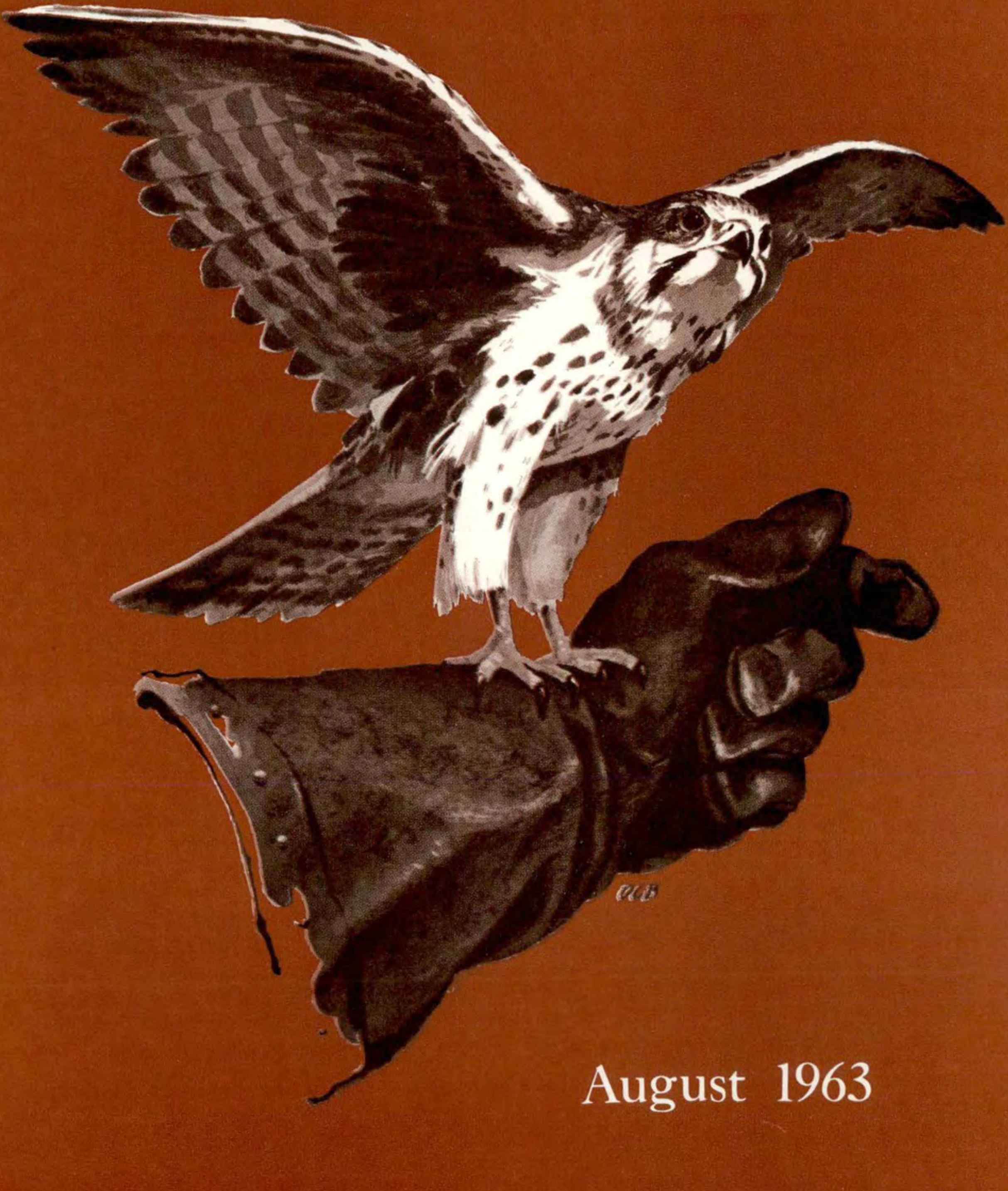
AEROSPACE

SAFETY

UNITED STATES AIR FORCE



August 1963

COLOMBIAN TROPHY

Col. Joseph J. Kruzel, commander, 354 Tactical Fighter Wing, accepts the Colombian Trophy from Mr. Joseph Comacho, representing the Colombian government.

Symbolic of outstanding flying safety and originality in a safety program, the trophy, established by the Republic of Colombia in 1935, is awarded annually to a U. S. Air Force tactical organization.

The 354th was selected to receive the award on the basis of ts achievements during 1962. The wing flew nearly 25,000 single engine jet aircraft hours without a major accident. In compiling this record the 354th participated n numerous exercises and overseas deployments in addition to providing transient alert service, maintenance assistance, navigation, weather and foreign clearance briefings for 20 squadrons on NATO rotations to and from Europe.

The safety achievements of the 354th Tactical Fighter Wing continue the highest standards and traditions for the Colombian Trophy, and reflect great credit upon the Wing, the Tactical Air Command and the United States Air Force. ★

Sandia AGAIN

On 26 AUGUST SAFETY OFFICERS from all over the world make their trek to Sandia Base, Albuquerque, New Mexico, to attend the week-long USAF Annual Safety Congress.

Those who have attended before find this session familiar. At the outset they are given the accident picture since last year. In the irrefutable harshness of cold statistics from the Directorate of Aerospace Safety they are brought up to date on how personnel have been injured and equipment has been damaged and destroyed since the last Congress. This information is then broken down into the major problem areas and comparisons made with preceding years. Then, with the problem graphically outlined in this manner, they split into seminars according to specialized skills and methodically go to work, a step at a time, on this business of accident prevention.

Those attending for the first time soon learn that the Congress is no panacea that provides the answer to all the problems at their home unit. They find it a place in which to roll up the shirtsleeves on their gray matter and dig, dig, dig for the elusive tools that can help them provide a safer way when they do return home. They find, too, that if they are to make the most out of their week they have to work, think and sleep safety. If they do, they might just find the answer to the big problem at their home unit—someone may have previously faced a similar situation and worked out a solution. They also find that there is no closed season on accident prevention ideas; they are as apt to appear at a late night session as between 0800 and 1630.

By the end of the week attendees can't escape the realization that the lower the rate the more difficult improvement becomes. They are reminded that additional effort is well spent, however. Here again statistics are used to point out that the more powerful and complex equipment becomes, the greater the probability of fatalities and major damage every time there is an accident. Dollar costs and fatalities have not kept pace with the overall accident rate reduction.

Above all, conscientious safety officers profit most from their week at Sandia through a refocusing on the major problem areas and acquiring a renewed determination to apply themselves most diligently in the next 12 months. If they acquire this resolve, and if they can imbue others with the same accident prevention fever when they return home, they can look forward to the safest year in Air Force history.

Safety, like peace, is hard to realize, but worth every effort spent in its behalf. ★

Lieutenant General W. H. Blanchard
The Inspector General, USAF

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Brigadier General Bertram C. Harrison
Deputy The Inspector General, USAF

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Brigadier General Jay T. Robbins
Director of Aerospace Safety

•

Colonel Charles L. Wimberly
Chief, Flight Safety Division

•

Colonel James F. Risher, Jr.
Chief, Ground Safety Division

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Colonel George T. Buck
Chief, Missile Safety Division

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IN THIS ISSUE

NEW POST FOR GENERAL BLANCHARD

Lt Gen William H. Blanchard, The Inspector General, USAF, for the past 22 months, has been reassigned as Air Force Deputy Chief of Staff for Programs and Requirements. Speaking for all D/-TIG personnel, the staff of Aerospace Safety takes this occasion to express regret at his departure, and to salute the intense personal efforts that General Blanchard has devoted to the critical areas of inspection, safety, and security during his tour of duty.

General Blanchard has left a personal mark on the USAF safety effort. Under his leadership as Inspector General, accident rate improvements noted include:

	1 Oct 1961	Mid-1963 (est)
Aircraft	6.8	4.8
Ground	3.82	3.48

Similarly, a reduction was noted in missiles destroyed during this period, despite a build-up in the missile inventory.

General Blanchard takes to his new job a well-rounded background of Air Force experience. He has served on active duty continuously since graduating from the U. S. Military Academy in 1938. Fifteen of these years were spent in SAC in key staff and command positions. Prior to his assignment as TIG, he was serving as Director of Operations, SAC. ★

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Chief, Education and Training Group
Colonel Jerome I. Steeves

Editor
Major Thomas J. Slaybaugh

Managing Editor
Robert W. Harrison

Feature Editor
Amelia S. Askew

Art Editor
David Baer

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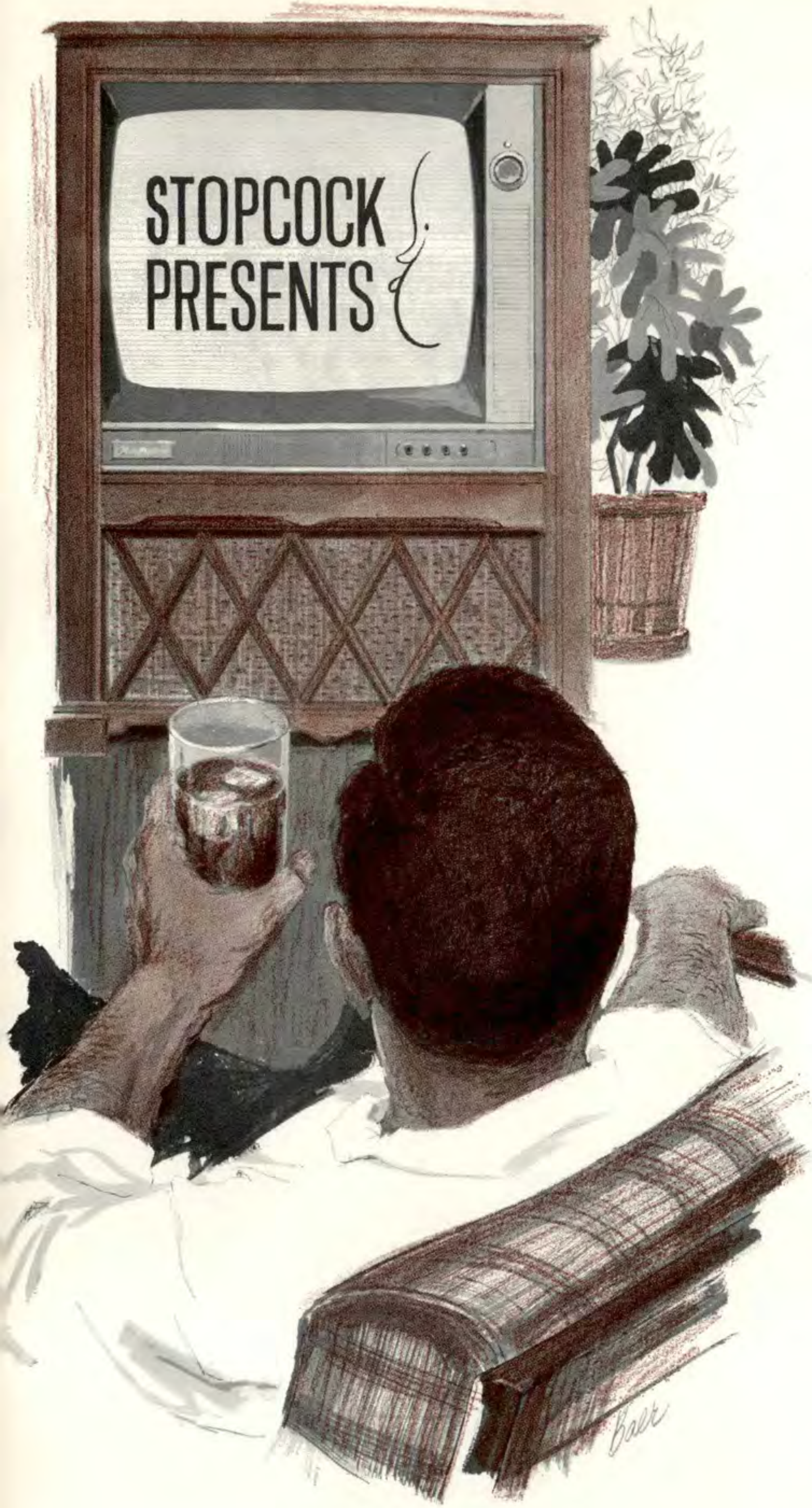


SIT BACK, relax, take a sip from your favorite cool one, let your mind become completely absorbed with the events portrayed on the screen. It's a beautiful setting, just the thing to get you in a relaxed mood. There's a crescent-shaped tropical moon shining on scattered puffs of clouds drifting across a South Pacific island. The familiar, long, slender rectangle of white lights you immediately identify as a runway. A few other lights provide the general outline of the building area. The regular flashing of the rotating beacon as it sweeps across above these lights fits the picture perfectly, even to the faint flicker of green as it swings through the 180 degree arc away from you.

Now, with this scene established, and slowly, as if not to disturb the tranquility established, a sound, faint at first but gradually building, creeps into the setting. This too is a natural sound, one you accept immediately and identify as made by the reduced power setting of four engines of a transport aircraft. Once the sound is established, and you have identified it, you notice a small, flashing red light moving in from the side. The sound, and the increasing clarity of the light as it moves in slow motion across the scene, tell you that the plane is coming closer. You watch it swing near the field, turn, start to descend; the sound fades—an approach has been started. He's outbound.

Everything is familiar, everything is routine. You take another sip from your drink.

The airplane's rotating red beacon is gradually getting brighter. Sound is still subdued, but lower pitched now. He's gone to higher RPM, inbound. Gear is down. The runway lights flash once; off, then on. You are completely relaxed now, absorbed in the beauty of the routine scene of an aircraft about to land.

FLASH! The whole screen lights up! The crash of sound is almost lost in the brilliant flash of light that obliterates everything.

Nothing now, just the light, flickering a little . . . fire! Gradually you become conscious of the gently crackling sound.

Impossible! VFR conditions. Not a hint of trouble. Engines sounded perfectly normal. Can't be. You've been tricked.

No sir! You have not been tricked. It happened. You saw it.

Now, will they show how it happened? Next the scene shifts to accident investigators. There is no beauty to the tropical island anymore. There are smoldering bits and pieces that the figures turn over carefully. Once in a while a piece is picked up, examined, then put down in the same position in which it was found. Your eyes watch the investigators at work, but your mind is busy trying to rationalize this accident. You still don't believe it could happen, really, and you are logically arranging your argument. After all, the pilot had to be one of the best in the business. The system sees to that—that's it, you've struck on the basis of your argument as to why such an accident shouldn't happen, couldn't happen, except on the screen.

You know that the man in charge there on the flight deck, the pilot in command, had to come up through one of the most stringent training systems in the world. He had to successfully prove his ability as he progressed through the pilot ranks until qualified as aircraft commander.

For one thing, you know that use of a GCA on a night approach such as this is an operational requirement. You also know that it is a responsibility of the copilot and navigator to monitor approaches and report discrepancies.

Although the remarks section of the Form 175 contained the remark, "Request GCA," communications transcripts show that GCA had not been requested. Crash occurred on final VOR approach, aircraft approximately 1000 feet below glideslope.

The navigator was sitting in the additional crewmember's seat in the nav compartment. A student navigator, seated in the navigator's position and monitoring the approach, called him forward and advised they were 500 feet low and had not arrived at the VOR station. The navigator took no action except to run back to his seat and fasten his seat belt.

