRY TO HELP! Relax and let the hoist operator do the work.

The hoist operator has removed the sling. You're safe and sound.

When the hero of the western story, armed with his six-gun, is attempting to smoke out the villain, holed up in the rocks with a rifle, there are three courses of action open to him. The first is to forget the whole thing and go home. Another is to shoot it out at long range, hoping that a random shot hits the mark. The last is to sneak in close enough so that his short range weapon is effective.

Obviously, what our hero needed was a weapon with the accuracy of the rifle, but with a longer range, so that he wouldn't have to marry the girl while carrying a posterior full of lead. The lack of such a weapon probably contributed to a high mortality rate among our western heroes.

As late as the Korean War, tactical fighter support of ground operations posed somewhat the same problem. Using tactical aircraft to soften up a position, or to knock out a bridgehead, meant heavy losses of men and planes.

"It wasn't the heavy flak or the medium flak on the way down that bothered the pilots so much as the small arms fire from the ground after they had finished their dives. If you had ever been in a raid, you'd understand." These are the words of the late Ernie Pyle, writing of the dangers of dive bombing during World War II. Pyle got the words from the men who flew dive bombing missions and some who were the victims of ground fire.

TAC'S WINGED

During the Korean conflict, American pilots flying from bases on the peninsula, from carriers and from Japan flew hundreds of thousands of sorties against their Communist adversaries. Mission requirements dictated that aircraft had to go in low, hit and run.

One veteran pilot says, "We were subjected to small arms fire, even rifle fire from ground troops. And what's worse—the blast from our own bombs. We got tired of pulling pieces of freight cars out of the wings."

In the twenty years between the screaming Stuka dive-bombing that paved the way for Hitler's early conquests and the acquisition of the BULLPUP air to surface missile as an operational weapon, techniques and technologies changed. High performance jet aircraft moving at sonic speeds could not be used safely for low-speed low altitude type dive bombing missions. Weaponry had to be improved to match performances with the airplane.

The BULLPUP, developed by the Martin Company, proved to be the answer. Adopted by the Air Force, an improved version called GAM-83 has case hardened the tip of TAC's winged sword.

Nellis Air Force Base, home of the 4520th Combat Crew Training Wing (Tactical Fighter) is the scene of the GAM-83 training. Here pilot students and ground crews are learning to use this air-to-ground rocket safely and efficiently. Nellis personnel teach rotating tactical fighter squadrons about the care, handling and safety of the GAM-83.

Packing a terrific wallop that enhances the mission effectiveness of Century Series aircraft now in use by Tactical Air Command, GAM-83 is a rocket-bomb that can be launched well away from the target. The rocket-boosted warhead travels at supersonic velocities to the target with unerring deadliness. It is guided by radio control. It is actually "flown" to the target by the pilot who uses a miniature control system mounted within the cockpit. The pilot can release the missile from its underwing launchers while still more than two miles from the target. Flares located in the aft section of the missile permit the pilot to track and direct it until impact. F-100s carry two of the missiles under their wings, and F-105s are now being equipped with the GAM-83.

Early last year, the Air Force awarded a contract to the manufacturer for the "development of a configuration to accommodate interchangeable nuclear and conventional warheads." This versatile bird has been designated GAM-83B. Both models are now equipped with a control package, successfully tested, which permits USAF pilots to launch the missiles from an "offset" position—that is, they can fire at a target while flying parallel to it instead of diving directly at it.

GAM-83 is designed to be safe. Actually it is designed to be treated as a round of ammunition. It needs no intricate checkout equipment. It is easily and safely assembled, and is simple to mount on launching racks. In net, it gives Tactical Air Command a fast turnaround capability. According to Captain Benjamin B. Benigno, Nuclear, Air Munitions and Missile Safety Officer of the 4520th, there is "little or no chance for either premature detonation or early burst." Captain Benigno explained that "premature detonation" refers to ignition prior to arming the missile while an "early burst" is an explosion after launching but before the missile has cleared the aircraft.

Safe design is one thing that is explained to the crews in their handling and use of the missile. In addition, extensive safety indoctrination is provided ground crews and pilots on safety precautions in ground handling, loading and firing. Outfits like the 522d Tactical Fighter Squadron, first USAF unit to receive the BULLPUP, undergo a month-long training period to gain battle capability with the highly accurate air-to-surface missile. Once back at their home base, they continue to sharpen their ability with the weapon on practice missions.

The GAM-83 is delivered from the factory in three sections; the forward section, which contains the guidance controls; the center section, which contains the warhead, and the aft section, containing either a solid

SWORD

fuel rocket motor or a liquid engine. These boosters are capable of sending it toward a target at nearly twice the speed of sound. It is approximately eleven feet in length, and weighs less than 600 pounds.

The three sections are stored in the ammunition storage area. It is in this area that many impressive safety features of the BULLPUP become evident, according to Captain Alton W. Powell, Ammunition Officer at Nellis. It is not necessary to wear protective clothing or special masks for protection against deadly fumes or contaminating acids since this missile does not use acids or chemical fuel mixtures. Everything is built into the missile sections, which can be stored for extended periods of time.

From the ammunition area, the missile is taken to the flight line loading area, where it is attached to its launcher and pylon under the wing of the aircraft. This operation is done by the ordnance technicians of the 520th Armament and Electronics Squadron at Nellis. If the plane happens to belong to one of the Tactical Fighter Squadrons which has rotated to Nellis for a periodic refresher course, the crew of the plane is supervised in the loading procedures by experienced Nellis personnel.

Once the BULLPUP is in position under the wing, a series of checks is made by the crew and the pilot. The aircraft components which provide the command link after launch are relatively simple in design, and small enough to fit into a desk drawer. A check of the aircraft wiring and components comprising the GAM-83 system can be completed in a matter of minutes. In the unlikely event of malfunction, various test equipment is available for insertion in different sections of the system. These tests can determine the exact location of the difficulty. Electronics technicians can replace individual sub-assemblies of the "black box" with very little delay. Testing is done before the missile is armed.

The last step in the loading of the GAM-83 is the hook-up of the "umbilical cord" through which the power in the aircraft is fed to the electrical circuits inside the missile. After the pilot is airborne, another check is made of the controls to be sure that the pilot has absolute control over the missile.

Since the accuracy of the GAM-83 weapons system is dependent upon the pilot's ability and skill in guiding the in-flight missile to the target, pilot training is mandatory to insure effectiveness of the weapon system.

The pilot is schooled in the system in order to attain the basic skills and knowledge requirements such as the function and purpose of the GAM-83 weapon system and components; capabilities and limitations of the system; the pilot's function within the system; flight characteristics of GAM-83 launching from the aircraft; GAM-83 missile flight characteristics, and missile control and guidance techniques.

