AEROSPACE

SAFETY

UNITED STATES AIR FORCE

SEPTEMBER 1965

AEROSPACE SAFETY

CONTENTS

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AFRP 62-1 SEPTEMBER 1965 VOLUME 21 NUMBER 9

FALLOUT

DISRUPTIONS. . . .

I've read Rex Riley's note "Disruptions, Disruptions" in the May issue and would like to have this incident viewed from a little different angle.

Perhaps the heading for this article should read, "Poor Planning." Disruptions 2, 2 plus, and 4 could have and should have taken place prior to the aircraft's entering the traffic pattern. Furthermore, the request to the tower (Disruption 2) is in violation of AFM 60-5, Par 2-3. Several locations have Pilot-to-Dispatcher (PTD) service available to provide direct communications to Operations. It is possible that the tower controller was busying himself with this pilot's request for a Non-ATC function rather than eyeballing the aircraft for abnormal conditions. Par 8-13, of AFM 60-5 would provide interesting reading for several of us.

Disruption number 3 is a mandatory transmission. (See FAA Manual of Air Traffic Control Procedures AT P 7110-1B, par 411, which is directive on USAF per AFM 60-5, par 1-1.)

Capt James F. Meyers
2025 Comm Sq, Hunter AFB, Ga

THE IPIS APPROACH

I certainly have enjoyed your new feature page "The IPIS Approach!" As a recent graduate, I am well aware of their qualifications to deal with the type of questions that so often go unanswered by instructors and examiners. Too often the answers given are "I'll look it up and let you know" or "Let's ask standardization," and little or nothing is satisfactorily answered. This page in your magazine will give everyone a direct line with the top authority. I have two questions . . . * * *

Capt Robert F. Wearley
1709 Tech Tng Sq
Tinker AFB, Oklahoma

Thank you for the kind remarks. You can expect answers from the school, and possibly both questions and answers published in AEROSPACE SAFETY as space permits.

SIMPLY PULL THE RING AND . . .

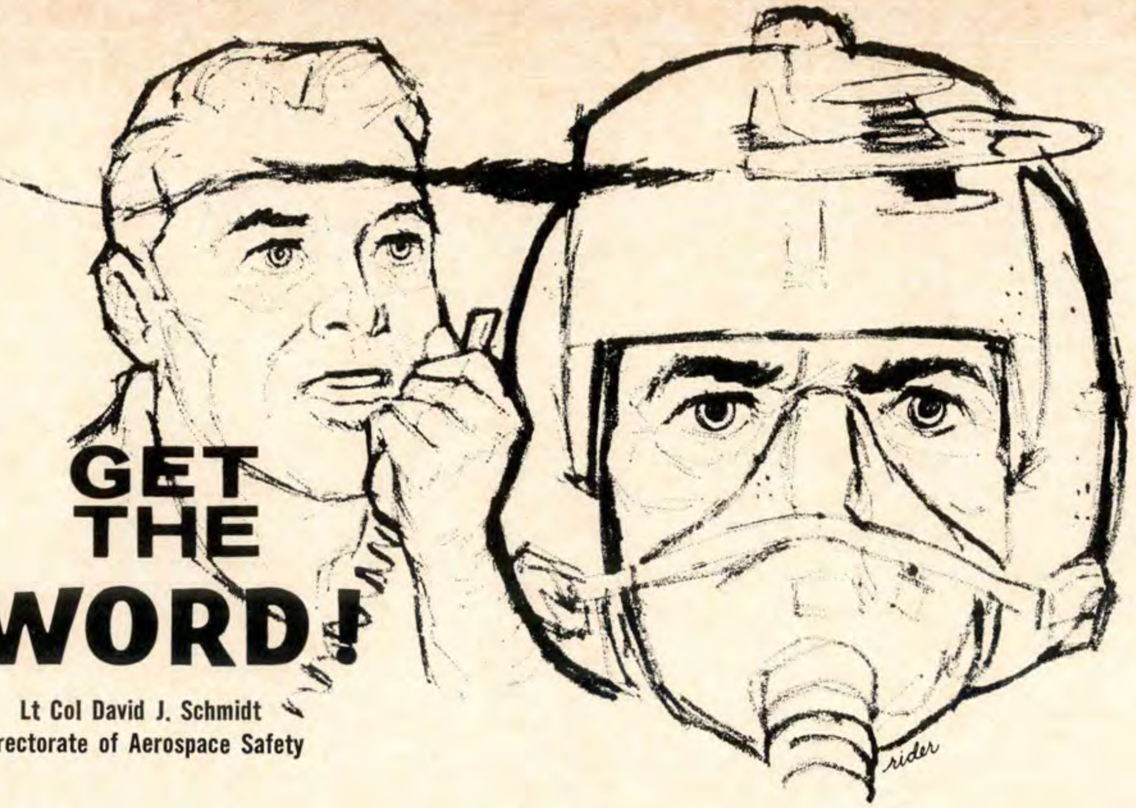
The following comments are forwarded to up-date the article "Simply Pull The Ring and . . . ," by S/Sgt Robert E. Brock, page 19 of the June issue.