The scene you are watching has shifted now. The principals are in a room—looks like some sort of hearing going on. Various individuals come in, one at a time, and are interviewed by a panel of investigators. Every once in a while records are referred to, and read from. The records are marked "Training Folder."

There was another individual . . . who said he preferred not to fly with him.

"I had him for two trips . . . and I wasn't very impressed.

"He shot two approaches that were downright hairy . . . The first one, I took the airplane away from him because he was very low and we were looking up at the top of Mt. ——. The second one he was high, fast, and never did line up with the runway so I took it away and we approached again and I put the other pilot in and let him make the landing.

"Did he scare me? Yes sir, he did, definitely.

"Some people have asked scheduling not to schedule them with him again.

". . . told me that . . . he would not upgrade—.

"He descended 700 feet below minimums at the outer marker. The copilot advised approaching minimums, 200 feet below minimums, and 700 feet below minimums, at which point the copilot demanded that he add power."

But that is all in the past. Some pilots don't upgrade as rapidly. Where deficiencies are noted additional training is given. Only after repeated training and repeated checks can a pilot reach aircraft commander status. Even then he must face recheck after recheck; they average one every three months. You rationalize; impossible to slip through. Listen again, they are talking about events on this particular cargo trip now.

On the previous leg the aircraft commander experienced difficulty on departure. He permitted the aircraft to bank excessively in turns and his airspeed varied between 120 and 180 knots during climbs. He lost 500 feet of altitude during a climbing turn. He also experienced difficulty during the previous approach.

You aren't so sure, now, that the accident was impossible. The producer seems to be as familiar with the system as you are. However, you still haven't been convinced. What about the copilot? They're talking about him now. You lean forward to listen.

The copilot did not assume control of the aircraft in time to avert the accident.

You can't argue that point. You still have doubts, but if the accident happened there is no doubt as to the observation, "the copilot did not assume control of the aircraft in time to prevent the accident."

The panel of investigators seems to be nodding.

Your eyes are glued to the screen. A large black sign is stamped across the picture as the investigation room scene fades. The sign says, PRIMARY CAUSE. You wait, and the words slowly bleed across from right to left:

The pilot failed to conform to prescribed letdown procedures and descended below established minimums.

If that happened, you agree, it must have been the primary cause.

These thrillers are getting more far-fetched all the time. But that scene of a burning airplane on an island hillside bothers you. Could that really have happened? In the way shown? Now, whose fault—that pilot's? Or was this accident set up somewhere back in time by a long line of supervisors? Were they the ghostly forms barely visible in the fire and smoke?

You turn the set off — wondering. ★

Look Ma, No Airspeeds

TAKE A FLIGHT of six F-100s on deployment to Europe. After eight hours over the Atlantic destination runway is going to look mighty good, even though weather is down to 400 feet with viz from one-half to one mile in heavy rain. Then, whoosh! No airspeeds! That's right, all six airspeeds kaput!

The TAC Airborne Command Post sent out a call for help and three F-105s (airspeed indicators normal) scrambled to lead the Supersabres in. Intercept was made 53 miles out and the F-105s split up, taking a '100 on each wing. From here on a radar recovery was culminated in a safe landing in all cases. After landing, the F-100s were checked and water was found in the systems.

Thanks, many thanks, to the F-105 jocks for a job well done.

And now, for an explanation of the loss of airspeed indication on the F-100s.

Basically, it's quite simple — water, with its property of being a fluid above 32 degrees F. and a solid below 32 degrees F.

After an inflight refueling near Lajes, the flight climbed through cirrus clouds to flight level 330. Shortly thereafter the airspeed indicators malfunctioned. Sure, there is pitot heat for the air intake, but therein lies the gimmick. The Dash One explains that hot engine compressor bleed air for the deicing and rain removal is taken from the mixing chamber of the air conditioning and pressurization system. And, to ensure that sufficient heat is available for pitot boom anti-icing, the windshield anti-icing or defrosting systems should be turned on. (This is not true on airplanes modified by 1F-100 D-510). Anti-icing of the pitot boom is controlled by a pitot boom heat switch which should be left on at all times. Further, under any icing conditions it is neccessary, on some F-100A and C models that the canopy defrost lever be at full increase, otherwise full available heat will not reach the boom. (Dash-Ones and recent TOs should be checked on this.) This does not apply to the F-100F-20 with the electrical elements in the boom.

Now, sitting under the glass bubble at altitude and exposed to the sun's radiant heating, there is a natural tendency to not want to turn the heat up.

So . . o . . o, as was apparently the case in this incident, some of the moisture picked up in the pitot boom does what comes naturally when it gets to 32 degrees — it freezes. And ice in the pitot boom makes for a no airspeed indication.

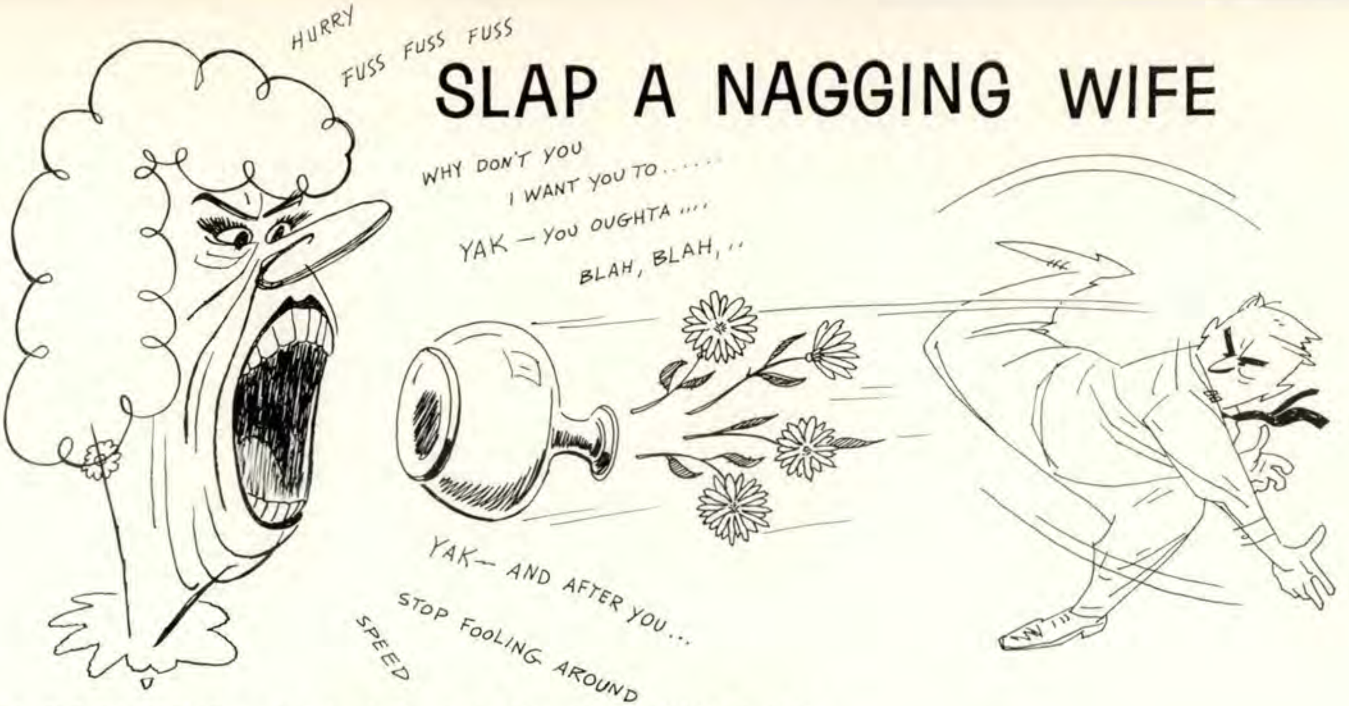
Dash One also states that under some icing conditions, particularly at high altitude, sufficient pitot boom heat may still be unavailable to do the anti-icing. If the boom becomes iced with pitot heat on, increasing engine power and airspeed and decreasing altitude will assist in ice removal. (This suggested cure apparently paid off in the case of the six '100s as airspeed indicators again became operational at low altitude and subsequent ground checks revealed no malfunctions.)

Here are three more incidents, all illustrative of the same general problem:

- F-100 airspeed indicator was observed inoperative after nose wheel liftoff on initial takeoff. Pilot was flying chase for instrument aircraft and a landing on leader's wing was made without further incident. Weather was clear with temperature minus 10 degrees. Aircraft was removed from warm hangar prior to takeoff. Probable cause was that moisture in the pitot tube condensed when the aircraft was removed from the hangar and froze during takeoff.
- F-100F airspeed indications became erratic and later indicated zero. Pitot heat was used with no effect. An escort aircraft was launched and airspeed returned to normal at lower altiture during GCA. Water was found in the pitot system. Pilot was in clear air during the malfunction but had flown through rain and clouds the previous flight.
- F-100F was flown through rain shower during descent to 18,000 feet for refueling. During climb at 35,000, airspeed dropped for four minutes and then returned to normal. Water was found in pitot system.

That's it. Heed the good Dash One book, especially the section that says to use the system even at the expense of pilot comfort. Better to sweat a little from heat than a lot from an IFR no-airspeed approach. Next time there might just not happen to be friendly F-105s around. ★

SLAP A NAGGING WIFE



John M. Radick and Maj Grover L. Heater, Jr., Directorate of Operations, Hq ACIC, St. Louis, Mo.

SEVERAL YEARS AGO one of our well-known surgeons, in speaking of how to attain longevity, encouraged the slapping of a nagging wife to reduce nervous tension. We in the Aeronautical Chart and Information Center indorse this philosophy with regard to our charts and FLIP products. If they don't meet your operational requirements, take a slap at them. If you find errors—and you will—slap hard!

This is not a new approach. During the 17th Century, when very little was known about the world, it was common practice for the marine navigator to turn over to the official state cartographer annotations and corrections to the charts he used on his voyage. During this time period in history, the success of both the traveler and the chart maker depended on close cooperation. Unfortunately, this close relationship between the pilot or navigator and the cartographer no longer exists, primarily because of our wide-spread and varied operations. Today we have to beg, borrow and steal information in an attempt to keep our products compatible with changing operational requirements, and you still have a responsibility to keep the cartographers advised.

The other day, while flight planning in one of our base operations, one of the authors overheard a pilot remark, "At last, I see they finally printed the correct magnetic course on ———— airway. That's been incorrect for over a year." Curiosity getting the better of him, the author introduced himself as a member of ACIC and asked the pilot if he would mind filling in the details. To make a short story shorter, he and the other pilots in his organization had known for a long time that the magnetic course, as printed by ACIC, was wrong. However, no one had taken the trouble to notify us.

Unfortunately, in our travels, we find that some base operations personnel have the same philosophy. It seems that the rule is, "As long as the local people have the correct information, I'm doing my job." SIDs are a good example of this type of thinking. How many times have you found a SID that doesn't show mileage from the runway to the first fix or to a point where there is a minimum altitude restriction? Of course, the locally based pilot knows that the local VOR is three miles from the runway, but what about the poor transient?

ACIC tries to correct this type of deficiency when the AF Form 272s arrive for publication; however, as many of you know, we haven't been successful in many cases. We aren't making excuses, but when you consider that this Center distributes approximately ninety million items per year, you can see that the law of averages is bound to catch up with us.

How do you notify ACIC when you find errors or don't like one of our products—SIMPLE. All base operations (we hope) have ACIC Form 0-150 which you may use. These are post cards which carry a listing of publications which might conceivably be corrected. Simply check the appropriate boxes and add a short statement concerning the problem. If the pre-printed data doesn't apply, don't worry about checking boxes; a written description will do—Spanish, French, even Pig Latin. The cards are pre-addressed to ACIC, and even the postage is paid! Suppose you feel like writing a letter—fine. The address is the same—Det 1, ACIC (ACRSF), Washington 25, D. C.

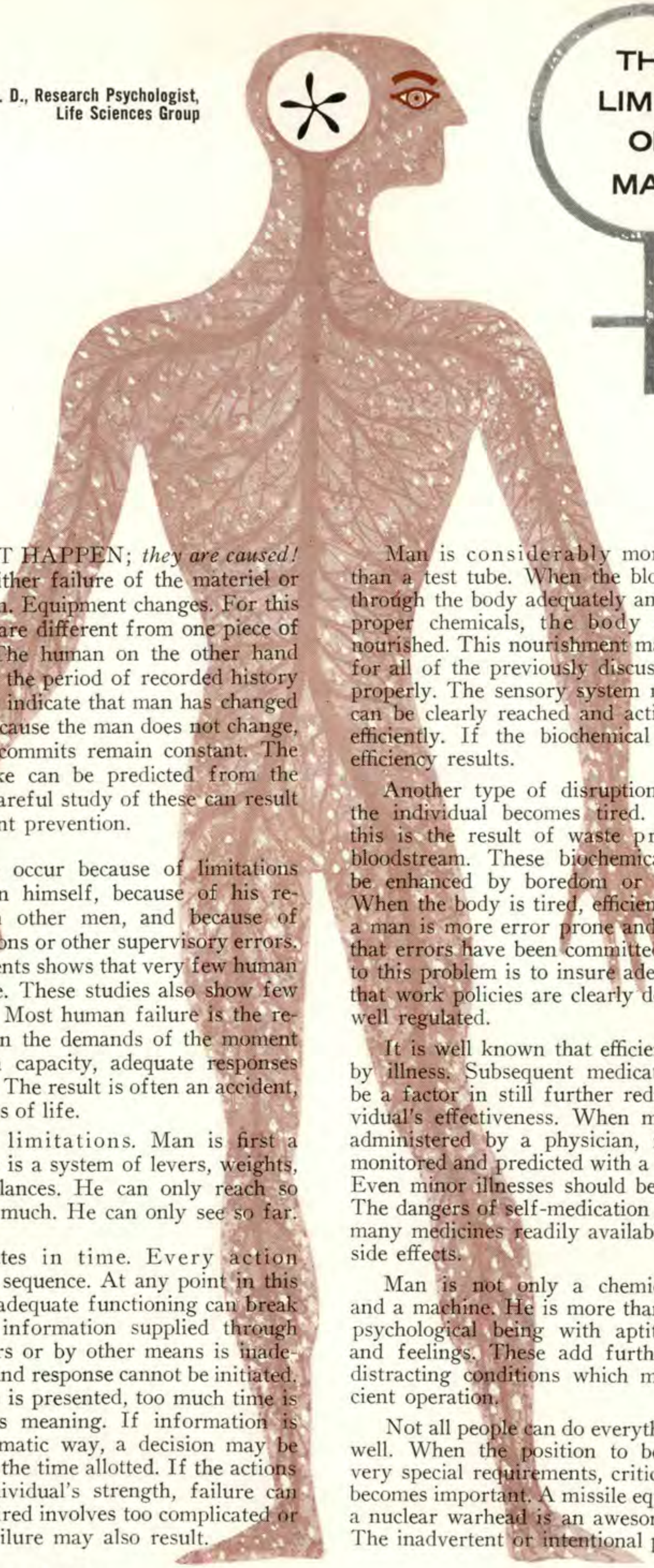
Remember, the USAF policy is, "It is the responsibility of any person noting errors, omissions, or recommended changes in ACIC products to report them for correction." Base commanders will note that AFR 96-12 is very specific about their responsibilities concerning review of publications.