The pilots are also briefed on the safe storage and handling of the BULLPUP, so that they are familiar with all phases of the operation. Academic instruction of approximately four hours is sufficient time in which to acquaint the pilot with details of the weapon system. The primary training aid, in addition to safety lectures and films, is the Ground Pilot Trainer.

The Ground Pilot Trainer is used to present the pilot with simulated missile guidance techniques. In order to give the pilot the feel of delivering the missile under various conditions, the instructor sets up different launch and guidance problems. If it appears that the pilot is using faulty techniques during practice deliveries, the instructor can point out his mistakes, thereby reducing the possibility of error during actual missions.

In utilizing the Trainer, the student progresses from simple to complex control problems as his ability increases. Proper control selector manipulations are accomplished by firing and controlling the simulated missile at a horizontal line (target), correcting for gravity only. The Trainer lights are on so that the instructor may observe control technique. Next the pilot fires and controls the missile to a vertical line (target), correcting for lateral movement of the simulated missile. He then progresses to a point (target) which requires combined commands. Once a sufficient number of simulated runs have been satisfactorily accomplished by the pilot, then, and only then, is he ready for the real thing.

Now we come to the part where our hero gets the

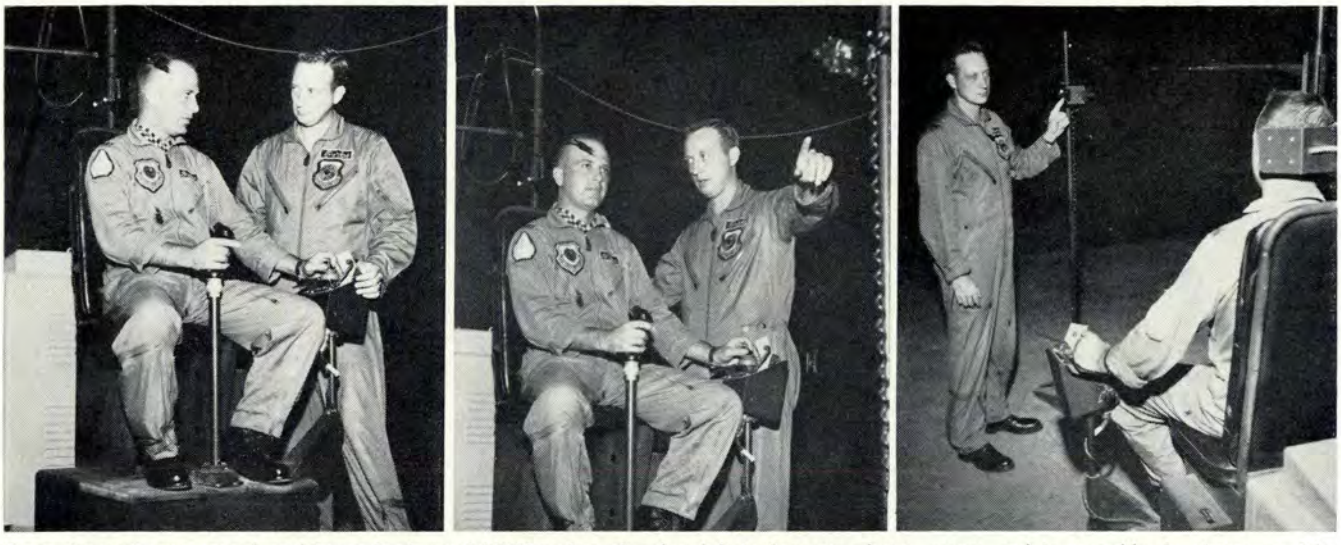
Carl O. Cleever, Office of Information, Nellis AFB, Nev.

TAC'S WINGED SWORD •

best of the villain. The increased safety provided to both pilot and aircraft by the GAM-83, as compared to bombing tactics as late as the Korean conflict, is startling. The toll of men and machines which was taken in Korea by defensive gunnery installations was often times pretty high, when compared to the targets involved. This was true because the attacking planes were unable to destroy the target unless they were at comparatively close range. Adapting the GAM-83 to the Century Series fighters enables the pilot to destroy the small and isolated targets with pin-point accuracy from a distance which is beyond the range of most conventional anti-aircraft batteries.

As an effective tactical weapon, the GAM-83 is hard to beat. Storage, loading, arming, testing, launching, and escape procedures have been established to make the GAM-83 a truly safe and effective addition to the tactical arsenal. ★

Martin test pilot Don McCusker holds T-GAM, low cost, light weight training version of the GAM-83. Missile is easily stored, handled and considered safe as a round of ammunition.



Capts. James Brown, seated, and James Portis try GAM-83 trainer. Stand,at left in first two photos, moves and is steerable. In picture at right, Capt. Portis points to target toward which Brown will guide "missile," the probe-like object before Capt. Brown's forehead, center.

Launched from supersonic F-105, GAM-83 streaks for target, guided by pilot in cockpit of fighter.

TACTICAL AIR COMMAND

TAXI OUT

AND GO

You've briefed in operations and know all the necessary details about your mission. You've checked weight and balance, made out your flight plan, figured your takeoff and landing data, been briefed by weather and filed the clearance. You've preflighted the bird and found it acceptable; not just the way you'd like it, really, but acceptable. You asked a maintenance type about the oil on the nose section of Number Two and he opinioned it was from a prop seal. No problem, really. You had bought that. You were a little more reluctant when you noted the lower left front row cylinders of the same engine stained with wet, black oil. When you asked about that, your flight engineer and the airman from maintenance gave the cylinders a flashlight inspection. Seepage from a rocker box cover, most probably. They'd peeled a chunk of cowling and given the cover bolts a few quick wrench twists. Should be O.K. The right wing inspection light was burned out, but that wasn't a no-go item. The flight engineer could check for syphoning with his flashlight and only 30 minutes of icing was forecast . . . could get by with out the inspection light. None of these items had been listed on the Form 781, you'd noted, idly.

Number Two smoked quite a bit when you had cranked it up. Probably that oil. Should burn off and be O.K. shortly.

The copilot had trouble copying the clearance—seemed to be straining to read the tower, but your reception was loud and clear. The navigator passed up another headset. Maybe that would help.

You had figured you'd be able to hack the mission, right up until engine run up. When you had a 150 drop on Number Three left mag you had your first real doubts. You checked Number Four, then came back to Number Three. You had tried burning it out, but still the drop—even after the third try. The engineer had shook his head then and you had told the copilot to request the backup aircraft. As you taxied back in you no longer had concern that the copilot still had poor radio reception.

Also, the delay had made you impatient. This impatience was reflected by the other crew members and they expedited the necessary activities incident to changing aircraft. The engineer had scribbled in the 150 mag drop on the form and you directed him and the copilot to get over to the backup aircraft immediately and give it a going over. You had hurried into Ops, had your weather extended, made other necessary changes in the paperwork and had finally gotten airborne in the backup aircraft. There had been a few discrepancies on the second bird too, but you had made it.