T.O. 14D1-2-601, 4 March 1965, requires that the J-1 parachute release be assembled and maintained in such a manner that a *maximum* of 25 pounds dead pull will always activate the release.

Point being, if a greater than 25-pound pull is required to activate the release, then the chute with this release should never leave the Personal Equipment shop. Therefore, recommend that when you preflight your personal chute, if you feel the required pull to activate the quick release exceeds 25 pounds, make the Personal Equipment shop prove you wrong.

SSgt Felix L. Smith
MOAMA, Brookley AFB, Ala

Good point. But preflight of quick release should be done in the PE Shop.



GET THE WORD!

Lt Col David J. Schmidt
Directorate of Aerospace Safety

It is not uncommon for an aircraft accident investigation board to find that a pilot or crew could have ejected and escaped the impact area of an aircraft crash if they had been warned in time.

Some control towers have the communications capability to transmit and receive on departure control frequency and the "saves" they have effected are, no doubt, numerous. But we rarely, if ever, hear about them. We are recipients of tragic news that another crewmember perished because no one could get through to him on the radio and he acknowledge in time to take life-saving action. For example, an aircraft made a second takeoff attempt after an abort in which the drag chute had been deployed but not jettisoned. The Supervisor of Flying and tower operator helplessly stood by watching disaster develop when they were unable to "get through" to advise the crew to abort.

More recently, the fuselage of an aircraft became engulfed in flames shortly after takeoff. Fuel in an aft fuselage tank ignited about the time the aircraft lifted off the runway. The tower operator advised the crew on guard channel that their tail was on fire but received only one aircraft transmission that was heard: "What's on fire?" The tower operator repeated his warning message but to no avail. Of the four crewmembers aboard, the copilot was the only one to eject, but too late to escape the fire pattern of the crashing aircraft. All four suffered fatal injuries. This airplane had attained an altitude of approximately 1100 feet and about 180 knots — above the emergency minimums for successful ejection. But —the crew just didn't "get the word."

Air Force Communications Service has encouraged base commanders to provide their control towers with the added capability for tower operators to transmit and receive on departure control frequency. This enables the pilot to respond directly to the tower operator on departure control frequency in the event of an emergency during or shortly after takeoff. At present approximately 60 per cent of the Air Force control towers have the capability to override on departure control frequency and "get the word" to the pilot during takeoff. It would be impossible to estimate how long it will take to so equip the remainder.

AFCS provides us with control tower operators and issues their operating procedures, but not the equipment. Their procedures require normal tower frequency coverage plus either two-way departure control coverage, or departure control reception monitoring plus transmissions on Guard. The standard instructions issued by control tower operators, before an aircraft commences takeoff, are to switch to departure control frequency before takeoff and monitor guard channel.

Several articles have been written on the use and misuse of guard channel, which has at times been referred to as a sort of "International Common" frequency, and it is obvious that non-emergency chatter still clutters up this frequency to a point where critical emergency instructions may not get through.

Until such time as all USAF control towers have this dual capability, it behooves every crewmember to be particularly attentive to departure control frequency and guard channel throughout the takeoff and climb portion of his flight. This is awfully cheap insurance where the only premium is "open earballs" and catastrophe may be the penalty for inattention. ★

Too Much Togetherness

During the two-year period 1963 and 1964, Air Force aircraft were involved in 43 midair collisions. Twenty-three of these were classified as major accidents, 11 of which involved USAF crew fatalities. That's one major accident a month and a fatal accident every two months, sufficient to confirm that we have a major problem. Fortunately, the solution may not be as difficult as it may seem at first glance. Only 7 of these midairs involved aircraft were not in some way associated, i.e., refueling, flying formation, intercepts. However, a broad recommendation such as "keep your eyeballs out of the cockpit," won't suffice.

For example, the problems during refueling range from poor pilot technique to altimeter discrepancies, with others in between. The interceptors have their own set of problems, and formation flying involves several commands, each with its own set of peculiarities in addition to those that are common. For those who think formation flying is formation flying and that's that, consider the problems involved when undergraduate pilot students are flying formation acrobatics. This is quite a bit different from experienced heads flying formation in tactical fighters. Here are some f'r instances.