So, "take a slap at that nagging wife." When you see something that doesn't make sense or is obviously wrong, let us know about it. Maybe passing-the-word-along will not reduce the nervous tension, but it *will* increase your longevity. ★

"Down?"
"I think so."

THE LIMITS OF MAN

Anchard F. Zeller, Ph. D., Research Psychologist,
Life Sciences Group



ACCIDENTS DON'T HAPPEN; *they are caused!* The cause can be either failure of the materiel or failure of the human. Equipment changes. For this reason materiel failures are different from one piece of equipment to another. The human on the other hand does not change. During the period of recorded history there is little evidence to indicate that man has changed in any major respect. Because the man does not change, the kinds of errors he commits remain constant. The errors that he will make can be predicted from the errors he has made. A careful study of these can result in positive future accident prevention.

Errors can occur because of limitations within the man himself, because of his relationship with other men, and because of faulty instructions or other supervisory errors. Study of accidents shows that very few human errors involve negligence. These studies also show few actual willful violations. Most human failure is the result of a situation. When the demands of the moment are greater than human capacity, adequate responses may not be forthcoming. The result is often an accident, loss of equipment and loss of life.

Let's look at man's limitations. Man is first a mechanical structure. He is a system of levers, weights, balances and counter-balances. He can only reach so far; he can only lift so much. He can only see so far.

Man operates in time. Every action follows a time sequence. At any point in this time sequence adequate functioning can break down. If the information supplied through the eyes or ears or by other means is inadequate, a proper decision and response cannot be initiated. If too much information is presented, too much time is taken in determining its meaning. If information is presented in an unsystematic way, a decision may be difficult or impossible in the time allotted. If the actions required exceed the individual's strength, failure can result. If the action required involves too complicated or too refined reactions, failure may also result.

Man is considerably more complicated than a test tube. When the blood is pumped through the body adequately and contains the proper chemicals, the body structures are nourished. This nourishment makes it possible for all of the previously discussed functions to operate properly. The sensory system remains acute. Decisions can be clearly reached and action can be accomplished efficiently. If the biochemical balance is upset, inefficiency results.

Another type of disruption occurs when the individual becomes tired. Biochemically this is the result of waste product in the bloodstream. These biochemical effects can be enhanced by boredom or other factors. When the body is tired, efficiency is also decreased and a man is more error prone and may even fail to notice that errors have been committed. The practical solution to this problem is to insure adequate rest and to insure that work policies are clearly defined and work periods well regulated.

It is well known that efficiency is reduced by illness. Subsequent medication may also be a factor in still further reducing an individual's effectiveness. When medication is administered by a physician, results can be monitored and predicted with a high degree of accuracy. Even minor illnesses should be treated by a physician. The dangers of self-medication should be stressed, since many medicines readily available to all have behavioral side effects.

Man is not only a chemical laboratory and a machine. He is more than this. He is a psychological being with aptitudes, desires, and feelings. These add further limiting or distracting conditions which may affect efficient operation.

Not all people can do everything equally well. When the position to be filled has very special requirements, critical selection becomes important. A missile equipped with a nuclear warhead is an awesome weapon. The inadvertent or intentional premature firing of such a weapon could be disastrous. It is important therefore that in the missile field selection not be left to chance. Each individual, particularly in the operating crews, must be carefully chosen.

Human beings do not come automatically equipped with knowledge. Most functions need to be learned. This implies that training programs need to be developed. At least three different kinds of training need to be considered. First, there is original training in which the person learns the basic elements of the job to be done. Next, there is proficiency training in which the techniques learned are reviewed and procedures refreshed. Last, there is transition training in which an individual learns to do something new.

The learning period is consistently associated with a higher degree of error than any other. Experience has indicated that all learning follows approximately the same pattern. The curves of accomplishment, activity, production, etc., vs. time are usually called the "Learning Curves." The term is not often applied to error rate curves. There is probably a good correlation between error rate and rate of learning. In the initial learning period, which proceeds rapidly, there are probably more errors than later on when the rate of learning gradually declines. This applies whether it is an individual learning to do a certain task or a group producing a piece of equipment. In this curve each period of time is marked by a decreasing rate of errors. The curve descends rapidly and gradually smooths out at some level of efficiency, ordinarily less than perfection. Because of the great number of errors during initial learning, this period must be carefully controlled. A carefully prepared training program must be developed and adhered to. Every step of an individual's progress must be controlled to insure that the required learning is taking place with the least possible number of errors.

Once learning has reached an acceptable state it is necessary that an individual practice what he has learned.

Studies show that most information learned during a given lesson is lost during the first 24 hours. After this, lesser amounts are lost until complete forgetting takes place. When a person practices what he has learned, forgetting is retarded. If he practices enough, the function is improved rather than lost.

Missile crews are in a peculiar position. Some have learned to do something which they will never be called upon to actually perform. If performance is required, it follows so long after learning that much forgetting has taken place. It is important, therefore, that every effort be made to insure proficiency even though actual practice cannot be accomplished. The use of trainers, simulated exercises and re-learning of the academic portions of the job are all useful means of keeping current in the job required.

The third type of training involves transition training or upgrade training. In this the individual must learn something new. Here again some of man's basic limitations make correct functioning difficult. When something is learned, some undefined change takes place in the nervous system. The result is that although learning is difficult, it is equally difficult to forget. In some situations the same act in a new situation will result in a different end result. For example, if identical switches are in precisely the same position in two different consoles but associated with different systems, the activation of the wrong system can sometimes result and be critical. In other instances, a switch in the same position associated with precisely the same system may have its direction reversed so that what is ON in one console is OFF in another. This is particularly hazardous although the new sequence may be learned quite easily. When a person is distracted, however, he tends to revert to the original pattern. Special checklists and resequencing of actions are aids in avoiding such problems.

Although people can perform mechanical type functions, unlike static pieces of equipment, they have emotions and feelings. If two people have the same basic talents and training, the one with the greater interest and motivation will consistently perform better. A person who is distracted by personal problems, worries, or tensions can consistently be expected to have these interfere in some way with the performance of his job. Emotional disruption in most instances leads only to inefficiency and relatively minor errors. In the critical missile field, however, it may lead to very serious and costly mistakes. This re-emphasizes the need for careful selection of people in the first place and a continuous watch to insure that emotional difficulties do not develop.

It is seldom that an individual in a large society works alone. This brings into focus a major source of error. It stems from a lack of clear definition of what each individual's task is and from a lack of adequate communication between individuals regarding what they are to do. It is a fundamental of good working relationships that everyone knows precisely what he is to do and be reminded of this regardless of how many times it has been accomplished in the past.

The supervisor must understand the task to be accomplished. He must be acquainted with the capability of the people he has available. He must know the limitations of the equipment he is to use. The man and the equipment must then be integrated into a working unit to accomplish the assigned task.

In conclusion, we must realize that the operator of equipment is in a position to commit a great variety of errors which can lead to accidents. Inadequate familiarity, poor directions and long operating hours are a few of the conditions which can lead to difficulty. However, accidents can be prevented. Accidents are for the most part the result of human failure. Most human error is the result of people failing to accept what they know. Namely, human tolerance cannot be violated. Excessive workloads, poor environmental conditions or emotional tensions are all important considerations. If any task is to be successfully performed, full consideration must be given to the limitations of the human element. And, if a task is successfully performed, it is safely performed. ★

BOXCAR MISHAPS

PARTICULARLY ON WEEKENDS, when much regular Air Force business hits its low ebb, Reserve and National Guard flying boxcars are familiar sights in many areas of the country. Ever wonder how these units do, safety-wise? After all, they only work at flying part time.

They do pretty well, actually. Last year, for example, they had but five major accidents, for a rate of 2.9. And besides doing most of their flying on weekends, they don't have the most trouble-free bird in the inventory.

By far their most critical materiel problem can be spelled with one word — engines. Be they 4360s or 3350s, the problem still is engines. During the past year they made 168 incident reports on engines or engine accessories alone. These reports stemmed primarily from inflight engine shutdowns. And, when it's fairly common to have to make your way back on one engine in a twin-engine aircraft like the C-119 it's essential that single engine proficiency be tops, else there will be more than incidents to report.

Engine problems fall into the prevalent categories. On the -C model aircraft, engines have been equipped with a variable speed blower and automatic engine control. When operating from high elevation fields where, particularly on hot days, density altitude is in the 9000 foot range, this feature causes more trouble than can be safely lived with. On takeoff roll, at about 90 knots, the supercharger of one or both engines will occasionally shift to high blower. When this happens, a considerable yaw, a torque drop and subsequent overboost occurs. What naturally follows is internal failure of the engine. A TO change, published last November, stipulates the replacement of the automatic engine control with manually operated throttle and blower controls as a fix for this problem.

Premature failure has been the other major engine problem area. Most have been attributed to poor overhaul contractual specifications. This condition has been corrected and, for two years now, overhauled engines have been meeting reliability criteria. Special analysis of engine oil and revision of Dash One operating instructions have been implemented towards preservation of these engines.

Prop problems have stemmed principally from loss of operating oil and oil seepage. TOs designed to rectify these problems have been published.

Some trouble has been experienced with the landing gear due to screw jack failures and upper torque arm failures. Tos have also been issued to correct these deficiencies.

Three of the five major accidents of 1962 were charged to pilot factor. In one, a runaway propeller occurred when the pilot was in a position to make a straight in landing from one-half mile out. He elected to make a go-around, during which control was lost and the aircraft crashed.

During preparation for a night flight the emergency gear switch was actuated instead of the emergency power switch. Both main gears retracted.

Loss of power shortly after lift off led to shutting down the engine. A turn was started, during which airspeed and altitude were dissipated to the extent that a crash landing was inevitable.

Good as the '62 record may be, (the major accident rate was reduced 20 per cent from 1961) there were lessons learned worthy of being passed on. These include:

Pilots must thoroughly know aircraft systems and performance if sound, safe decisions are to be made during emergencies.

When there is a lack of adequate and qualified supervision there is also a lack of crew professionalism.

Thorough adherence to checklist and care in manipulating switches in the cockpit are necessary, particularly during hours of darkness, if mishaps are to be prevented.

Thorough flight planning and computation of expected aircraft performance is a prerequisite for safe operations. (e. g., adherence to gross takeoff weight limits and knowledge of critical single engine altitude and airspeed.)

Thorough knowledge of aircraft emergency procedures and rigid crew discipline go hand in hand in preventing mishaps.

One other accident, this one charged to maintenance, has such a moral that it should be included: During a refueling stop, and after the aircraft had been serviced, the pilot and copilot entered the aircraft to start the engines. The right engine started, but the crew was unable to engage the left engine starter. Maintenance personnel were advised of the trouble. While the right engine was still running the crew chief and an electrician went to the left wheel well area. The electrician removed the junction box cover and attached one end of the jumper wire to the bus, intending to touch the other end to the starter relay terminal. The loose end of the wire touched the landing gear relay. The main landing gear started to retract, the electrician ran, and the aircraft settled on the fuselage. ★

AFTER THE STORM—investigators check hail damage to a C-119 control surface. A highly localized, unpredicted hail storm caused major damage to 25 ailerons and 15 elevators, necessitating surface change. In addition, minor damage occurred to 38 ailerons and eight elevators. This one storm, lasting but a few minutes, rendered 34 aircraft out of commission for surface changes and repairs.

TWX's

ACCIDENTS, INCIDENTS AND ALMOST...

▶ THE SOFT TOUCH. After touchdown and during landing rollout the left main gear and nose gear sank through runway paving. The airport was listed in the flight planning document as an unrestricted PC field. However, approximately 700 feet of the runway is comprised of approximately one-half inch oil and rock watershed covering adobe and red clay. This stabilized area is an extension of the runway but with no markings and no visible difference in appearance. Recent rains had apparently undersoaked the ground until it would no longer support the aircraft. In fact, it wouldn't support the motor vehicles used to recover the aircraft.

▶ CB FUMES. A B-58 crewmember, while moving forward in the aisle to manually channel a radio, accidently discharged the CB fire extinguisher. The crewmember received the discharge in the face, experiencing momentary blindness and extreme difficulty in breathing. One hundred per cent oxygen was used to overcome fumes and assist in breathing. The crewmember was examined by a flight surgeon after landing, and because of a slight unsteadiness, was hospitalized. Full recovery is expected. A directive has been issued requiring that the fire extinguisher be moved prior to crewmember movement through the area.

▶ MISNOMER. The pilot made a report via radio and his aircraft number was copied as 783. No such numbered aircraft was known to be in the area. Subsequently, when the tape was replayed, it was discovered that the number was reported as "seventy-three" was interpreted to be 783.

Proper procedure is to use the five digit call sign or code name and number as shown on the clearance. Proper pronounciation of both letters and figures is spelled out in the "Standard Terms and Phrases" section of AFM 51-37.

▶ C-119 LUCK PUSHERS. Review of incident reports of C-119 incident reports received during April revealed two instances where additional landings were made after a gear shimmy was experienced. Not strangely, shimmies were experienced on the additional landings.

When a gear shimmy is experienced, good judgment and safe operating procedures dictate that the flight be terminated as soon as practicable and proper maintenance performed.

▶ THE L . . O . . O . . O . . N . . G ROLL. Everything checked. Brakes were released. Acceleration normal, verified by acceleration speed check. Now at 6000 feet, near lift-off point, rate of acceleration drops like something is holding the plane back. It is! The approach chute has deployed! On and on the plane rolls. Slowly rotation speed is reached. Finally, airborne! Comes a call from tower, "Your approach chute has deployed." The chute is jettisoned over farmland and performance is again normal.

The tower operator, noting the chute deploy during takeoff roll, hesitated intentionally to advise the aircrew commander for fear he might create a momentary distraction during a critical phase of takeoff roll.

Recommendations are that control tower operators advise the pilot immediately whenever any chute deploys on takeoff, also, that maintenance personnel be reminded of the significance of properly adjusted approach chute doors. ★

Turnabout

Maj H. G. C. Hennenberger. Reprinted from APPROACH, Feb 1963

FIXED WING PILOTS are all too familiar with the theory that as bank angle increases there is a corresponding increase in stalling speed. Since helicopters don't have the same stall characteristics as fixed wing aircraft it is doubtful that helicopter people are as familiar with the theory as their fixed wing brethren.

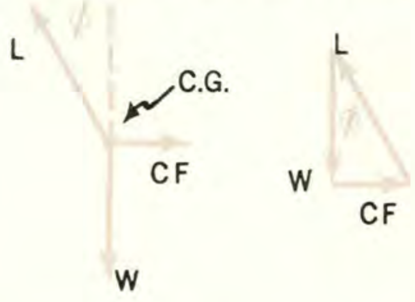
Load factor or "G", however, increases with bank angle in a helicopter in exactly the same way it does for any other aircraft. Correspondingly, the power required to hold airspeed in the bank without losing altitude increases. If the pilot doesn't come in with that extra power at the precise moment it is needed, he further complicates the power problem and he either begins to settle or lose airspeed. If he holds airspeed he will settle, if he holds altitude he will lose airspeed. If he is heavily loaded he may not have the extra power to spare and if he is close to the deck he will undoubtedly succumb to the urge to come in with collective. The story from here on is all too familiar to helicopter pilots — another loss-of-turns accident.