* * *

Episodes like the above have occurred often enough to warrant another try at means of elimination. This time, maintennce and materiel inspectors were queried. They were asked for suggestions. They continually visit Air Force installations world wide and have the opportunity to observe organizations that have been highly successful in solving this problem. Here are some of their suggestions.

• *Equipment Write Ups*

During a recent inspection a B-47 was noted that was carried on initial in the Form 781—not a single delayed discrepancy. A check of other aircraft forms showed many with only one discrepancy. Further probing disclosed that crew members of this organization wrote up every discrepancy they could find, in detail. No discrepancy was too insignificant. If pressure gauges were not parallel on pilot's and copilot's panels this was noted. If a windshield wasn't spotless, the fact that it should be wasn't left to the discerning eye of a ground crewman. It was written up. (Remember the poor reception in the copilot's position, the prop seal leak, the inoperative wing inspection light? How about the oil leak on Number Two? None of these were written up in the hurry to get the back up aircraft into the air. Will the next crew take it with these discrepancies? Will this plane be aborted again? Did the last crew fail to pull a postflight? Was that why the mag drop hadn't been caught?)

• *Debriefing Teams*

AFM 66-1 directs that debriefing teams will be established. One inspector told of maintenance personnel on such a team querying the crew on details of the writeups. Team members were all highly experienced maintenance troops. In addition, specialists standing in the back of the room were free to ask for any details that might help them in troubleshooting and correcting the problem. Of course, if the flight crew overlooks a discrepancy the debriefing team is unable to get the information needed to put the aircraft back in top condition.

• *Daily Maintenance*

If items that should be corrected on the line are not reported, or are reported and then carried forward rather than corrected, time in periodic maintenance will have to be spent in correcting such discrepancies. Because of this the aircraft will not be out of periodic on schedule, or will not receive as thorough a periodic as it should.

• *Adhere to 66-1*

As prescribed, a monthly Maintenance Plan and Weekly Aircraft Utilization and Maintenance schedule must be made up and adhered to. The purpose of this plan is to obtain the best productivity from the mechanic and maximum utilization of facilities and equipment. A supervisor must know that at a certain time and place he is to receive a specific aircraft. The aircraft must be there and he must have available specialists with proper tools and supply support. He can then get his assigned job completed and the aircraft out on schedule. Experience has proven that when everyone concerned accepts this requirement and operates accordingly the quality of maintenance reaches the highest level.

* * *

Next time these are some of the key considerations in whether or not you will taxi out and go, and go safely in an aircraft in top condition, or return to the ramp. ★

AFM 160-1 says that overweight can be cause for removal from flying status. And it has been the Surgeon General's policy not to grant waivers on this item. If your shape resembles those to the left then we ask . . .

HOW SO, FATSO?

Col Kenneth E. Pletcher, Surgeon, MATS, Scott AFB, Ill.

Last December an article, "2400 Pushups," discussing the dangers of obesity and suggesting remedies in general terms of diet and exercise appeared in this magazine. There has been considerable response, to wit: "Sure, it's not good to be fat—so we ought to diet and exercise—but what diet and how much and what kind of exercise?" This is a practical response and understandable in view of what has transpired.

Ever since the evils of obesity became public knowledge and the body politic stirred itself to find what to do about it, enough nonsense has been produced, published and purchased to stagger the imagination. Most either concerns various fad type diets or promises systems of weight reduction based on the "eat all you want and get thin" idea. Both are arrant drivel but apparently have been successful in providing a substantial return to the authors from people looking for a pleasant and painless way to reduce.

There is no pleasant and painless way to reduce! Weight reduction is painful and unpleasant. Also, unless different eating habits are established, any weight reduction achieved will be only temporary. One can be sustained in a reducing effort only in the knowledge that good things rarely come easily and the pleasant end will justify the unpleasant means.

One who leaps flabbily from a relatively sedentary existence into a program of strenuous physical exercise as an instrument of weight reduction is in danger. This is hazardous even to younger age groups and extremely hazardous to the over-40's. However, a graded program of exercise in which one gradually attains a state of improved physical well being is to be encouraged for all. Generally speaking, the older one is the more gently he must approach exercise as a means of attaining a desirable muscular and skin tone—both of which tend to decline during a weight reduction program. For the older age groups mild calisthenics, walking and bicycle riding are perhaps the best forms of exercise and should be done on a programmed, progressive basis. For younger individuals team athletics of a not too strenuous sort, such as volley ball or doubles in tennis, offer an acceptable start toward attaining the desired end. Golf is mentioned only to remark that if one has enough time to play this game and derive exercise from the walking entailed, he is fortunate indeed.

Now how about the real crux of any weight reduction program—diet? Many popular weight reducing diets contain articles of food (such as lamb chops, liver, brains, and beef kidney) which are not ordinarily met with in a normal dietary regimen. Is it really necessary to eat the less frequently consumed and unfamiliar foods in order to lose weight? Definitely it is not, although one is likely to eat less of them out of distaste. But this is hardly fair.

The thing to be considered is the establishment of better eating *habits*—not particularly in content but in amount. As one grows older and more sedentary in habit any food intake seems distressingly likely to show itself very shortly as subcutaneous fat. Every mouthful appears destined to be larded efficiently on the waistline rather than burned. Without going into a technical discussion of intermediate metabolism it is sufficient to say that the average American has quite a good diet as to content and quite a bad diet as to amount. In short, we eat too much of the right things.

In order to develop proper eating habits based on the foods we even now consume, it is suggested that the following plan of diet be tried:

First Week—Take accustomed servings of food at each meal and eat approximately ¾ of it.

Second Week—Again take accustomed servings of food at each meal and eat approximately ⅔ of it.

Third Week—Take accustomed servings of food at each meal and eat half of it.

Ed. Note: (We realize that leaving ¼, ⅓ or ½ of the food on your plate might not go over so well with the little woman or the food service types BUT some of us might not know the exact quantity of an accustomed serving well enough to judge what fractions of it would be. Besides, the author insisted this part be left in. Ed.)

From the fourth week on *take* helpings one-half the size of those to which one formerly has been accustomed, i.e. before starting the regimen. These reduced amounts gradually become accustomed amounts and the dietary habit is established.

This dietary regimen will do two things. (1) It will, over a period of several months, provide the desired weight reduction in a safe manner and (2) it will establish an eating habit by which one can much more easily maintain the desired weight. One can vary the diet as required to gain, maintain or lose. It is well established that proteins constitute the most important element of the normal diet so this factor should be kept in mind.

By the above method of diet the so-called appestat (appetite thermostat) is adjusted physiologically to the decreased food intake and one will feel satisfied with decreased amounts of food as the stomach decreases in size to accommodate the lesser volume taken into it.