A flight of six F-100s were on a night refueling and navigation proficiency mission. Due to various factors, including one pilot who lost his radios, two of the aircraft collided and both pilots had to eject. The events immediately before the collision were essentially as follows: Nr 5, the one without radio, was on lead's left wing. To his left was Nr 6, who had been Nr 5's wingman but who had been instructed to move up and lead Nr 5 in to a landing. Unfortunately Nr 5 didn't know this. While trying to attract lead's attention he had closed in and tried various methods including a pen light, fuel probe light and the cockpit utility light. When he moved back out to his left he was not aware that Nr 6 had moved up, and his aircraft collided with Nr 6. Prior to impact Nr 6 simply thought Nr 5 was moving over to join up on him.

The pilot of Nr 6 aircraft was tagged with the primary cause — because he assumed Nr 5 was joining on him and he did not take evasive action. A dissenting member of the investigation board argued that it was not the fault of the individual pilot but rather supervisory error in that night formation procedures with lost communications were inadequate.

Another kind of formation flight provides a sharp contrast. A pair of T-Birds, one occupied by a solo student, were flying formation acrobatics. During an Immelmann, Nr 2 (the student) encountered the jet wash of lead and failed to follow through on the rollout. This put him inverted above lead at 7 o'clock. With lead straight and level, the student tried evasive action by pushing forward on the stick and rolling to his right. He crossed over lead from left rear to right forward in a rolling, descending motion. His left tip tank struck the right tip of lead, tearing off both tip tanks. After controllability checks both aircraft landed safely. The primary cause was determined to be operator error on the part of the student for failure to maintain spacing.

To further complicate matters here's another case with a little different twist. An F-104 was on a check flight with a like aircraft flying chase. Lead had some difficulty so he asked the chase pilot to inspect the under part of the aircraft. Meanwhile the chase pilot had fallen out of position so he rammed on the coal, overrunning lead from below and right to left. While overrunning the leader he attempted to look up and inspect the other aircraft. Result: as the chase aircraft crossed in front of lead, the left horizontal stabilizer of chase hit the right side of lead's nose section. Fortunately the damage to both aircraft was minor.

In assessing the primary cause, the investigators decided that the chase pilot exhibited poor technique in attempting to visually check the other aircraft while crossing and overrunning. As a result, all pilots were to be rebriefed on formation techniques and a procedure would be established for making visual checks.

Here's another midair labeled pilot factor, but, as usual, there were some extenuating circumstances. As the formation headed home from the range one of the jocks was having trouble closing his MN-1A dispenser doors. The formation spread out while he attempted to get the doors closed. As the doors finally closed the pilot realized that he was sliding into the aircraft on his left. He made a last-moment rolling pullup but the gun bay of his bird struck the wing tip of the other aircraft. It just happened that while this was happening the other pilot was scanning the area in the opposite direction and didn't see the aircraft sliding into him. Again, they were lucky — only minor damage.

The finding of the Board was that the pilot with dispenser trouble was responsible because he became preoccupied with closing the dispenser doors while flying formation. A contributing cause was that the complicated system for MN-1A doors invited pilot preoccupation.

REFUELING

Now let's look at a couple of refueling mishaps. In one case an F-4C was rendezvousing at night with a KC-135. Before he had reached the correct offset for completion of the rendezvous, the F-4C jock called for the tanker to turn on course. This resulted in a stern chase and the fighter had trouble with the tanker's wing wash. After a couple breakaways, the fighter came in for a third attempt. At this point the boom operator noted that signal coil continuity was lost so he briefed the receiver on the manual procedure. As contact was made and fuel transfer begun, the nozzle light seemed to go out. Then the receiver pilot said there was a leak and the boom operator thought he saw fuel in the slip stream. As the receiver moved away the copilot of the tanker noticed that hydraulic pressure had gone to zero. The boom was then retracted and stowed using the emergency hoist pump. Fuel dumping, however, was unsuccessful.

In this case the fighter tried contact for 25 minutes, which exceeded the fighter on-fighter off and abort point, without making a successful contact. During one of his attempts to hook up, the fighter rammed the tanker boom ice shield breaking the hydraulic line to the dump finger. Loss of hydraulic fluid caused loss

of boom control. Lack of proficiency on the part of the receiver pilot was blamed for this mishap.

During another night refueling between a KC-135 and an F-105, the tanker boom lower nozzle light went out and the boom operator advised the pilot to close very slowly for the last five feet. (Two other aircraft had fueled with the light out without difficulty.)

As the boom operator attempted contact the fighter was overshooting slightly and the operator couldn't see the end of the boom. The '105 backed off for another try and encountered light turbulence. At the same time the boom struck the aircraft, inflicting a 20-in gouge in the panel beneath the air probe door and breaking the outer glass on the left forward windscreen. Cause factors: lower nozzle light inoperative; pilot of receiver overran; boom operator did not keep the boom clear; insufficient light from the receiver; lack of procedure.

Action was to restrict night refueling with the lower nozzle light out except in emergencies.