Helicopter pilots should be just as familiar with the important numbers associated with bank angles in their particular machine as fixed wing pilots are. Ask any jet driver what per cent increase in stall speed is generated in a clean 30-degree bank over the break in his bird and he can probably tell you. But ask the average helicopter pilot what per cent increase in apparent gross weight is generated in a 30-degree bank for his bird and the odds are that he can't tell you.

The load factor and, hence, apparent gross weight increase in banks up to 30 degrees is relatively small. Even so, under the right set of adverse circumstances, such as high density altitude, gusty air, poor pilot technique and high gross weight, a power deficit could easily be induced. Above 30 degrees of bank the apparent increase in gross weight soars. At 30 degrees of bank the apparent increase is only 16 per cent but at 60 degrees it is 100 per cent. We all know that the bank limitation on most helicopters is 30 degrees, but we know too that helicopter people are famous for ignoring this limitation. Perhaps if they were familiar with the numbers involved they would have more respect for the limitation.

There are other problems associated with the mechanics of the banked turn in helicopters such as retreating blade stall and structural stress at high gross weights. The most pressing problem from the accident prevention point of view is power management. We have a good idea of how many helicopter power management accidents there have been. What we don't know is, how many of our tired old birds have had their guts nearly pulled out when the pilot induced a power deficit in a low speed steep bank and was lucky enough to get away with it. We can't help but wonder how many of these same birds were later involved in engine failure accidents. ★

EQUILIBRIUM TURN FORCE DIAGRAMS



Load Factor = L/W = 1/COS Ø: for Ø = 30°
COS Ø = 0.866: LF = 1.16

Load factor developed in a turn could be limited by the following:

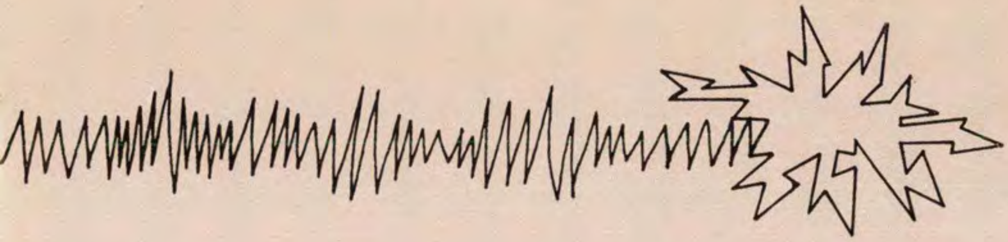
a. Limit load factor of structure.
b. Power available to maintain altitude and airspeed.
c. Blade stall.

Below is a rough load factor breakdown on some of our helicopters at various angles of bank. Included is the apparent weight increase over a given gross weight in straight and level flight.

APPARENT WEIGHT INCREASE OVER INITIAL GROSS

Bank	Load Factor	HUS*	HUP*	HOK*	HRS*	% Increase
10°	1.02	226	106	118	150	2%
20°	1.06	678	318	354	450	6%
30°	1.16	1808	850	945	1200	16%
40°	1.3	3390	1600	1770	2250	30%
45°	1.42	4750	2225	2470	3150	42%
50°	1.55	6200	2900	3250	4100	55%
55°	1.74	8370	3900	4370	5500	74%
60°	2.00	11,300	5300	5900	7500	100%

H-34 (HUS) loaded initially to 11,300 lbs.
UH-25 (HUP) loaded initially to 5300 lbs.
OH-43D (HOK) loaded initially to 5900 lbs.
CH-19E (HRS) loaded initially to 7500 lbs.



One Electrifying Day

Robert D. Nagle, Electronics Engineer, Flight Safety Division

This subject refers to the contents of one day's incoming messages concerning electrical malfunctions in Air Force weapon systems. (Ed. Note: Asterisks indicate author's remarks relative to selected messages.)

The FIRST message referred to an incident wherein two external tanks were inadvertently released in flight. Quote: Concerned aircraft has been flown twice with test equipment utilizing flash bulbs to detect stray voltage. Both flights were successful in that all systems operated without any evidence of stray voltage in the pylon jettison circuits. Both pylons and 450-gallon tanks were then installed and the aircraft has had one successful flight with the tanks empty and two successful flights with 100 gallons of fuel in each tank. Note all test flights were conducted over water avoiding populated land area. Based on the above test the aircraft has been released. Unquote. *Chalk up one more undetermined cause in this area.

The SECOND message reported a lightning strike on the nose of a C-118 cruising at 11,000 feet in clouds. The Nr 2 HF antenna was struck, causing it to break and flap against the fuselage. Radios were inoperative for a short period. A small hole was found in the vertical stabilizer, most likely the point at which the charge departed the aircraft. *This is an Act of God type of incident against which there is little defense.

The THIRD message referred to explosive squibs igniting while an airman was tightening the ground leads of the squibs. At the same time the squibs fired, he noted a spark from his wrench which had made contact with a terminal block. *It didn't take much investigation effort to determine that all electrical power should have been disconnected before maintenance of this kind.

The FOURTH message reported a functional check flight after a 150-hour postflight inspection on a twin-engine jet fighter. The right engine was shut down at 30,000 feet with windmilling RPM at 30 per cent. Ignition did not occur during attempted airstart. All alternate means were used without success. Both generators were then turned off to get emergency DC power but ignition was still not accomplished; an emergency was declared and a single engine landing was accomplished. One igniter plug of the right hand engine was cracked. A loose wire was found on a circular terminal strip. Upon engine runup on the ground in preparation for another functional check flight, ignition could only be turned off by turning battery power off. Further investigation revealed a faulty ignition timer relay. *This indicates a total of three failures in the same system, all present simultaneously.

The FIFTH message reports an explosive incident. An experienced airman was installing the left hand drop tank explosive bolts on a B-47. Two and a half hours earlier, explosive bolts fired on the same aircraft with no warning. A complete wiring checkout had been completed. Upon inserting the right and left hand bolts for the tank, the airman was examining serial numbers on thrusters when the right bolt blew again. A fragment hit the airman on the collarbone, puncturing the skin. Minor first aid was required. At the time of the incident, the bolts were completely disconnected from the circuit, with no wire attachment of any kind. A safety observer was in the cockpit to insure the jettison switches were not activated. The left bolt did not fire. Fuses to left tank had blown on the original occurrence and had not been re-installed. The cause was undetermined.

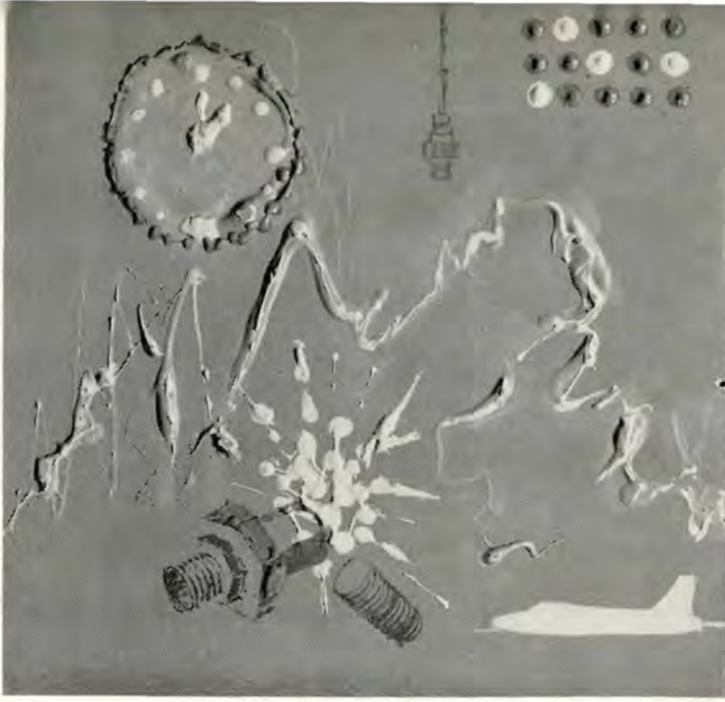
The SIXTH message involved smoke in the cockpit during takeoff and the flight was aborted. A connector, P/N MS3106F-28-11P, was shorted and burned. There was evidence of moisture in the spaghetti that covers the wiring. The most probable cause was moisture in the connector. *This incident was similar to another that occurred three days earlier.

The SEVENTH message was a reference to an incident already reported wherein the arresting hook extended inadvertently. The primary cause was maintenance error, in that a mechanic inadvertently depressed the control switch and fired the arresting hook explosive bolt.

The EIGHTH message reported the loss of oil pressure after one hour and fifteen minutes of flight in a twin-engine jet fighter. The right hand engine was shut down and during windmilling, the oil pressure dropped to zero. A constant speed drive hose assembly broke and all oil was lost.

One electrifying day...

Continued



The NINTH message reported a right hand generator failure. A single engine landing was accomplished after shutting down the right hand engine. The right hand constant speed drive was not rotating and the magnetic plug contained excessive metal contamination. No oil consumption was evident on the right hand engine. The left hand engine required 19 pints of oil which was cause for engine removal. *This incident points up the probability of loss of both engines, had the flight progressed further, since the pilot would not be aware that the constant speed drive on the right hand engine was not rotating.

The TENTH message also reported the loss of the right wing missile pylon over land. Cartridge was not installed. An explosive bolt separation occurred in center of designed failure area, a mechanical failure. The involved organization is presently removing all explosive bolts for x-ray examination.

The ELEVENTH message referred to two incidents and one major accident since 1 March, all of which involved failure of the pylon jettison gun. Preliminary information was that failures have occurred as a result of excessive roll G forces. It was recommended that all pilots use caution in weapons delivery and comply with existing G restrictions.

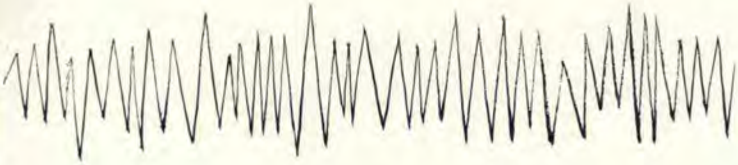
The TWELFTH message reported a T-33 incident involving a plenum chamber fire warning light after 15 minutes airborne. A piece of loose safety wire shorted across a terminal strip which caused a false fire warning.

The THIRTEENTH message reported an incident involving a napalm drop during a close support and training mission. The left napalm tank would not release normally. Attempt to jettison, using outboard pylon jettison circuit, resulted in only the right pylon and rocket launcher leaving the airplane. When "jettison all' button was pressed, the left and right pylons jettisoned. The left inboard pylon struck the remaining napalm tank and ruptured it at the mid-section. Return to base was made with the empty ruptured napalm tank still attached. Wires of the system were found to have been jerked out of staked terminals and a broken resistor was found on the wing pylon jettison resistor panel.

The FOURTEENTH message was another regarding constant speed drives in F4B aircraft. Bus tie light came on during taxi after flight. Pilot recycled right hand generator switch. This was followed by flickering of all warning lights, right hand and left hand generators and the bus tie. Upon shutdown, smoke was observed coming from the left hand generator and constant speed drive. This was the ninth electrical system failure for that squadron during a 15-day period with four occurring in one day. A possible contributing cause was that this squadron was not equipped with a suitable vari-drive to test the constant speed drives and generator before installation.

The FIFTEENTH message reported generator failure compounded by complete electrical failure in a T-33. This resulted in fuel starvation after losing all radio and navigational equipment, and the occupants bailed out. The cause of the generating system failure is presently unknown. *The number of identical mishaps in T-Birds would probably total about 50 over the last ten years.

The SIXTEENTH message also involved a T-33 electrical failure as a result of an improperly staked terminal of a generator lead. The pilot was at 31,000 feet and UHF trouble was encountered while trying to contact the Atlantic Center. All radio was lost by the time he noticed the "generator out" warning light. Its



cover was rotated to the maximum dimmed position. *The battery eventually went dead and, by good fortune, a flashlight—and being able to observe other aircraft for direction—he made it to Maxwell. A UR was submitted on the dimmable "generator out" light. This points up the necessity to take a good look at what warning lights should not be dimmable. It also involves a training deficiency in that all warning lights should be left in the maximum brilliance position at least for the first warning, should it occur.

The SEVENTEENTH message was a critical safety hazard EUR involving a B-57. During a night GCA, a dangerously high wing heaviness condition was noted and the cause was evaluated as attributable to a faulty circuit breaker. Symmetrical balance was obtained by pressing a circuit breaker which was making intermittent contact. There are two circuit breakers, each labelled "WING and TIPTANK"—one for each side. *The recommendation included in the message appears to be a good one. Wire one circuit breaker for both tiptanks and the other for both wing tanks. In the event one fails, lateral balance should be retained.

This résumé of one day's message arriving at one desk may have appeared boring but it points up the variety of mishaps that are happening daily, many of which could have been easily prevented. And these are not all of them—they're only the ones involving electrical matters in one form or another. The continued loss of external stores is apparent in this group of messages as well as the continued need for more reliable constant speed drive generator systems.

It is apparent that explosive bolts have some "hair-trigger" tendencies that must be corrected. There is a continuing, repeat CONTINUING, need for protecting connectors from moisture induction beginning at the design level right on through maintenance at the flight line level. The moisture-in-connector problem continues to be manifest in all systems. It trips off stores, fires guns and missiles without warning. It causes dangerous flight control problems and all manner of difficulties in landing gears—there's no use naming every aircraft system. Name any system and there will be associated malfunctions involving moisture-in-connector trouble. It's an insidious, sneaky thing and the difficulty is that when the trouble-shooting begins, the moisture has most likely evaporated. The lack of visible residue is no criterion either; the moisture path may have been there just the same. The other half of the connector problem is foreign metallic objects inside. The use of vacuum cleaners and clean brushes is conspicuous by the absence of same. The use of these articles should be stepped up. The same goes for terminal strips — *before* the covers are installed.

The message "stack" for this particular day is not unusual. Some days it is worse. Your help is invited. This does not mean the "Suggestion Box." These are matters that require rapid and correct evaluation for even more rapid corrective action. Go the UR or EUR route in accordance with TO 00-35D-54.

To sum it up — when sifting the pieces after an accident, investigators find the moisture and foreign objects that may have been in connectors have a habit of disappearing. Even the connectors are pulled or exploded apart. Sometimes there's lots of moisture — it may have rained or the firemen put it there. Get the picture? We need your help — badly. ★

"Now that you mention it, I do notice a power loss."

OUR FEATHERED ENEMIES

LAST APRIL, at 0720 in the morning, an Air Force F-101 rolled into takeoff position on the active runway at an East Coast base. A light rain was falling, but visibility was good—10 miles. Power checked. Brakes were released. Acceleration was normal.

At about 150 knots, as the pilot rotated, he caught a glimpse of a large flock of gulls on the right side of the runway. As the fighter took off, so did the gulls. There were hundreds of them. Abruptly, they swerved up and into the path of the climbing '101. The pilot pulled the nose up higher, hoping to outclimb the birds by using maximum angle of attack. However, just moments before reaching the flock, he had to lower the nose slightly when the aircraft shuddered. Now the gulls were just above and in a direct line with the plane. The pilot and his radar intercept officer ducked. Certain collision was inevitable; the pilot attempted to flip on the anti-icing switch to provide continuous ignition to the engines. Inadvertently, he knocked the right afterburner off, but did get the continuous ignition switch on.