The digestive processes over a period of weeks adjust themselves to produce the right amounts and proper kind of juices to deal with the food in a more efficient manner than when they were required to struggle with much larger quantities or, indeed, be overwhelmed by sheer weight of sludge. ("Dear, where did you put the bicarbonate?")

A word about eating between meals. It is better not to do it. Perhaps a drink of water will serve to satisfy a desire to eat something. Or, if one must have something to chew on, try a carrot or one of the low calorie vegetables or fruits. However, again eat only half the amount that one normally would consume.

Drinking? A bottle of beer is about 150 calories and the average highball the same or a bit more. The calories of alcohol are burned, not stored, but their fuel contribution permits other food to be stored. So, unless one is a shocking bibber, the same rule applies—half as much.

The above program is not spectacular and is not designed to sell health foods or reducing pills (which are not of much account anyway and can be dangerous) or to provide an income for the author of this article. He has no ax to grind and only the truth to tell. Don't be fooled by the "eat all you want and get thin" deceit. Don't participate in fad diets and violent exercise. Fad diets generally are dangerous and violent exercise without proper conditioning is a real hazard.

Strive to cultivate an equanimity of disposition which will tend to eliminate the compulsive type eating seen in people who eat because they have frustrations rather than because they are hungry. Self-discipline is a most desirable character trait. It is regrettably lacking in a great many people these days. Its development will add to individual as well as to national stature.

It is interesting and no doubt significant that most people do not reduce their weight for reasons of health. They do so for reasons of pride in appearance as a careful study conducted recently in PACAF showed. What's bad about this? Nothing at all—particularly since the by-product of pride in appearance is improvement in health and longevity.

Be proud. Eat well, drink well, and exercise—but not too much. ★

• • •

SSSWWISHHH!

It was to my amazement and displeasure to watch unfold, an episode which resulted in a near accident and a potential fatality all in one short second.

The whole episode began when a simulated "BROKEN ARROW" was sounded. As the fire station received the call, firemen sprang into action. All except one truck headed in the direction of the simulated accident. This lone fire truck headed to the north end of the ramp, (the "BROKEN ARROW" was at the south end). The driver stopped at the stop sign at the north end of the tanker parking area and, at this point, was met by another fire truck headed to the simulated incident. Some personal equipment was exchanged. The lone fire truck made a 180 degree left turn and proceded south on the ramp, accelerating until it was traveling at 45-50 mph as it reached Base Operations. At this point, a pick-up truck, fire fighting type with a trailer, exited from the fire station.

A collision possibility existed. Some light braking was in order on the part of the driver of the lone fire truck. Not this guy. He left his foot in the carburetor. Accelerating all the way, he proceded to pass the fire truck with the trailer. As he pulled to the opposite lane he saw a lonely little blue motor scooter coming down the other side. He hit his brakes, then, with a puff of smoke and a honk of the horn, his foot returned to the carburetor. He continued. The motor scooter rider dodged the fire truck, cut between a restricted area sign, around some fire bottles, missed a B-47, regained his shaken composure and continued down the ramp. I failed to see where he went as I was watching to see if the lone fire truck would get back to his lane in time to avoid colliding with a pick-up truck directly behind the motor scooter.

At this point I couldn't look any more. I jumped from the wing of the T-33, on which I was witnessing this one-act play, covered my eyes and waited for the crash. No crash?, he made it! *By what skill?* I'll never know.

This brings me to question the necessity for practicing exercises to save lives and aircraft in such a manner as to kill more people than can be saved. I'm sure you'll agree that the intended purpose is to get there the *fastest way* but also the *safest way*. I insert the following to emphasize the feeling a safety officer has when it is his misfortune to witness an episode such as this. How long does it take?

- It takes a minute to write a safety rule.
- It takes a hour to hold a safety meeting.
- It takes a week to plan a safety program.
- It takes a month to put it into effect.
- It takes a year to win a safety award.
- It takes a lifetime to make a safe worker.
- It takes one second to destroy it all in one accident, it could have been this one.

I'm sure it goes without repeating that it will take more time to clean up the mess, remove the wreckage and bury the dead, than the few seconds saved getting to the existing emergency. The quickest way isn't always the safest. Get there as quickly as possible, by using the safest method. ★

1/Lt Robert L. Bowers, Jr., Director of Safety, Whiteman AFB, Mo.

Rain of Hardware. If you have an iron hat, get it out and keep it close by. When you've finished reading this you probably will not venture out without it. During an 18-month-period there were 1223 reported inadvertent release of stores from Air Force aircraft. Included were bombs, missiles, pods, pylons and tiptanks.

With this rain of hardware descending out of the sky, somebody is bound to get hurt. Fortunately there have been few casualties, but there have been some, hence the iron hats. This, however, is not the optimum solution to the problem. In fact, it's no solution at all. The answer is simple: Through better maintenance, supervision of all personnel involved with external stores, design and pilot procedures we can drastically reduce this lethal rain. Many inadvertent releases go unexplained. Others can be pinpointed as to cause. Here are some items:

"The rain in Spain falls mainly in the plain."

- Pilot attempted to silence gear warning horn and pushed the jettison switch by mistake.
- Pilot did not observe armament selector switch in "all jettison" position before making LABS check and jettisoned tanks and pylon.
- During flight to bombing range, two MK-76 bombs fell from aircraft. Improper positioning of the bomb circuit holding switch.
- Bombs lost due to personnel not conforming to Tech Order checklist.
- A 275-gallon tank released because the arm assembly was improperly installed.
- A piece of fairing tore loose from center line pylon because it was not fastened down.
- Tiptanks lost due to improper soldering on hot lead to external jettison switch.
- Bomb dispenser fell from aircraft during bombing mission. Trunion stops were found to be installed upside down.
- Tiptanks lost because the Tech Order was not complied with.
- Improper installation of wiring bundle allowed chaffing and shorting of wiring, resulting in release of pylon and bomb dispenser.
- Doppler radome lost in flight. Maintenance personnel installed undersized bolts.
- One more—and this one is almost unbelievable: Pilot tied auto tire to pod.

These are just a few of the more than twelve hundred such incidents reported by TWX and Unsatisfactory Reports. Undoubtedly there were more. Inadvertent release of stores is a problem. Once each Unit recognizes this, correcting the situation shouldn't be too much of a job for a professional unit. ★

Fighter Division

C-NOTES

F-102

The TWO and YOU. In spite of the many improvements in the F-102 over the years, the basic problems with this aircraft are the same today as they were in 1956. Let's discuss one of the problems which has caused accidents in the past and which will undoubtedly cause accidents in the future. Knowing the facts about these problems and applying that knowledge may save the Air Force more than a few '102s.