As the plane plowed into the mass of gulls it lunged and swayed, as in a severe yaw. The yaw sensation was accentuated by loss of burner on the right engine and rapid head movements in the cockpit. Severe compressor stalls in the left engine further aggravated the erratic flight path. (Witnesses noted torching of the left engine at this time, further evidence of the series of compressor stalls.) To stop the stalls, the pilot came out of AB on the left engine.

Momentarily, the pilot pulled back both throttles, then, remembering his altitude he shoved them forward to full military. There was no apparent engine response to this throttle movement, but control feel was still normal. Next, the pilot eased both throttles back about halfway on the quadrant. RPM steadied at 85 per cent left, 83 per cent right. Both EGT and EPR were higher than normal.

Now, under control, an emergency was declared. The pilot had not had time to retract gear and flaps. He left them extended, flew a wide downwind pattern and made a landing with no further difficulty.

Damage: Severe foreign object damage (sea gulls) to the right engine, slight damage to the left engine, left wing flap slightly buckled, landing and taxi lights broken. The pilot reasoned that penetrating the flock with the highest possible angle of attack probably reduced the amount of damage to the upper portions of the aircraft.

Both engines had ingested several of the gulls. Casualties included 35 countable carcasses found on the runway, plus four walking wounded. Activation of continuous ignition just prior to impacting the birds may well have prevented loss of the aircraft, and possibly its crew.

Spectacular, yes! Isolated case, no! In 1962 there were 53 reported cases of USAF aircraft damaged by collision with birds.

ANALYSIS

Analysis of the factual data in the 1962 bird strike cases provides the following information.

Although the bird was observed in approximately 40 per cent of the

This photo shows impact point on lower right corner of right windscreen of T-33. Although considerable damage was done to the windscreen frame, the canopy was only slightly damaged.

instances, little or no action was taken in 81 per cent of the collisions. Usually the bird was observed just prior to impact. In some instances, although action was taken to avoid the bird, the bird dived at the aircraft.

Of the identifiable birds, buzzards and other large birds were encountered most often. Encounters with large birds were most frequent en route and on low level missions. Small birds of starling and blackbird variety were found most often in the vicinity of airfields. Sea gulls were the primary bird hazard in coastal areas. Fighter aircraft were involved more than any other type, possibly because of their high speed. Encounters by type were: Fighter 21, trainer 13, transport 12, bomber 7.

Only one of the 53 strikes occurred above 5000 feet, this a C-124 that encountered a flock of migratory birds over Canada in May. Most strikes occurred at less than 1000 feet. Nine that occurred during the takeoff phase were within one-fourth mile of the runway.

Thirty-seven of the encounters were during the en route phase. Of the 16 remaining, nine were considered to have been possibly preventable by some form of anti-bird device.

Aircraft wings and engines were areas most often involved, with the engine the most critical area from safety of flight consideration. Seven flameouts or shutdowns resulted from bird ingestion. Five of these occurred on takeoff or go-around, one resulting in a major aircraft accident. Areas of damage were: wing 23, engine 16, fuselage 8, windscreen 5, stabilizer 1.

Dents on this visor cover were probably caused by the magnetic compass which broke loose. The microphone connection on the front of the mask was shattered. A hole in the O_2 hose can be seen about 4 inches from the mask. The flight surgeon stated the visor and mask protected pilot's face.

Bird strikes on the windscreen-canopy area caused the greatest number of injuries to aircrew personnel. Of the five incidents in this area, two resulted in injuries to three aircrew members. Helmets and goggles were considered to have prevented greater injuries and possibly a fatality.

Twice as many incidents occurred in the southeastern and southwestern U. S. as occurred in the northern half of the country. The breakdown discloses: SW 17, SE 13, NE 8, foreign areas 8, NW 7.

The majority of the bird collisions were in early spring months and again in late fall, corresponding with the most active migratory bird seasons. Encounters by period numbered: Apr-Jun 21, Oct-Dec 19, Jul-Sep 9, Jan-Mar 4.

ACTION UNDERWAY

Experimental work to develop devices designed to eliminate birds from airfields is primarily mechanical, chemical or electrical. Most mechanical sound producing devices have proven ineffective since the birds soon get accustomed to the noise. Ultra-sonic and sonic waves have proven unsuccessful. In fact, the vibrations associated with the sound spectrum of a commercial air transport actually attract birds. It has been suggested that the sound spectrum contains a noise identical to the chirp of crickets.

The most promising device to date appears to be the use of distress calls of birds. A combination of distress calls and the firing of "shell crackers" has proved quite effective.

The FAA is researching the bird hazard problem with the aim of eliminating or minimizing this hazard. This long range research project goes into such areas as bird behavior, testing of known or proposed devices or materials for use in bird control, sterility producing agents and chemical, sonic and electronic media.

SUGGESTIONS

For temporary relief:

Publish a NOTAM concerning any influx of migratory birds.

Require control tower operators to advise departing and arriving aircraft when flocks of birds are seen roosting on the airfield.

Flush birds from roosting areas near runways prior to aircraft takeoffs. Use scaring devices such as shotgun shells and firecrackers designed to explode at intervals. (Scaring devices usually only provide temporary relief in the case of migratory birds. Birds permanently remaining in the area soon learn scaring devices are harmless and return.)

Permanent control:

Eliminate dumps and other unsanitary conditions. These attract gulls, starlings and other birds that eat waste food.

Destroy potential roosting sites. Tall reeds, weeds or brush attract starlings and blackbirds.

Replace berry and seed producing shrubs with shrubs less attractive to birds.

Drain ponds and other water accumulation areas.

Cut deep grass near runway and adjacent areas.

Apply herbicides and weed killers to kill broadleaf seed plants and weeds to eliminate roosting areas.

CONCLUSIONS

Aircraft speed makes it highly improbable that the bird will be avoided, even after it has been observed.

The airport environmental area upwards to one-fourth mile from the runway is the only area wherein employment of present known methods or devices may reduce the hazard of birds on the airfield.

Elimination of bird strike hazards outside the immediate airport areas must depend primarily upon modification of equipment to reduce such hazards. Efforts to shield jet engine intakes and to improve strength of canopies should result in some improvement.

Low level routes should be selected outside known paths of migratory birds. ★

"Buzzard?"
"I think so."

Last year, 1962, there were 428 Air Force lives lost in private automobile accidents. During the first five months of this year the score was 312, a 19 per cent increase. The automobile continues to lead all other causes for Air Force fatalities. Some of the reasons are examined by Col Emmert C. Lentz, Chief, Life Sciences Group, Directorate of Aerospace Safety, in an attempt to answer the question,

428 — WHY?

A FEW YEARS AGO I had a shaking experience with a new automobile. I had registered into a motel and, a little later, started on a trip to town. The motel driveway opened onto a main highway. As I approached the highway I prepared to stop, but when I applied the brake the foot pedal went to the floor. I gave it a quick two or three pumps — nothing! My emotional response was a rapid transition from amazement to sheer panic. I could not even remember that the automobile had an emergency brake. My final reaction was to shove the automatic transmission into reverse and the car skittered to a stop.

No damage was incurred except to my ego and exhausted nervous system. Examination of the car revealed that a bleeder plug had loosened and had let the hydraulic fluid escape.

This story illustrates the psychological blockage that can occur when an individual is faced with a sudden totally unexpected emergency, causing a few seconds of inability to respond. Brake failures and other mechanical malfunctions, however, cause relatively few accidents. What then are the major causes for automobile accidents among our Air Force population?

If we consider the entire driving population it would be necessary to examine the problems of age and medical conditions. Obviously old age is not likely to be a problem concerned with Air Force personnel. Our age grouping runs from young to middle age. Medical infirmities also do not present a serious problem. The military driver population is subject to continuous medical screening which eliminates the more severely affected people from our posts and bases. However, some epileptics who have responded successfully to therapy are retained in the military service. Adequate liaison should be maintained between the surgeons and safety officers to insure that these personnel are identified by an appropriate physical profile document or other means in their personnel records. This is to preclude their assignment to a number of hazardous work fields. They should not be authorized to drive government vehicles or operate heavy equipment. This raises the question of whether the afflicted military person should be authorized to operate a private motor vehicle on the military installation. Each case must be decided on an individual evaluation.

There are also many psychophysiological factors bearing on accidents. Some of these are distraction, fatigue, auto-hypnosis, carbon monoxide poisoning and lack of sleep. Underlying any set of accident statistics there may be more interesting unknown factors.

Statistical coding tends to be based on the more obvious errors or on the link of the chain which can be successfully prosecuted. A man might be distracted from his driving by an attractive figure standing at the bus stop. Assume he crashes into the rear of the car ahead. He gets charged with something like "following too close" or for "reckless driving." We can even assume that prior to the distraction there was no offense. It was only after his distraction that the distance between the cars diminished to the point that the accident became inevitable. Such accidents also involve two cars and two or more people which furnishes the setting for further distortion of our statistics.

Fatigue hides itself in dubious ways. Long hours behind the wheel give the individual a degree of insensibility to speed. The fatigued individual further finds that "due care," "caution" and "judgment" are much more easily compromised.

Fatigue is conducive to a state of auto-hypnosis. Concurrent with fatigue, the long hours at the wheel of a vehicle and leaking exhaust fumes into the cab or car increase the possibility of the driver suffering from some degree of carbon monoxide poisoning. Irrespective of the links or the arrangement of the links in this chain, the resulting accident is charged to the more obvious fact that the driver fell asleep.

Falling asleep, whatever the contributing causes might be, is a real accident cause problem in our military population. Extension of military control of personnel traveling under the validity of a Class A pass and traveling while on temporary duty, leave and permanent change of station orders, is a challenge I relegate to our military commanders.

Let's next consider our big problem which is youth and immaturity. In this group we have the untrained, the poorly trained, the well trained and those that can't be trained. In 18 to 20 years a baby grows physically to manhood or womanhood. The chronological age of an individual is not a valid index of the individual's emotional maturity, nor of the adequacy of the individual's personality to maturely respond to the complexities of his problems.

Before discussing the more complex problems let us first consider the average youth. California high schools offer a mandatory drivers' course of 30 hours. Of the 30 hours, 8-12 hours are spent in a car. Three students are taken by the instructor for each hour's instruction. This gives each student 18 trips wherein each spends 20 minutes behind the wheel. Each student's driving experience for the course is six hours.

A driver with this amount of experience may be safely able to ferry passengers from the Operations Building to the BOQ on our bases. I am not prepared to certify him for unlimited highway driving. These trainees need further graduated highway experience with an instructor. My experience has been that most partly-trained drivers are totally unprepared to integrate the factors of higher speeds to potential hazards. Their driving horizon is not sufficiently distant. Their sense of safe car spacing is inadequate. Their sense of the stopping distance is inadequate and their sense of the increased passing distance is inadequate.

At the Air Force 3rd Annual Safety Congress a company demonstrated a driver trainer. Ten highway sequences were projected onto a screen. The accelerator pedal controlled the speed of the movie camera and a recorder. The individual successfully accelerated, steered, decelerated and braked to meet each potentially hazardous situation or he crashed. This trainer provided a very realistic exposure to common highway accident producing situations which many individuals have learned the hard way. The films and sequences of such a trainer could be expanded to expose the trainee to most every conceivable driving hazard. Such a trainer could be a most valuable adjunct in driver training.

Let's consider for a moment a bit of immaturity, buried hostility, etc., that is present in many of us. The delay caused by an accident, a road block, the haggling of the wife, the loss of a sale or a score of situations may trigger a release of adrenalin and the driver takes it out on the accelerator. For a period of time, usual caution and common road courtesy is cast aside. Until the temper cools we have no less than a temporary maniac behind the wheel. I have no ready solution for this problem. The trainers of Amos and Enos, the chimpanzee astronauts, provided an electric shock when the "monks" made a mistake. A comparable shocking system on the automobile accelerator might be effective.

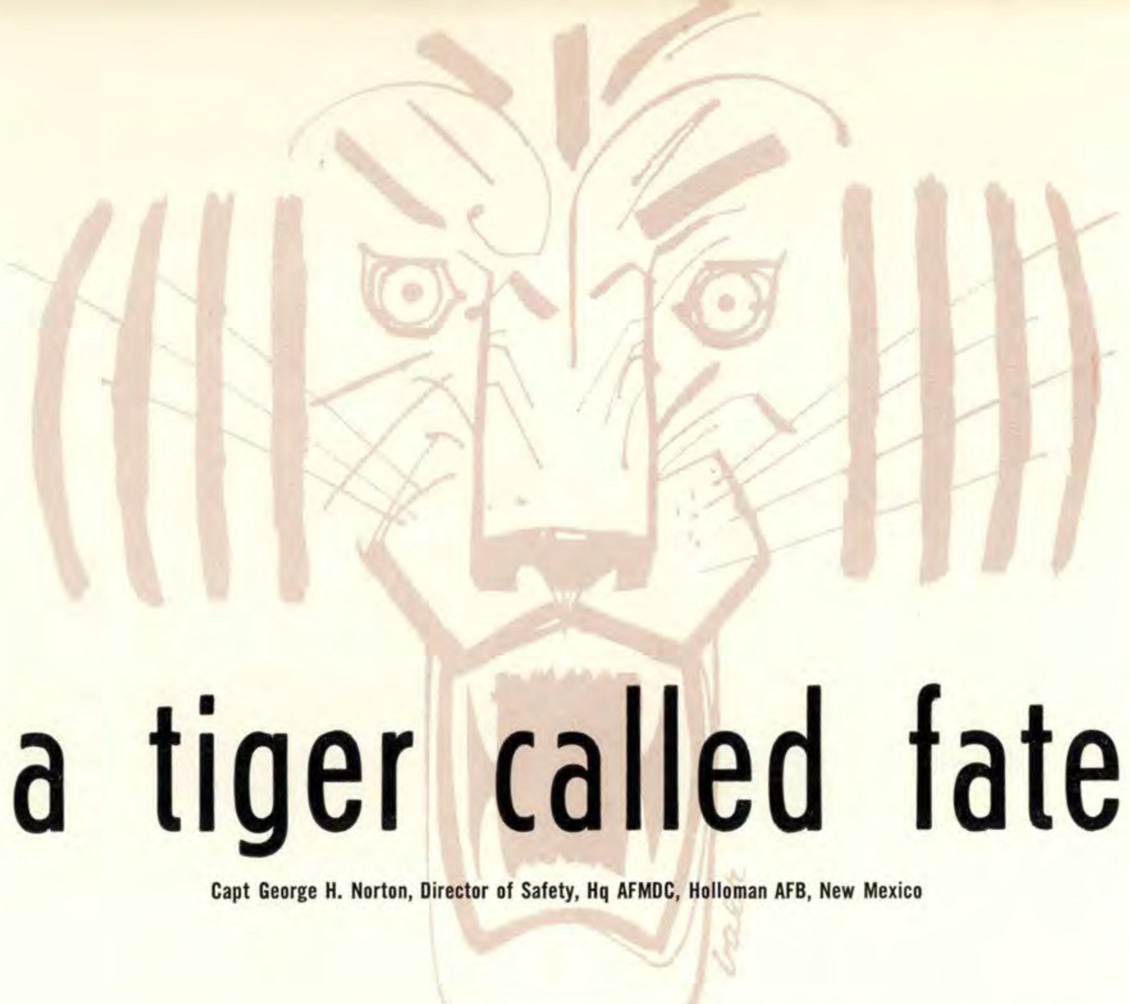
A moment ago I mentioned immaturity in conjunction with youth. Under the general topic of immaturity we must consider the subject of alcohol as a primary leading cause of highway accidents. Perhaps it would be better to plagiarize the title of a book, "Devils, Drugs and Doctors" — alcohol being the devil, barbituates, tranquilizers and pep pills being the drugs, and the doctors for being so promiscuous in writing prescriptions as well as for their activities in urging corrective action.

At last year's Safety Congress I conjectured that the alcohol problem raises its head in around 60 per cent of the Air Force's fatal accidents. In eight years of large hospital administration one of my routine queries in making a round of the orthopedic wards containing the victims of automotive accidents was to ask the question, "What happened to you — mixing a little alcohol in the gasoline — or having too heavy a right foot?" "I guess a little of both," was such a common answer. I believe it approached 70 per cent. Only once did I hear of a brake failure.

The alcohol problem is one of public, legislative and executive apathy. People are unwilling to face the facts. A little alcohol may give the appearance of livening up a party. A similar amount in the blood of a young automobile driver is another matter. It provides the little tempering of ordinary caution, care and judgment which, plus an auto, is all that is required to provide the setting for an accident. The right foot is pressed a little harder with diminished appreciation of its effects. Who bothers to consider that as you accelerate from 40 to 50 miles an hour you have added kinetic energy equivalent to that entailed in accelerating from zero to 30 miles per hour; that in accelerating from 50 to 60 we have added the kinetic energy we wrap into an automobile in accelerating from 0 to 33 miles per hour; that in accelerating from 60 to 70, one has again added the energy equivalent to accelerating from 0 to 36 miles per hour.

It is regrettable that the alcohol problem remains so submerged in the highway accident picture. Police are tied to submitting charges that the courts will support. The drinking driver, particularly the less intoxicated, are frequently charged with reckless driving, driving on the wrong side of the road, speeding, or for the offense which can be successfully prosecuted. The courts, on the other hand, are dependent on the laws enacted by the respective state legislatures and the Motor Vehicle Code. We can add that the military is, in turn, geared to the common codes, court decisions, etc., of the states.

As long as people entertain the thought that a man can safely drive unless he is incoordinately drunk. these highway fatalities will continue. Ceasing and desisting from mixing alcohol and gasoline will save hundreds of Air Force lives annually. ★



a tiger called fate

Capt George H. Norton, Director of Safety, Hq AFMDC, Holloman AFB, New Mexico

HAVE YOU T-BIRD JOCKS ever taken off from ye olde aerodrome feeling like you could conquer the world and that you could do no wrong? You know, the old "tiger" approach.

There was one morning I remember when I could have licked any tiger in the Air Force, young or old, two or four legged. I was going on a flight that I had flown many times before. We were to fly a tactical formation mission to 30M and to terminate at home plate with a formation landing. The only difference between this mission and any other tactical formation mission was that we were going to fly formation with a QF-80 drone. Usually a drone is a pilotless target aircraft controlled by radio control functions from another aircraft. In this case the QF-80 had a pilot at the controls (commonly called a Safety Pilot) to override any incorrect radio control commands that might be made by our young student Remote Controller (RC Pilot) in the front seat of the remote control (Director) aircraft.

As the tiger in the back cockpit of the DT-33 control aircraft, I was acting as instructor to teach our young RC pilot how to fly by radio control. This normally is quite simple for an experienced RC pilot to do. All he does is punch a few buttons and these buttons in turn send coded signals to the autopilot in our QF-80 and it reacts. However, to become an experienced RC pilot, one has to go through extensive training. This is what we were to accomplish on this bright sunny day.

We took off from the air patch with me flying from the back seat of our T-33 director aircraft, and our young student in the front seat was taking the QF-80 off by radio control. Now this young "Puddy Tat" (not quite a full grown tiger) had flown quite a few missions like this, so we were not too concerned with the first phases of the mission. Our main interest was to be centered on the traffic pattern and landing phases.

I must interject a point here: whenever a drone aircraft is flown on a Nullo (unmanned) mission, it is controlled by radio from another aircraft, and when it is flown into the traffic pattern it is turned over to a ground controller on the final approach who effects the final approach and landing of the drone. In an emergency it is possible to land the drone in formation from the radio control (director) aircraft. This is generally called an air-to-air landing and was what we were to practice.

Our young Puddy Tat had never made an air-to-air landing so it was up to this Tiger to tell him how to do it. Old Tiger was pretty sharp this morning as he was in a realm that he had been in many, many times. Puddy Tat couldn't have had a better instructor! We had made a few low approaches for practice and were finally going into our last pattern. This was it. Old Tiger could really show his stuff. The drone was turned onto a base leg with the T-33 in formation.

As we turned base, the flaps and landing gear were commanded full down on the drone and likewise in the director aircraft. The gear on the QF-80 was checked visually to be down and locked, and the Safety Pilot in the F-80 visually checked the gear of the director aircraft to be down and locked. The gear was further ascertained to be down by Tiger.

As we turned onto the final approach the tower called and requested we do a 360 to let another jet aircraft land before making our landing. The turn was accomplished and we were again on final approach. At this point old Tiger's china clippers were going a mile a minute, telling Puddy Tat how to effect the flareout and touchdown of the drone. In the interest of safety, it was the normal procedure for the pilot in the back seat of the director aircraft to call the power off as soon as he knew he had the landing made.

Old Tiger was real sharp this morning. He flew perfect formation (as usual) and called power off at just the precise moment. When Tiger had ascertained the drone was under complete control he placed his attention on his own landing. All of a sudden this old Tiger's tail stood straight out and all the hair on his back stood straight up. (His sixth sense coming to life.) The reason for all this sudden flow of adrenalin was that the drone was already on the ground and old Tiger's aircraft was lower than the drone and still hadn't touched down yet. (Any bets?)

Well, Old Tiger being real sharp, cobbed the power and leveled out just as ye olde T-Bird touched down—minus the landing sticks. As we touched down the power was passing through 50 per cent. Now if any of you have never seen a Tiger pray, you should have been there at that precise moment. We ground along the ground for what seemed about 100 miles, Tiger playing the controls feeling for that last ray of hope. Well, it came, and Tiger's prayers were answered. That old T-Bird got airborne again minus half of its flaps and a small hole in its belly. (We slid only about 200 feet before becoming airborne.) We pulled up onto a downwind, placed the gear handle in the down position (yes, it was up!), checked the gear down, declared an emergency and landed. To retrogress a moment: immediately after becoming airborne from the grave, our young Puddy Tat was heard to ask "Wha' Hoppened?" (Any comments?)

When old Tiger got on the ground, all the vigor and vitality was gone. He wilted like an unstarched shirt in a bowl of hot jello.

I don't think there is any question as to who bought the accident. It took 175 hours to repair Tiger's chariot so it could fly again.

Now if any of you tigers get up some morning and feel like you could lick any tiger on two legs or four, just remember: there is always another tiger somewhere that feels the same way. That other tiger is usually called "Fate."

This tiger called Fate is always on the lookout for that little opening to get at your throat or your belly. In this case he got to my belly. He found his opening. From the time the gear was put down on the base leg, the gear was never rechecked to be down and locked until after the aircraft had touched down and become airborne again minus a few pounds of metal. Believe me, this isn't the time to check your gear to be down because, if it isn't, you might not be as lucky as old Tiger and you might end up in a ball of flame off the end of the runway and having someone say a prayer over you.

Remember, you tigers, it's not the fall that hurts; it's the sudden STOP! ★

PROFESSIONALISM

Three years ago we in Safety made the profound statement that the reduction in accidents was attributed, among other things, to the fact that pilots are professional. Basically, we feel—and rightly so—that Air Force pilots are not amateurs.

But there are some inconsistancies. Continuing this thought that a military pilot is not an amateur, it is difficult to explain why we still have gear-up accidents in aircraft which are not in an emergency condition. The rash of gear-up accidents in T-33 aircraft still continues, even after we in Safety insisted that each T-33 seat be filled with a qualified T-33 pilot. I ask you, is this an indication of a professional or an amateur?

Continuing further this thought of a professional as opposed to an amateur, let's widen the scope to the man who maintains the airplane. We expect him to be a professional, i.e., to follow technical orders to the letter, utilize proper torque values, proper inspections, and make proper entries in the appropriate forms. Of course, if we expect the maintenance man to be a professional, pilots must make complete write-ups in the 781-2, and they must subsequently check the 781 for corrective action taken. We in Safety do not advocate that forms and entries will cure all of our safety problems; however, we have found that accidents have resulted when discrepancies were not written up or were written up inadequately. In addition, the simple procedure of removing an item from an airplane without making the proper notation has denied subsequent investigators the exact cause of an accident. This is so critical that everyone concerned should be conversant with the proper use of the 781 and the other appropriate maintenance forms.

Here's a true incident of several years ago. Were these pilots true professionals or were they amateurs? Two "well qualified" T-33 pilots arrived at a west coast base, anxious for the party they had been anticipating all week. They advised the transient alert crew of their expected departure time and date and noted three major items that needed correction. This immediately placed the T-Bird on a grounding red-cross. Late Sunday afternoon the same pilots returned, filed a clearance, leaped in the airplane and flew home. After landing they discovered that the Form 781, which was so necessary for logging their flying time, was not aboard the airplane. NOTE: Check List Item Number 1—Exterior Inspection—Form 781 Check. The first item on the check list was not completed by these professional pilots.

Here was an accident in the making. It was prevented because maintenance personnel in this case were professional and had corrected the discrepancies.

Being a professional is a full time job and requires constant attention to the smallest of details. The modern supersonic airplane is not nearly as forgiving as the PT's and BT's we learned to fly originally. Suggestion: Each time you prepare to fly, ask yourself the question, "Am I a professional or an amateur?" ★

Col Jack D. Beckelman

WX FLYING...THEN.

ONE DAY LAST SUMMER, while having lunch in Seattle, a precise, white-haired gentleman recounted an experience of three decades ago while flying a Ford Tri-motor in weather. This story loses a lot when you can't watch this man's eyes flash as he relives the flight, but we are going to report it here anyway. Those who fly can visualize what he was going through as he negotiated a severe storm area just above the Tennessee hills. Then, just for contrast, and to illustrate that weather hasn't changed much after all, we follow this with an account of a fighter pilot as he busted *through a storm* area at 40,000 feet.

"On the night of March 31, 1933, the southern transcontinental tri-motored Ford night schedule came into Memphis where it changed crews. I was at that time flying First Officer with one of the most experienced pilots on the airline. We were to pick up the trip at Memphis and go on to Murfreesboro.

"Flight Superintendent Tom Ridley at Murfreesboro had sent through an advisory to hold the flight for the next weather sequence. We knew there was a frontal area working up from the south but knew nothing about its intensity. Weather reporting in those days left much to be desired, although the weatherman did his best.

"When the next sequence came through, less than half the stations between Memphis and Murfreesboro reported. About four stations were noted as missing. It had been raining lightly and while we were waiting the wind picked up considerably from the southwest. Ridley sent through a radiogram directing passengers to be taken to the hotel and to hold the plane and crew with mail and express for daylight departure. This was about 3:30 AM.

"While we were waiting for daylight, several heavy rainstorms crossed the field, the wind remained at about 15-20 mph, but the weather at Memphis did not look too bad. The weather at Murfreesboro was CAVU (Ceiling and Visibility Unlimited). The two stations on the weather sequence to the east of Memphis showed ceilings and visibilities about the same as that at Memphis but with higher winds.

"About 6:00 AM we were cleared for departure to Murfreesboro. In those days there was very little instrument flying done. We had instrument trainers and the instrument panel was based on the "Stark 1-2-3" Airspeed, Turn/Bank, Rate of Climb system. However, the LF radio ranges were poor with multiple courses and non-existent over many segments of the route and we did not trust ourselves on instruments in severe weather. We, therefore, planned to make the flight contact, as usual. When we started out it was possible to stay contact at about 600-700 feet. As we progressed the wind became stronger, the rain squalls became more frequent, turbulence increased, and at times we were forced to clear the Tennessee hills by about 200 feet. There was no thunderstorm activity, but as we progressed the turbulence got more and more severe until at times both of us were on the tri-motored Ford controls. Those who have flown this airplane will remember that the controls were considerably heavier than anything flying the lines at the present time. At times the yoke was full forward against the instrument panel to keep the plane from being sucked up into the clouds. Frequently we rolled the wheel hard over with full coordinated rudder to keep from being completely rolled over. On one severe jolt the cockpit door flew open and I saw rivers of water running down the sides of the cabin, although I had taken the precaution to turn the outside ventilator scoops facing aft.

"After passing through a severe stretch of turbulence, the Captain looked over at me and bellowed, 'You scared?' I bellowed back, 'Yes!' He came back, 'So'm I!!' It was evident to both of us that to go back was to go through the same muck we had just come through and we felt that it couldn't be any worse ahead.

"About thirty miles from Murfreesboro, right when it was blackest, and after we had received three or four terrific jolts, we suddenly broke directly out into brilliant clear morning sunlight with blue sky and green fields ahead. We circled the Ford around and took a look at one of the blackest walls of cloud I have ever witnessed, with characteristic white roller at about 1500 feet altitude, stretching as far north and south as we could see. We both agreed we would never have entered that storm from the front. We had sneaked up into it from behind until we were in so deep that we felt it would be just as easy to proceed as to return."

. . . AND NOW

And now, extracted from the fighter pilot's debriefing notes, impressions as he made a planned penetration in an F-106 research aircraft, at mach 1.63.

"As I approached the storm, it was very well defined. It was puffy, glaringly white on top, but on the under side of these puffs, it was grayish. It looked to me like it was really boiling. The western edge of it was very clearly defined into a solid wall. As I got to within a few miles of the storm at my target altitude of 40,000, eyeballing the tops of them, it looked like they were around 44,500 or 45,000 feet. As I went into it, light precip began almost immediately, and the cloud darkened as I went into it more. The heavy precip started as soon as the cloud started getting real dark. This is where I think most of my turbulence was. I came out of this heavy turbulent area into a relatively smooth area. It was still raining, however. And then the turbulence increased again, and in this area I think I got the hail. I could hear it hitting on the airplane, and the turbulence increased up to a level slightly less than my first area of turbulence. Keeping my attitude straight and level on my attitude indicator, I came out of the top of the storm, or the clouds at 43,500. But up ahead of me there were higher clouds, which I went right back into, and then I pulled up — pulled up to about 47,000 feet, made a left turn, and I could see this general cloud picture very well. One of the interesting things, after I got on top at 46—between 46 and 47,000—the turbulence I would classify as almost moderate. I think any other airplane would probably have had difficulty up there. It was really bouncing me around. I was well on top of all the clouds when I experienced this moderate turbulence, on top. I would say I was 2000 feet above any cloud." ★

Editor's Note: Our thanks to Mr Dan Beard, Assistant Vice President, Safety, American Air Lines, for the account of his flight in a Tin Goose; we filched the '106 experience from a Project Rough Rider report.