- *The Landing Gear.* Early in the F-102 development program it became apparent that this aircraft could not hack design specs in its original configuration. Area rule was applied and at the same time a weight reduction program started. Naturally, since the landing gear does not contribute to performance, the gear was designed to meet specs PERIOD. At that time the specifications called for a 9-foot per minute sink rate BUT SIDE LOADS WERE NOT CONSIDERED. Gear failures began occurring at a great rate *during the second year of operation.* (More about this later.) Hard landings, short landings, tire failures and sometimes just materiel failure after an average landing raised the gear failure accidents and the accident rate. Something had to be done—and done fast—to stop such accidents. Within the Air Defense Command, an intensive effort was made to reduce the number of accidents as a result of the above causes.

Now let's talk about the second year of operation. Why were there no significant failures during the first year? Initial checkouts of IPs and flight commanders were conducted by a small nucleus of pilots who had participated in Phase IV testing of the F-102 at Edwards AFB. These pilots flew the '102 as they'd been taught at Edwards, i.e., 160KT final, two to two-and-a-half degree glideslope *strictly controlled with power.* Touchdown point controlled with the throttle.

Evidently during the second year, personal opinions or F-86 experience took over and pilots began to try to fly the F-102 traffic pattern the same as they had flown the '86 pattern. True,

you can do this, but you have to be absolutely right every time, as the number of short and hard landings proved. So, in order to compensate for this pattern (low power, steep final), the final approach airspeed was upped *and upped* to compensate for those people who chose to fly the '102 different from the way it was designed to be flown.

This was the first step. This gave the pilots airspeed to flare with from the steeper approaches, This airspeed does not help in those accidents where the aircraft runs out of wet runway, following drag chute failure. (But this is the other end of the problem.)

- The second step was to get the aircraft on the proper glideslope by requiring full stop landings out of GCA or ILS approaches.
- To reduce gear failures caused by blown tires, 20 ply tires were finally obtained for the F-102. In addition, the technique for dealing with a blown tire was changed to include locking the brake on the blown tire to reduce strut vibration which caused materiel failure of the landing gear.
- A change in the landing gear side brace boss and the orifice in the shock struts, to more evenly distribute loads.
- Addition of a wheel bearing sleeve to reduce axle flexing.

All this helped for a while. So where do we stand? The recent increase in gear failure accidents means a close look at pilot technique, maintenance inspection procedures, pilot writeups of hard, crabbed, or marginal landings, any condition where excessive side loads may have been applied (rapid turnoffs, crosswind, and so on).

A professional approach and landing, and conscientious writeups if and when, maybe, it wasn't the best landing you've ever made, can help until we can get a gear that will have some extra margin of safety. Give it a try. It worked each time a professional pilot followed procedures. ★ **Captain Martin O. Detlie, Fighter Division**

F-102

CUSHION ON THE

The ultimate goal of every commander with a flying mission, is to put the required number of aircraft in the air—safely and on time. He knows that when he doesn't provide the number required, his organization has failed.

Over the years, experience has proven that the only way to meet safe and adequate flying requirements is with a cushion of in-commission aircraft available on the flight line. The surest back-up of operations plans is achieved when maintenance and supply people team their individual efforts to give priority to the base mission, that of launching mechanically correct aircraft.

Let us examine some of the consequences of a lack of "cushion" or aircraft available. It's no secret that when things are done in a hurry something is apt to be forgotten and something forgotten on an aircraft is a potential accident. It follows too, that with more complex aircraft entering the Air Force inventory each year, more requirements are placed on the mechanic's pre- and post-flight inspections.

What happens to a maintenance organization without a cushion of time? It is trying to meet its scheduled flying commitments and has only enough in-commission aircraft to do just this. For want of a cushion the position soon becomes too hard to take. The mechanic has minimum ground time to turn his aircraft around and they're off on another mission. An excessive amount of man-hours is being utilized on out-of-commission aircraft in order to stay up with the schedule. The crew chief begins to lose faith in his supervisor's ability to manage, and his morale is affected; he will lose pride in his work knowing that his aircraft has not had a proper inspection. Pilots develop an apprehensive attitude and begin to lose confidence in maintenance. They may be excessively critical of the aircraft, both orally and in their writeups, which will lessen the confidence of the mechanic in his professional ability and the airworthiness of his "bird." And, when a cushion of confidence is lacking, the mission potential can be seriously affected. If the situation goes far enough, maintenance and supply will work overtime and pilots will be sitting around with nothing to fly. There can be no doubt that, without the cushion, a flying mission can be partially or completely stifled in a short period of time.

Now let us look at another type of situation and see the difference. The required cushion of in-commission aircraft is available to the manager. He is able to schedule planes so that the flying commitment is met and no aircraft is required to fly without adequate inspection time. He can schedule the efforts of the crew chief so that while one aircraft is flying he can go over the in-commission birds on the ground. By having this cushion of time, he often finds small items which, corrected early, prevent major discrepancies. The crew chief takes pride in his work for he knows that the bird he just sent off is in good shape mechanically. He passes this confidence on to the pilot who will return from a flight pleased with the bird and gaining confidence in the maintenance capability. Here we have a "cushion of confidence" and the mission potential is vastly increased. By being able to schedule aircraft into maintenance, the manager keeps an even flow of work, morale is high and good utilization is realized. He can properly schedule his available man-hours and keep his fleet time in the proper sequence.

Next, let us see how we can lose the cushion. One of the surest and quickest ways is a breakdown in supply discipline or support. Many people labor under the illusion that supply discipline and support are strictly problems of the base supply officer. Nothing is further from the truth, and the sooner all personnel realize this the closer a consistent cushion will come to being a reality.

Supply discipline is an individual responsibility and must be shared by everyone. Suppose a man in the records section fails to foreast a time change item, or perhaps a crew chief removes and misplaces a hi-value item, or maybe he knows a part is defective and

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fails to order it immediately. On the other hand, suppose a supply clerk loses a requisition or fails to order an item that has a known replenishment schedule when it reaches the re-order point.

These suppositions lead us to conclude that a low AOCP, EOCP/ANFE rate is not just an indication of a good supply operation but it contributes directly to the cushion of in-commission aircraft. If aircraft parts are not properly forecast, requested and procured the cushion will decrease rapidly.

Proper planning and scheduling play an ever increasing role in keeping the cushion available. If the flying time is not programmed within maintenance and supply capability, so that the same number of aircraft come out of inspection that go in, there soon will be a large number of aircraft waiting inspection without man-hours or parts available. *A small error or miscalculation in the maintenance plan could have a large effect on the required cushion.*

With the more complex aircraft of today, training of personnel plays an important role in maintaining the cushion. The technician and journeyman must be aware of his responsibility in training the apprentice. This training is especially important in a man's early development, for if he is not taught to assume responsibilities, he loses faith in his ability and becomes a morale problem. The more adequately a person is trained, the more informed he is, the more effective he becomes. *Individual effectiveness plays a large part in maintaining the cushion.*

There are many factors affecting safe flying hours, and many excellent publications issued as guide lines for supervisors. It should be acknowledged that they are merely tools for the manager and their strict compliance cannot guarantee mission success. *The surest and most positive method for maintaining a safe and adequate number of flying hours is for all personnel to be consistently aware of the importance of their individual efforts.* ★

"No fuss, no bother," is the new slogan of the 405 Fighter Wing Flying Safety Office for pilots who have inflight emergency or operational hazard reports to make. Instead of writing out each report and submitting it through channels, the pilots of this Wing simply dial "118" and dictate their comments over the phone to a tape recorder in the Flying Safety Office. Above, Captain Charles G. Russell, Wing FSO, listens to a taped report submitted during the night, as his secretary, Mrs. Peregrina Gueco, prepares to type up a copy for corrective action. "Because there is less bother for the pilots in the new system, reports are submitted sooner, permitting corrective action to be taken in many instances on the same day," Captain Russell commented. (Office of Information, Hq 13AF, Clark Air Base, P. I.)

• NEWS NOTES •

Admiring huge MATS Flying Safety Trophy are Lt. Col. Edward J. Kaminski (left), Commander, 1506th Support Sq., Clark AFB, Philippines; and Maj. Norman R. Cook, unit operations officer. Trophy, won by Western Transport Air Force, is being circulated to all WESTAF units—the idea being that it belongs to the units and their personnel who made the award possible, rather than merely to the Hq trophy room.

CROSS COUNTRY NOTES

Suppose, just for fun, you're a supervisor of flying—say a Major. It's a nice warm day; your desk is tidy this Friday afternoon and it's nice just to sit and contemplate a long weekend at the mountains—a little skiing, maybe a card game or two in front of the big fireplace. Then your moment of constructive thinking is blasted by the desk-mounted UHF.

"Homeplate, this is Red Leader. I've got wingman with a sick bird—pneumatic system failure. Advise."

"Roge, Red Lead. What's your fuel state?"

"About 2400 pounds, both birds."

"Where are you and what's your altitude?"

"Homeplate, we're 30 south, at 27,000. We'll stay at altitude."

So what are you going to do? Fuel is no problem—at least right now. There shouldn't be any problem getting the gear down but how about the landing roll? Red 2 may be without brakes and drag chute. With our runway, a barrier engagement is for sure. And we have the MA-1A barrier even though our 102s have the tailhook. Hey, how about Bakstrap. They've got a BAK-9 barrier.

"Red Lead, this is Homeplate. Advise you divert to Bakstrap. Advise tower your trouble and barrier engagement is probable. Keep me advised."

"Roge, Homeplate and thanks."

Ten minutes later the call comes through.

"Homeplate, this is Red Lead. My friend is down and O.K. Please send a T-Bird over for him."

"Red Lead, this is Homeplate. Roge and out."

Gee, what a beautiful afternoon. Wonder if that little blonde will be up at the lodge tonight. If she is, maybe . . . .

So what's the moral of this little tale? The moral is this: Do you know the status of your own barriers and of those adjacent bases to which you could send a troubled airplane driver? Sure, I do. Why I could send him to . . . . Hey, I'm not sure that they've got their barrier in operation yet.

Rex found out on his last trip that this, unforunately, was true at two out of three squadrons he visited. Agreed that *maybe* this type situation will never hit you, *but* if it does, you can't dilly-dally around trying to find out *after* the emergency happens and you can't afford to make a mistake.

Give it a thought, old buddy—you might just save an airplane, a pilot and a lazy Friday afternoon.

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Some of the non-jet types and maybe even some of you that are jet qualified wonder why we publish as much as we do about the T-33. In the safety business you grease the wheel that squeaks the loudest. There are more T-33s in the inventory than any other single aircraft and the wheel is squeaking loud and long. THIRTY-EIGHT T-BIRDS WERE DESTROYED in the first six months of 1961. That's a bunch in anybody's language. Along the way 17 households have become shattered shadows due to the death of male members. Not a very pretty picture, is it?

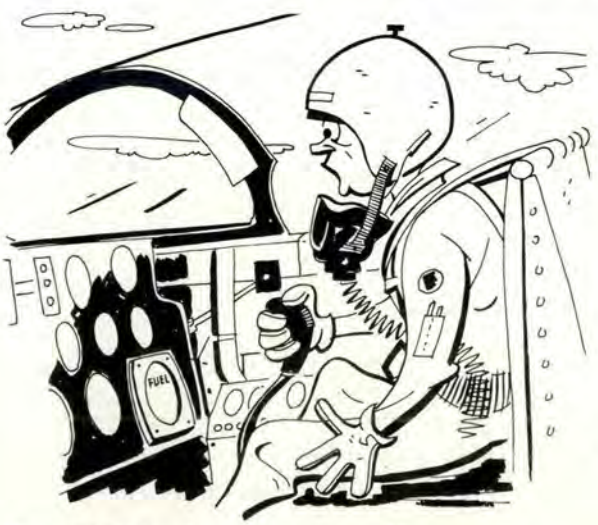
How come 47 major accidents, 17 aircrew fatalities, 14 major injuries, 38 destroyed aircraft? Is the T-33 a professional little killer? Not "no" but "heck, no." The rate for the T-33 is only about 7 accidents per 100,000 hours flying. When you compare this with the rate of the Century Series fighters, it indicates that the T-Bird is a well-behaved little lady—if treated right. And there is at least half the answer. Fifty-one percent of all the T-33 major accidents were pilot factor type. Don't get me wrong, I'm not out to charge every pilot who prangs an airplane with pilot factor—I'm a pilot too, and I don't want to get nailed to the cross for trying to save an airplane when I probably would have been less scared if I'd leaped smartly and quickly out. But let me give you a few examples and maybe you'll see what I mean.

- Flameout during climb—fuel mismanagement.
- Premature gear retraction on takeoff.
- Failure to recover from unusual attitude (VFR)—two accidents.
- Misinterpretation of altimeter.
- Flight Planning—ran out of fuel.
- Landed short—seven accidents.
- Landed gear up.
- Loss of control in weather penetration—two.

And on and on—

Get the pitch now? We're killing pilots and wrecking airplanes through preventable accidents. Preventable means paying more attention to airspeeds, altitudes, and techniques in the traffic pattern. We should know the airplane better. We should spend a lot more time under the hood making penetrations and low approaches. And how long has it been since you've practiced vertical recoveries supervised by an instructor pilot? Have you made any SFOs lately? Do you fly a

. 2 Points



"Roger Old Dodger, how about a practice DF steer to base."

FROM REX RILEY

bunch for two or three days, get to feeling sharp and then sit on your hind quarters for two or three weeks and lose your touch? The decision is yours. We just don't want your name floating around on an accident report without your being around to write a long rebuttal. It could happen, you know.