ACES PROMOTE SAFETY

Men who were once occupied in the destruction of aircraft, property and lives now devote their efforts to saving the same. Assigned to the Directorate of Aerospace Safety, DTIG, these officers are using their knowledge to prevent aircraft and missile accidents. Their experience totals up to more than 41,000 flying hours, 1093 combat missions and 96¼ aircraft kills. However, combat skill alone is not enough; they have eight bachelor degrees and three masters. Left to right: Col James P. Hagerstrom, Col Frank Q. O'Connor, Col George T. Buck, Commander Norwald R. Quiel, USN Liaison Officer, Brig Gen Jay T. Robbins, Lt Col Frederick C. Blesse, Maj Eugene P. Sonnenberg, Col Paul P. Douglas, Jr., Col William A. Daniel. Also assigned to the Directorate of Aerospace Safety but not in the photo: Col Arthur F. Jeffrey. (Since this picture was taken Col Hagerstrom has been reassigned and Col O'Connor has retired.)

The Blue Canoe In '62

IF YOU REALLY WANT to establish an outstanding safety record, how about this combination? Take young men who meet rigid physical and intelligence standards, give them at least nine months of the best flight training in the world, then provide them with a well-proven, light twin-engine airplane. Oh yes, restrict all flights to VFR unless two of these pilots are aboard and never permit flight in icing conditions.

Then suppose at the end of the year — take 1962 for example — you check up to see how this has worked out. WHAT? Five major and four minor accidents? How come? Eighty per cent of the majors caused by pilot error in judgment and technique! Six people killed!

This is terrible. Surely it hasn't been that bad in the past. No, the rate is four times what it was the year before.

How?

Two flew into mountains — one on an IFR clearance and the other while trying to maintain VFR in marginal weather conditions at night.

In one case an airspeed indicator had a history of indicating 10 miles per hour higher than actual. Finally, a pilot turned final a little high, reduced power to maintain a final approach speed of 95 mph, started his flare at 30 feet, immediately stalled and crashed on the runway.

In another case the pilots experienced engine failure, feathered the prop on the good engine; then, after restarting the good engine, failed to establish maximum power, lost additional altitude and decided to crash land due to loss of altitude, airspeed and impending darkness.

And, in one case, materiel failure was tagged with the primary cause. A main gear collapsed upon landing due to failure of the drive tube assembly. Improper rigging of the gear contributed to the failure of the part.

What do the accident prevention analysts have to say about such a record? They conclude that 80 per cent of the major accidents caused by pilot errors in judgment and technique should confirm the fact that the "blue canoe" is not a toy. It requires the same respect and professionalism demanded in other aircraft. Increased emphasis on proper operation is required during training and standardization flights. They urge additional emphasis on the necessity for professional airmanship and aircrew discipline during all phases of flight as a prime requirement for reduction of pilot factor accidents.

Now what do you do? There is no airplane that is impervious to flight into a mountain. There is no twin-engine airplane that will maintain altitude and airspeed when one engine fails and the other one is then shut down. There is no airplane that can be dropped in from 30 feet without some damage and, eventually, malfunctioning instruments only lead to trouble if not repaired.

As sure as the '62 Summary shows, if pilots persist in such attempts they are going to die, and airplanes are going to be destroyed — even pretty little "blue canoes." ★

SYMPTOMS AND CURES ....

On this page are several displays depicting engine problems in the F-104. The idea is to examine the instrument readings, determine the trouble and test yourself as to the best procedure to use for correcting the problem. Diagnoses and recommended procedures are to be found on the next page along with a brief discussion of the Concerted Flight Safety Program from which these problems were extracted.

Fig. 1

NOZZLE FAILS TO OPEN POSITION DURING MILITARY THRUST OPERATION

THROTTLE-MILITARY

Speed	350 knots	Alt	3500′
RPM	100%	MFF	4000
EGT	350°	Oil	40
Noz	10	CIT	+15°

Fig. 2

I G V CLOSURE

THROTTLE-MILITARY

Speed	.84M	Alt	32K
RPM	100%	MFF	2200 military
EGT	590°	Oil	40
Noz	5	CIT	−5°

Fig. 3

FLAME OUT

THROTTLE-MILITARY

Speed	250 knots	Alt	45K
RPM	90%	MFF	500
EGT	100°	Oil	30
Noz	1	CIT	−34°

Fig. 4

ENGINE SEIZURE DUE TO OIL SYSTEM FAILURE

THROTTLE-86% SEIZURE TAKING PLACE

Speed	300 knots	Alt	10K
RPM	75%	MFF	2500
EGT	650°	Oil	0
Noz	10	CIT	+10°

Fig. 5

LOW ALTITUDE STALL — BELOW 15,000 FEET

THROTTLE-MILITARY

Speed	350 knots	Alt	4500′
RPM	74%	MFF	1500
EGT	800°	Oil	26
Noz	10	CIT	+20°

Fig. 6

HIGH ALTITUDE HIGH MACH STALL, ABOVE 15,000 FEET

THROTTLE-FULL AFTER BURNER

Speed	2.0M	Alt	35K
RPM	103.5	MFF	6000
EGT	590°	Oil	44
Noz	9	CIT	+100°

A FEW MONTHS AGO John Fritz and other General Electric engineering test pilots visited F-104 units, worldwide, to put on a concerted safety program tailored specifically for F-104 engine emergencies. In connection with this program they prepared a booklet called the General Electric Concerted Flight Safety Program, with slide presentation, designed to help pilots recognize, identify and correct any inflight engine malfunction quickly and successfully. (The booklets have been left with or are being distributed to all F-104 units.)

It would appear that the technique used could be applied to other than the F-104.

Each section deals with a different malfunction. On the left hand page of each section are shown the key gages for diagnosing the particular emergency. At the bottom of the page the throttle position or other operating conditions are noted to provide all the information required for analyzing the problem. On the right hand page are listed the "Key Recognition Points" and the "Emergency Procedure" as shown on the Pilot's Abbreviated Check List. The purpose is to provide, at a glance, what the pilot sees as a particular malfunction and what he can do about it.

Following this section, a "Fireside Chat" section expands on information contained in the Pilot's Handbook. The booklet's originators explain that, since an emergency rarely appears exactly the way it was anticipated, and no procedure ever seems to go exactly as practiced, information in the "Fireside Chat" section is mandatory for the pilot who wants to be able to THINK, as well as DO, when the emergency arises.

When it comes to engine troubleshooting, these GE specialists point out that the EGT gage is the pilot's primary instrument for inflight engine analysis. Other engine instruments, such as RPM, nozzle, main fuel flow and oil pressure, are secondary or supporting instruments which may explain a given EGT. Corrective action should never be taken on the basis of one instrument alone. For instance, RPM unwinds rapidly both in a severe stall and in a flameout; only the fact that EGT is high in the case of stall and low in the case of flameout, can allow the pilot to differentiate between the two.

In the same way, the nozzle can be wide open both in stall and nozzle open failure. Again, EGT, which is high during stall and low during nozzle open failure, lets the pilot identify his problem. It is for this reason that the authors state that the pilot should always check EGT first, then the other gages. If this is done, they add, the pilot will be spared the embarrassment of performing the right procedure at the wrong time.

Their concluding reminder is that, if the reader is like most pilots, he will probably never have to use the emergency procedures covered; if the occasion does arise, however, thorough knowledge of the material presented will enable him to handle it successfully. ★

.... SYMPTOMS AND CURES

SITUATION	KEY RECOGNITION POINTS	PROCEDURE FOR CURE	
FIG. 1 NOZZLE FAILS TO OPEN POSITION DURING MILITARY THRUST OPERATION	1. EGT low 2. Nozzle max open position 3. Noticeable loss of thrust	Nozzle fails open during flight 1. THROTTLE – MILITARY 2. EXHAUST NOZZLE HANDLE – PULL 3. Check for nozzle closure and monitor EGT. If nozzle fails to close, push handle in.	NOTE: If nozzle fails open in landing pattern 1. EXHAUST NOZZLE HANDLE – PULL 2. REDUCE DRAG 3. FLAPS – TAKEOFF 4. Monitor nozzle position.
FIG. 2 IGV CLOSURE	1. RPM, EGT normal 2. Nozzle too far open 3. Fuel flow abnormally low (less than half of normal) 4. Severe thrust loss.	1. Throttle – AFTERBURNER Monitor EGT to minimize over-temperature 2. Stores – JETTISON as required 3. Make precautionary pattern, T.O. flaps only, extend gear only after flare is assured.	NOTE: This failure and procedure is not listed in the Pilot's Handbook at the present time. It is included in this instruction by G.E. to serve as an interim until appropriate instructions are issued in the Pilot's Handbook.
FIG. 3 FLAME OUT	1. Slight, sometimes audible "pop" or "chug" followed by thrust loss. 2. EGT very low. 3. RPM unwinding rapidly.	AIR START 1. START SWITCHES – START 2. IF RELIGHT IS NOT OBTAINED OR RPM HANG-UP OCCURS, THROTTLE – STOPCOCK AND RETURN TO MILITARY.	3. IF NO START OCCURS, START SWITCHES – START 4. RAT HANDLE – PULL 5. START SWITCHES – START
FIG. 4 ENGINE SEIZURE DUE TO OIL SYSTEM FAILURE	1. EGT rising. 2. RPM unwinding. 3. Increasing, severe vibration.	1. Throttle – OFF 2. RAT – EXTEND 3. Make deadstick landing or – EJECT. NOTE: This specific failure & procedure	is not listed singly in the Pilot's Handbook. It is included for illustration & education. This procedure is not intended to conflict with or be used instead of official handbook procedures.
FIG. 5 LOW ALTITUDE STALL – BELOW 15,000 FEET	1. High EGT 2. Full Open Nozzle 3. Low RPM	Engine Stall Clearing Below 15,000 Feet 1. THROTTLE – STOPCOCK 2. START SWITCHES – START 3. RPM – 70% OR BELOW 4. THROTTLE – MILITARY	5. Monitor RPM to 100%, land as soon as practicable. Do not decrease RPM below 97% until landing is assured. 6. If RPM stops at 94%, a cold shift has occurred. Land as soon as practicable, adjusting pattern for maximum RPM of 94%.
FIG. 6 HIGH ALTITUDE, HIGH MACH STALL, ABOVE 15,000 FEET	1. EGT 2. Nozzle All fluctuating above & 3. RPM below normal readings as 4. Fuel Flow "bang bang" stalls occur. 5. "Bang Bang" stall sounds & sensations. 6. Aircraft oscillation in yaw 7. Aircraft deceleration	ENGINE STALL CLEARING. Above 15,000 Feet. 1. THROTTLE – MILITARY 2. THROTTLE – IDLE: Check EGT and RPM for possible hang–up. 3. If stall still persists, use procedure for "Below 15,000 Feet."	

MISSILANEA

GAR-8. Incidents involving damage to the glass dome of the GAR-8 Guidance and Control Unit continue to occur as the result of negligence, inadequate supervision and lack of proper training.

In addition to damaging the missile a mishap may create a personnel hazard. The GAR-8 Guidance and Control Unit contains a gaseous mixture called Mercury Thallium. These elements are poisonous. Mercury Vapor enters the blood stream via the lungs, condenses and is absorbed as a compound. One or more of the following symptoms may be evident: Inflammation of the mouth, loosening of the teeth, muscular tremors and nerve disorders. There is no specific treatment for Chronic Mercury Poisoning.

Thallium is a silvery-white metal which melts at 300 degrees Centigrade and is found in combination with other ores such as zinc, lead, bismuth or platinum. The chief hazard comes from inhaling and absorption of the dust, the metal tending to accumulate in the blood to cause a chronic poisoning. The main effect is on the nervous system and the endocrine glands. Loss of hair, cataracts on the eyes, and inflammation of the kidneys and sex organs usually follow.

All missile handling personnel should be aware of these hazards and use caution.

Missile Safety Office, Nellis AFB, Nev.

GAR-8 Investigation of a recent GAR-8 (Sidewinder) missile incident indicates the cause to be related to materiel failure or personnel error regarding the influence fuse O-ring seal; therefore, the following data extracted from the NOTS Air Weapons Bulletin are considered worthy of command and supervisory emphasis in the missile safety efforts of all GAR-8 units.

The two motor O-rings for which ordnance men are responsible are on the influence fuze and the nonpropulsive attachment (NPA). The following instructions should be followed whenever O-rings are installed:

- O-rings should always be installed in a clean, undamaged condition, free of dirt, metal chips and other foreign matter and without cuts or cracks of any kind. If foreign matter is present on the O-ring or in the O-ring groove, the possibility of damaging the O-ring during installation is very high.
- Silicone grease (DC-11) should be used when O-rings are installed to ease installation and ensure proper seal. The O-ring should be thoroughly cleaned before a light coating of grease is applied.
- Never re-use the influence-fuze O-ring. This O-ring seals the critical junction between the fuze and the rocket motor chamber. If this seal is not complete, hot propellant gases will escape from the rocket motor chamber and a motor failure will occur. Inspect the new O-ring carefully for damage or foreign matter, apply a light coating of silicone grease, and install.
- The NPA O-ring may be re-used, but a careful inspection should be made before installation. If any damage is found, the O-ring should be discarded, and a new one installed.

The NOTS Air Weapons Bulletin

CHECKLIST SHORTCUT. Checklists spell out the step by step procedure for motor change on the MB-1 Rocket. SOPs stipulate that the normal crew be augmented by one person for that part of the operation that entails use of the MC-1 handling bar. Equipment damage and personnel injury resulted when, in the absence of the augmenting crewmember, the check list monitor laid his checklist down and attempted to assist. Items on the checklist were omitted and the incident resulted. ★

AERO BITS

NEAR MISS — RUNWAY TYPE. Occasionally a classic happens — like the T-Bird and the F-100 on the landing roll on intersecting runways at speeds which placed them at the intersection at the same time. That T-Bird jock was fast mentally and dexterously — he cobbed the power and hopped right over that F-100. He couldn't hold it up though and the T-Bird mushed back to the runway and ran off the end. The bird suffered minor damage only . . . It would be interesting to have a movie of that pilot's thoughts.

Lt Col K. I. Bass, Directorate of Aerospace Safety

T-BIRD HANDBOOK REVIEW. SMAMA convened the T-Bird handbook review conference at Lockheed, Burbank, Calif., some months ago. The reviewers came well prepared. Frequent knock-down, drag-out verbal exchanges ensued, but the chairman qualified as an able arbiter and he made agreement possible. The conferees, though much biased, think the new handbook will be far better than the old. Nonessential wordage, and some whole paragraphs, have been eliminated. Obscure and misleading explanations of systems and procedures have been either eliminated or clarified as necessary. The trend of building bulk has been reversed, and it is hoped not temporarily.

Lt Col K. I. Bass, Directorate of Aerospace Safety

T-33 CANOPY SYSTEM—"The Prime cause of this accident is personnel error in that the occupant of the rear seat inadvertently actuated the canopy ejection system as he reached for the seat adjustment switch."

We could stop right there. The facts are apparently contained in those few words. But if we look a little deeper we find other interesting items that should be brought out.

A non-rated officer was to occupy the rear seat of a T-Bird. After strapping in, he reached down between the seat and the side of the fuselage to actuate the seat adjustment switch. His shoulder harness was locked which made it difficult for him to bend over far enough to reach the switch. As he continued reaching for the switch, the canopy system was actuated.