Based on T-33 Aircraft Mishap Data 1 Jan 61—30 June 61.

• • •

I've just received a letter from one of our readers regarding the recent mod providing gangstart for the T-Bird. He had this to say:

"The other day I was checking out another T-33 pilot (Base Ops officer, to be exact) as an Instructor Pilot. As one of the items of back seat familiarization, I requested that he make an automatic ground start from that position. Much to our surprise and after two attempts to make the start, it just wouldn't go. Thinking that we might possibly have a starting fuel system malfunction, I tried a start from the front seat, and it was successful, 'Must be a loose wire in the back seat switch,' we thought. Since we were on an out and back type X-C and I had personally flown the initial test flight on the gangstart mod a few weeks back, we were not overly worried about getting an airstart (from the front seat, of course), if one were needed. We made it, needless to say, and the discrepancy was duly recorded on the AFTO form 781 upon landing. This is where we come to the interesting part.

"There is nothing in the present Dash One or checklist that says an automatic ground/air start from the back seat is impossible. For that matter, T.O. 1T-33A-SF-1-4 dated 9 December 1950 (Warning Note) even makes reference to the starting fuel switches in BOTH cockpits. If there are some pilots who by this time are wondering what I am getting at, then join me and learn as I have about the starting fuel system (T.O. 1T-33-515 completed). You'll see that the starting fuel switch (Auto position) in the back seat has been disconnected but not removed from the aircraft. I don't know where I missed the boat, but I take my Dash One as gospel. Without being too snide I would say that the procedure outlined in T.O. 1T-33A-(CL)-1-1, Page E-5 would be completely null and void, mainly because item 9 would not effect a start. Pages 1-12, 2-18, and 7-11 of T.O. 1T-33A-1 (re: Starting Fuel System) are also in error because of the 515 TOC.

"So, no matter what type of procedure used in attempting an automatic ground/air start from the back seat (Engine Fuel System #1), the attempt would be futile. The only reason you would want to use this procedure would be in case of Gangstart failure (T.O. 1T-33A-593 completed) or (with only 515 completed) a flameout. I wonder if there isn't a pile of ALCOA wrap, and two twisted bodies somewhere who would have liked to have known about this discrepancy between the airplane and checklists!

"I would like to respectfully request that the aircraft capabilities be made compatible with the checklist and that this information be made available immediately to all T-33 pilots."

This got ol' Rex to doing some checking. SMAMA says that if all mods have been properly complied with it won't happen. They suggested a recheck of the original wiring diagram.

• • •

With due credit to Ogden AMA, Hill AFB, read a seat pin tale with a moral:

Takeoff was all set for Sunday morning. "After tying myself to the aircraft, I decided to pull the seat and canopy pins and get that much of the procedure out of the way while waiting for the flight leader's airstarter 'boom' (F-86H). That's our signal to crank up.

"Gee, it was quiet out there on the ramp, not even an APU was running. As I pulled the pin from the seat initiator, I heard a 'click' from the area of the pin hole. A fatigue crack had caused the pin to break at the hole, and I had to use my fingernails to pull the remaining part out. I sure was thankful for the silence that had prevailed, as I sat there—wondering. I'd never thought before to check to see if the pins came out of the hole all in one piece.

"For those of you who inspect the pins at both ends after the gathering is complete, there is no problem. But—for you who yank 'em, wrap 'em in a ball of red streamers, wave 'em at the crew chief as a signal to 'take the ladder away,' then stuff 'em uninspected into a vacant spot in the cockpit—you, sirs, could be faced with a real and mysterious problem. The dilemma would even be magnified if you bite your fingernails."

Moral: Check Your Pins! ★

'of View .

"This is the third time he's pulled this practice bit; why can't he admit he's lost and declare an emergency. The last time he flamed out on the runway."

LETTERS TO THE EDITOR

FALLOUT

T-Bird Tips

The "Tips for T-Bird Drivers" in September have caused me to wonder a bit. This article concerns the vertical stall in the T-33 and mentions the loss of six aircraft to date.

Although I am not acquainted with the full facts of the cases concerned, I feel that these birds were lost because of "misdirected safety" in training. Because everybody says how horrible spins, stalls, etc., are in the T-Bird, many of our pilots have adopted the policy of "left arm rest, right arm rest, and Pffft" when they get into one of these maneuvers. I spent many years hearing horrible accounts of various experts only to find the Dash One was right after all. Not only does the T-Bird recovery work but if you get confused, let go and the plane will recover by itself (tips dry and garbage up).

In reference to your vertical stall, I'm sure your cheery "don't do it" is no comfort to an IP when he finds the wild indian up front has just successfully completed the first part of a vertical stall. I don't go around recommending vertical stalls but what about some consoling words for those few who find themselves in this situation?

The recovery used back in the T-6 days works equally well on the T-Bird. Hold ailerons and elevators neutral and hold full left or right rudder until the nose of the plane hammerheads below the horizon. Neutralize rudders and wait until speed builds up to 100 or so and initiate a gentle pullout. If the elevators are allowed to go up or down, due to pressure from relative wind or pilot control as the plane backs down, a whip stall will result and a certain amount of "rattlin' around" will take place. It is much nicer to hammerhead.

Now, what to expect: Well, first, a lump in your throat, fuel fumes and the low level light in some cases; 30 to 40 knots of airspeed because that's as low as the gage goes; a rather fast flip from nose-up to nose-down and oscillation sideways until speed builds up (if you hammerhead), and a series of positive and negative G if you whipstall.

What about a spin occurring after the stall recovery? It is possible if the pilot freezes on the controls with full rudder or if he overcontrols during pullout. Whether you are right side up or upside down, follow the information in the Dash One. Opposite rudder until rotation stops and release back pressure. I have found that recovery is nicer if stick is held just aft of neutral during recovery. The old bugaboo of confusion can be overcome if you check the turn needle to see which way you are spinning. Inverted or right side up makes no difference. If turn needle shows left, use right rudder, and vice versa.

During normal spin entry, the T-Bird has an odd beginning. To the left the nose will rise and the plane will sideslip a bit to the left and then continue with the turn ending up in more of a spiral that a spin. The one to the right is more conventional except the bird sometimes actually turns upside down in entry and then the nose points straight down before the spin settles down. Many T-33s actually fight the spin and it takes full back stick and rudder to hold it in. Even then the bird will hesitate in the rotation for short periods of time. If the plane is solo, the description above will fit most T-33s. Dual, especially if the troop in the back is the large type, the sideslip to the left will be longer. Otherwise, no change.

To a pilot who has heard all of the horror stories, has never been permitted to spin the T-Bird and is smelling the fuel fumes headed straight up at 50 knots, I say your chances are pretty good of being number seven in this series. If you are easy on the controls and know what to expect, you will save a T-Bird for the Air Force. The longer we refuse to recognize this problem, the more horror stories I'll hear about.

Me . . . ? I'm for keeping them safe by making them proficient.

Capt Gordon R. Links, USAF
Kelly AFB, Texas

Can't knock proficiency, but consider avoidence of hammerheads as a preventative measure.

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T-Bird Tips

I've read the "Tips for T-Bird Drivers" in the July issue and would like to offer some dissertation and solicit comments on what procedures are best to use when one brake or wheel locks.

General teachings have always advocated that maximum braking is obtained by applying maximum brake pressure just short of locking the wheel. However, when the other wheel is already locked and the tire blown, the question arises that the drag produced by the skidding tire beads and wheel may be greater than the maximum braking which is obtainable from the good brake and wheel assembly. The result, of course, is that the aircraft will veer off towards the locked wheel.

Many pilots believe the best procedure, under such a situation, is to lock the good brake and wheel, thereby at least equalizing drag in an effort to keep the bird on the runway. This would work, in theory, provided the bird's line of travel was not already headed off to the side of the runway.

Personally I am of the opinion that optimum braking of the good wheel, just short of skidding, generates greater braking and yaw drag than the locked rubber and metal grinding on pavement. However, I believe this would only be true when optimum skill and cunning is used in maintaining constant and optimum brake pressure on the good brake and wheel. I may be wrong—hence my soliciting the ungarbled word and inclusion of same in the Handbook.

Maj George E. Kammerer
Chief of Safety, 325th Ftr Wg
McChord AFB, Washington

We referred Major Kammerer's letter to Major George Wilson (Hail, Hail, The Gangstart's Here! June 1961), ATC Material Representative at SMAMA, for his comments, which follow:

"The engineers agree that the coefficient of friction for metal to runway will undoubtedly be less than that which can be obtained with maximum braking on a good wheel and tire. My own experience, I am thankful to admit, affords me very little insight into the problem as I have never experienced either a locked wheel or a blown tire since the T-6 days. However, I have investigated many blown tire incidents involving F-86Ds and Ls, some of which involved locked wheels. I can state without hesitancy that these cases proved to me that braking on a good wheel is sufficient to overcome the drag produced by either a skidding tire or a skidding wheel. As a matter of fact, I have seen instances where directional control was maintained even though one-half of the wheel had been worn away. It is true in some incidents involving F-86 aircraft that nose wheel steering was employed, but this was not true of the majority of cases to which I refer.

When we consider the wisdom of causing failure of the opposite tire when a locked wheel is encountered, I think we must consider that when this procedure is used with the T-Bird, the pilot will then be "just along for the ride" since no directional control will be possible after that point. Employing maximum braking, on the other hand, allows the pilot to maintain some directional control throughout the skid, whether or not he can keep the aircraft going in a straight line. Although skill and cunning are certainly involved in "maximum braking short of skidding," I believe that the average pilot will be better off to use braking on the good wheel to compensate for a locked wheel."

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Padded Flying Time

With the continued cutback of flying time for proficiency purposes, I believe that a comment is in order in regard to padding

of flying time by some of our throttle jockeys. Occasionally I've been blessed to fly with some character who flys the pencil almost as much as he flys the bird. This practice runs us out of flying time without the actual experience that is supposed to go with it. Fortunately, this does not happen as much as it did in some units in WW II but just a little cheating in this area is still too much. Flying the pencil does not pay the insurance premiums on flying proficiency. In addition, this accelerates the consumption of time change components and speeds up inspection cycles without need.

At the rate of about 120 hours per year, I am having a rough time retaining a small portion of the touch I once had. Recently I rode with an individual who started the flight five minutes before we were off the ground and we were walking away from the bird before the down time had actually occurred. It is also interesting to note the weather that is encountered in 30-minute and one-hour increments. Some of our throttle jockeys must have connections with the weather man to make it come out so even.

Keep up the good work!

Capt Henry F. Fischer
3320th Tech School
Amarillo AFB, Texas

Perhaps these types should be flying pencils all the time—not airplanes.

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Survival Items

We read and liked Major Crum's article "Cool, Cold Water" in the July issue. One thought comes to mind: Most of us Navy types (at least S2F drivers in this squadron) wear our Mae Wests on most flights either over water or over land. One reason might be that we carry more than just water survival items in our life vests. I myself carry a mirror for water or land signaling, along with the packet of shark chaser, although the latter may not be too effective on land. I also carry a Boy Scout compass. Some of these items would be of use in either a land or sea survival situation.

Please thank JLT (Lt. Col Tissue, perhaps) for the "Name of the Game" article. I have been on both sides of the fence and just realized that it might be just as he notes.

Lt J. P. Sheehan, USN
Aviation Safety Officer, VS-41
NAS North Island, San Diego

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Go No Go Guages

We have manufactured a number of the "Go No Go" gauges for the Globemaster, discussed on page 21 of your July issue, but have found that a bar 47 7/8 inches long was much too long for checking properly installed nosewheels on our C-124s. We chalked this up to a typographical error in the Air Force Times, where we first saw this item. We have found that a bar 41 3/4 inches long fits exactly when the wheels are properly installed, and now along comes your article giving the dimension at 47 7/8 inches. We're confused. Are we doing something wrong or does the 1502d have a different nosewheel installation?

Gordon Cassadei
CMS Line Chief
63d Periodic Maint Sq
Donaldson AFB, S.C.

Hope by now you've heard from the 1502d Air Transport Wing at Hickam—we sent them a copy of your letter. Here's what appears on page 20 of the MATS Flyer for July 1961, regarding this item: "The gauge is constructed of a quarter inch steel bar forty-seven and seven eighths inches long." Let us know who's right and thanks for writing.

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Safety Belts

I've read with interest the article, "Don't Sit On Your Life Insurance," (July, 1961) and it scares me. Are we complementing a 300-horsepower motor with a safety belt to ascertain just how dangerously and foolishly a person can drive and still live?

Lest we forget: 10,970 persons were killed last year exceeding the speed limit; another 5170 died on the wrong side of the road; 3890 passed through the pearly gates because they didn't have the right-of-way on the highway, and 5050 drove off the roadway to join 3800 reckless drivers in eternity!

How many are we going to save with safety belts so that they may try again? Let's get back on the track of Education, Enforcement and Engineering. Let's survey existing laws and procedures to insure modern adequacy; insist on safety education in the schools, in the home, at work; abide by a strict law enforcement program, and exercise care, caution and charity when behind the wheel ourselves.

Capt Bernard B. Keller, USAF

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The Flying Safety Officer at George AFB sent these pictures in. They're trying this idea to complement their OHR program. Boo-Boo boxes are white with glowing green polka dots.

*U.S. GOVERNMENT PRINTING OFFICE 571223