Apparently in reaching for the switch this man pulled the pin streamer and the T-Handle with his sleeve, causing the T-Handle to rotate forward and fire the initiator.

This was the subject's third ride in a T-33 but he was unaware of the function of the canopy jettison handle. Although he had been thoroughly briefed on the seat ejection system, he did not recall ever being told anything about the canopy T-Handle.

Obviously, pilots should brief passengers on all such systems. However, there is no published checklist for briefing passengers. It's up to the pilot to remember each item. Among the recommendations brought out by the findings in this mishap are:

- A requirement that pilots and crewchiefs check for loose safety pins during preflight. In this case the pin installed in the initiator was loose.
- Canopy initiator pin should be considered as a flight status pin to be removed by flight personnel at the same time seat pins are removed. If no one is to occupy the rear seat, the pin should not be removed by ground personnel until after the pilot is completely strapped in.

SAME CHORUS, 'NOTHER VERSE—THE HURDLES. Contractor personnel performing construction work on an approach light project had left three-foot mounds of dirt and galvanized iron material approximately 200 feet short of the approach end of the runway. There's probably not a safety magazine reader in the Air Force who doesn't know what is coming next. But, at the risk of redundancy and for the sake of possibly getting the word to a few more who might heed, here's what happened this time. An aircraft,

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◀ **TWO-MAN GANG.** First photo of the Air Force's new two-seat supersonic tactical fighter, the F-105F after it came off the assembly line at Republic Aviation Corporation, Farmingdale, L. I., May 23. The 1400 mile-an-hour jet can carry 4000 combinations of nuclear and conventional weapons. The F-105F will see service with the seven Air Force wings now flying the single-seat version of the Mach 2 jet, with the Tactical Air Command in the U. S., and with Air Force units in Europe and the Far East.

inbound for landing, just barely didn't make it. The right rear tire struck a metal cylinder, causing it to bounce up and strike the leading edge of the right horizontal stabilizer. This made a 14-inch hole that required 71 manhours to plug.

Now that we've again said goodby to the horse, we note that procedures established to fix this barn door include: Aircraft land at least 500 feet down the runway and cross the threshold with a minimum of 10 feet of altitude. All construction will be lighted during the hours of darkness. Control tower to issue advisories to all landing aircraft on the status of construction.

STALL, CRASH AND BURN. Unprecedented is the word which best explains the T-Bird accident picture as of 31 May 1963, particularly in pilot factor accidents. In preliminary analysis only one "pilot factor" primary cause had been assessed in a total of nine accidents. The pilots were killed in this regrettable accident. It was the crash and burn type from an accelerated stall in the traffic pattern. This is the type of accident that reflects the alarming traffic pattern accident trend shown during 1962. All safety media have been used quite extensively during the past few months to emphasize this problem.

Pilots must be required to fly a power-on pattern, keeping it loose. Today's modern aircraft are flown in this manner and the T-Bird rests but one rung down the ladder. All flying supervisors should liberally give of their time to observe their pilot's traffic pattern technique.

Lt Col K. I. Bass, Directorate of Aerospace Safety

CHOPPER CHATTER. The versatility of helicopters makes possible operations into and from non-airfield locations. Of course, flying under these conditions can be, and often is, very hazardous. Common sense and review of past accidents dictate that non-airfield operation be authorized, properly supervised, professionally conducted and held to the absolute minimum for mission accomplishment. Paragraph 11 of Air Force Regulation 60-16, dated 20 November 1962, establishes the conditions under which helicopters may be operated at non-airfield locations.

"11. Helicopter Landing Areas. Commanders of non-flying Air Force stations who require helicopter support will designate safe landing areas. Helicopter aircraft are authorized to land at non-airfield locations (such as fields, highways, and parks), provided:

a. A military requirement exists for such landing.

b. Specific written orders are issued to authorize use of non-airfield areas.

c. Adequate safeguards are taken to permit safe landing and takeoff operations without hazard to people or property.

d. There are no legal objections to landing at such non-airfield sites.

NOTE: Air Force installation Commanders are authorized to waive the provisions in paragraphs a through d above when dispatching helicopters engaged in rescue operations."

Lt Col James F. Fowler, Directorate of Aerospace Safety

Ever seen a pair of these "Fly Safely" wings? They were fabricated at Tachikawa Air Base in 1957 and '58 from reclaimed C-124 propeller metal and presented to aircrews as incentive awards. They are now scattered throughout the world. Just goes to show there is no limit when it comes to accident prevention efforts.

Courtesy Maj Virgil O. Hall (Ret.)

EJECTION FATALITIES—In two recent ejection fatalities, evidence indicated that the pilots apparently did not attach the chute arming lanyard anchor to the lap belt, thus negating automatic chute function. The time lost by the omission of this vital step was undoubtedly a major contributing factor in these fatalities.

A study of USAF ejection escape for the period January 1961 to December 1962, disclosed that failure to attach the chute lanyard to the lap belt contributed to three other fatalities. This needless loss of life can and must be eliminated. Crewmembers must insure that all procedures necessary to ejection survival are accomplished. The time required to manually deploy the chute is only one consideration. The confusion attendent with ejection can result in the loss of valuable seconds before it becomes apparent that the chute is not going to be automatically actuated. Crewchiefs can also help with this problem by making sure the pilot is correctly hooked up prior to taxi-out.

Robert H. Shannon, Safety Officer Life Sciences Group

C-47. An Instructor Pilot told a fledgling C-47 trainee to remove the gust locks and tie downs from the left side of the C-47 during pre-flight. Either misunderstanding or not knowing the difference, the trainee removed the left main gear down lock along with the gust locks. He handed them to the IP who stowed them aboard. The IP then directed the student to pump up the hydraulic pressure. Not being real sure which handle was which, the student asked, "Is this the right one?" The IP really couldn't see which device

AERO BITS

Continued

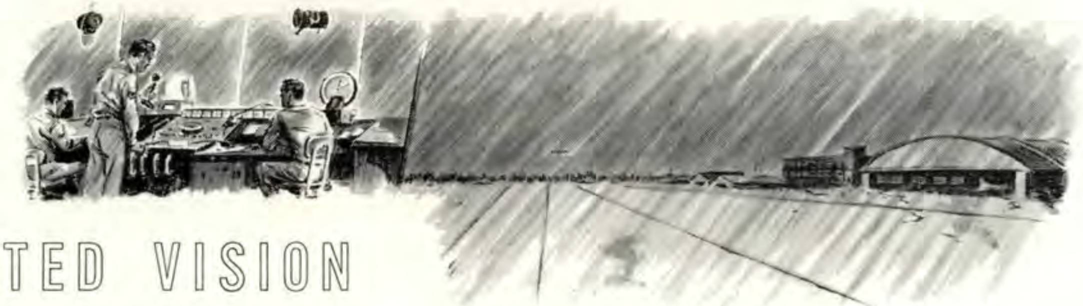
the pilot had his hand on because the troop was kneeling in the aisle. But he nodded his approval and said to pull on it right hard. (After all, who in the world would mistake a hydraulic pump handle for landing gear latch handle?) Pushing on the safety catch, the fledgling gave it a bloody pull and sure enough one of the gears collapsed. The left prop, wing, oil tank, etc., (12,000 bucks worth at least) were severly damaged. For the C-47 drivers who might have a question or two – the landing gear handle was down but hydraulic pressure was zero.

● T-39 SEPARATION OF MAIN TIRE AND WHEEL. On takeoff roll, as the aircraft was rotated to takeoff attitude, the left main tire and wheel separated from the aircraft. The pilot heard a strange noise and felt the left wing dropping. He pulled the aircraft into the air and completed the takeoff. Fuel was burned down to about 500 pounds in each wing tank and the aircraft was landed on the right side of a 150 foot wide runway.

The aircraft remained on the runway for approximately 3000 feet and then swerved off the left side. The nose gear and strut broke off and the right main gear collapsed inward. Some fuselage and wing damage was sustained. Investigation disclosed that improper bolts were installed in the wheel.

An urgent action Technical Order 1T-39-734A was published requiring inspection of all T-39 aircraft and stipulating use of proper wheel bolts.

Maj Eugene P. Sonnenberg, Directorate of Aerospace Safety



RESTRICTED VISION

TSgt David F. Overman,
1st Mobile Communications Gp, APO 74 San Francisco, Calif.

LIGHTNING RIPPED A ZIG-ZAG path down the sky. Icy rain slashed across the airfield and pelted against the tower, trying vainly to penetrate its interior. The inside warmth caused ghostly mist on the window bases. This storm was cruel and would challenge any creature to execute sureness and exactness.

A few hours before the atmosphere had been calm, but now, as the storm flung itself across the landscape, an aura of danger prevailed and the tower men, placing themselves vicariously in the cockpit of each approaching aircraft, knew that steady demonstration of skill was required. "Beware of consequence if caution guide you," the eerie confusion from outside shouted. Only competence, gained through mastery of complexities, the drudgery of constant training and the pressure not to err focused real definition on the problem at hand.

"Now have him transmit," Sgt Whiteley demanded.

The direction finder, its needle moving swiftly, steadied on 185 degrees.

"He's five degrees left of runway 18. Turn him right 190, nice and easy."

"That's pretty good arithmetic," the one-striper exclaimed.

"Thanks, now have him transmit again, and if that needle points to 184 or less, turn him left and have him roll out on a heading of one-eight-zero. That should put him right down the middle. We won't have a second chance, so let's put that baby right in there."

Time. There's never enough in this game. Decisions are based on immediate circumstances; the pressure of possible error and its life-or-death result is always present. Little wonder that men age early in this business. Many drop out of the program—like ripe apples they fall damaged to the ground. Ground? Grounded. That's how the flight surgeon labels medically disqualified tower operators. Ironically, it is the ground which the airborne seek and which is the practical reward for a safely conducted flight.

"Turn left 180," the airman transmitted.

He and the sergeant stared anxiously toward the approach end of runway 18, the rain restricting their vision to a blurred two miles. "There are his lights."

"Yep, and he's got that 10,000 feet of concrete right in front of him. He can't miss."

Now the rain had changed its tune from a mournful dirge-like quality to a happy pattering sound on the glass walls. The speaker crackled: "Send me a tug, Tower, I don't have enough fuel to taxi in. And a real good job. I owe you guys a beer. How does that grab you?"

The sergeant, smiling now, keyed his mike. "Real good, sir."

Laughter sounded through the speaker, then all was silent. Again the tower atmosphere was quiet and serious. Delta Charley, a flight of two, reported. The deadly serious job of helping the birds to roost was resumed.

Maybe then, this was it—a restricted vision of greatness, the controller's reward for bearing the constant pressure, making hundreds of crucial decisions, sometimes bearing the brunt of ridicule from dissatisfied pilots, and always, always, aware of the importance of being right.

"What you thinking about, sarge?"

"Not much. With this rain I wonder if our relief is going to be here on time." ★

WELL DONE

Major Charles A. Ludwig

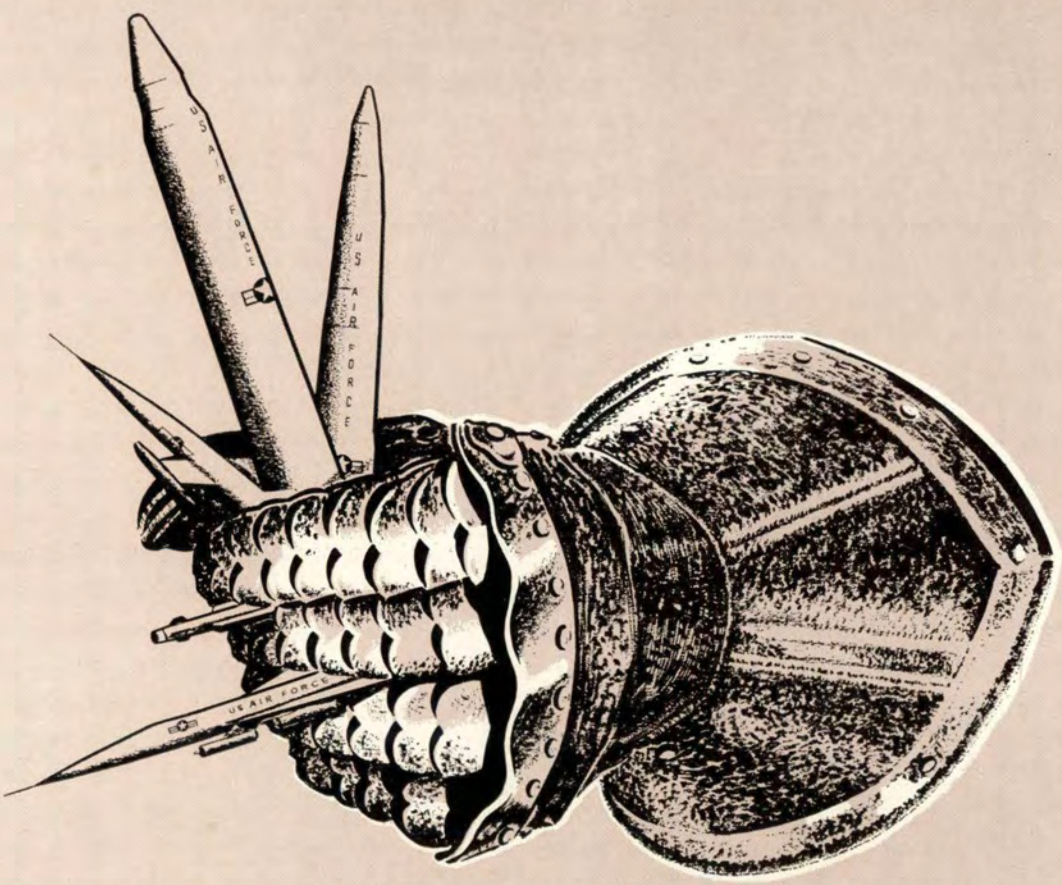
6515 Organizational Maintenance Squadron, Edwards AFB, Calif.

While en route to Hill Air Force Base, Utah, flying a T-33 at 29,000 feet over mountainous terrain, Major Charles A. Ludwig, 6515 Organizational Maintenance Squadron, Edwards Air Force Base, California, heard a muffled thump in the aft section, followed by an immediate flameout. He descended to 25,000 feet where he made several attempts to restart the dead engine and at the same time instructed the copilot to make the necessary Mayday calls and prepare for possible bailout.

Sighting a large break in the undercast, Major Ludwig decided to make a descent, knowing that the bases of the cloud deck of 4000-5000 feet would provide adequate altitude for ejection. If the airfield were not sighted and the aircraft were not ideally situated for a flameout landing, he would make a 180-degree turn toward the mountains to avoid the populated areas, and eject. Fortunately, the airfield was sighted and the aircraft was in an ideal position for a straight-in approach. Major Ludwig lowered the gear and flaps and crossed the end of the runway at 116 knots for a perfect landing approximately 800-1000 feet down the runway. Subsequent investigation revealed a frozen drive-shaft on the engine driven dual fuel pump, making it impossible to obtain fuel pressure for a restart.

For saving the United States Air Force a valuable jet trainer and averting possible loss of life in the face of what appeared to be inevitable ejection, Major Ludwig has earned a Well Done! ★

ABSOLUTE CONTROL



prevents personnel errors

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