Fortunately, these accidents resulted in only minor damage. There have been more serious refueling accidents recently, one in which an F-105 was lost and another in which a B-47 and its crew went into the ocean. A few years ago a B-47 collided with a tanker with only one person surviving from the bomber, which crashed in a remote area.

Interceptors, too, have their problems. In the past two and a half years there have been five major accidents involving collisions during intercepts. But here the rule of see and be seen is complicated by another factor. Four of these collisions occurred at night when the only real reference was radar. Granted that scope interpretation is somewhat more difficult than visual location, pilots must nevertheless accept full responsibility for providing clearance during these required and intentional close passes. Precise range, azimuth, and elevation information is clearly presented on the same scope as that steering dot. Yet, in case after case, pilots have become so overwhelmingly preoccupied with a dead center dot that they have ignored this vital information. While a centered dot is admittedly the "name of the game" both for peacetime filling of squares and for combat effectiveness, we have yet to issue a requirement for a ram follow-up to insure the kill.

These examples could continue for many pages, but only one more will be presented, this one because it points up, tragically, how various ingredients combined to almost guarantee an accident. These ingredients were:

- Mixing a high speed fighter aircraft with slow aircraft at low altitude.
- Aircraft design which made it difficult for one of the pilots to see the other aircraft.
- Failure of one of the pilots to make sufficient effort to observe the other aircraft.

This accident occurred when a fighter, returning from a low level mission, collided with a helicopter. The chopper crashed and the fighter pilot was forced to eject.

Study of the accident factors indicated that the primary cause was that the pilots simply didn't see each other's aircraft. But consider the other factors: penetration and approach required much of the fighter pilot's attention in the cockpit; shortly before the collision the fighter was descending, which placed the olive drab chopper against a background of winter terrain, very effectively camouflaging it; for 30 seconds or more there was nearly a constant relative angle between the converging aircraft; relative motion was almost zero.

To further complicate the fighter pilot's job, this aircraft has a pair of windscreen supports that block his vision from 6½ degrees to 12½ degrees each side of a line from the pilot's eyes to the center of the windscreen. Therefore, at a distance of, say, 8000 feet the blind spot on one side would be 850 feet. The only way to compensate for this is not by merely swiveling one's head, but by a combination of swiveling and back and forward motion of the upper part of the body.

While the majority of the midairs during the past two years were attributed to pilot factor, the corrective action in most cases could be summed up as the need for (1) air discipline and (2) better supervision.

Now these two terms are admittedly broad and extremely general, and, like a thick coat of makeup they cover a lot of sins. In essence, though, most of these accidents and incidents could have been prevented by heads up flying on the part of pilots and a lot of improvements in procedures at levels higher than that of the man in the cockpit.

What's the midair picture for tomorrow? In every investigation of a midair collision, such as those recounted, recommendations are made: modify procedures, discontinue or alter the more hazardous elements of certain operations, provide better guidance — these are representative of efforts to cut down the number of midair collisions. Very possibly, many midairs have thus been prevented.

However, the eight major midairs in the first four months of this year do not indicate such progress. In fact, the average is running about double that of 63-64.

Don't be disappointed if you don't get specific answers here. The only valid solutions must come from the users of the aircraft. Involved are several commands, and people of varying experience and ability. Obviously, some procedures need improvement and others should be examined. But no matter how much tactics and procedures are changed, the real hope for greater protection from midair collisions tomorrow, especially between associated aircraft, rests largely with the men in the cockpits. ★

LOOK OUT... and live

Capt Charles P. Cabell, Jr, 70 Bomb Sq, Loring AFB, Me

We had just completed a bomb run on Oilburner "Orange Tree" (a SAC low-level navigation and bombing route which is laid out in Kentucky between the Newcombe VOR and the Lexington VOR). Richmond Bomb Plot cleared our B-52 to turn and climb to racetrack altitude for another bomb run. We leveled on the crosswind leg at four thousand feet, a thousand feet below an overcast, and I, the copilot, copied the post-release information from the navigator and started to relay the data back to the bomb plot for a score. At that moment the pilot tapped me on the arm, pointed, and swung the airplane down and 30 degrees to port. He was pointing at a Cessna 172, on a collision course with us and right on our altitude. The Cessna pilot took no evasive action and probably never saw us.

The point of my story is not to fix the blame for near-collision but to illustrate the need for reviewing what happens when you descend from high altitude.

At altitudes above FL 240 you are separated from other aircraft horizontally, by RADAR. All aircraft fly under Instrument Flight Rules with a standard 29.92 altimeter setting, and are vertically separated by one thousand to two thousand feet. As you descend below FL 240, your IFR clearance clears you vertically from other IFR traffic *only*. Some of the traffic is VFR. There probably is no RADAR separation, and your vertical separation has been reduced to five hundred feet. Bear in mind also, that below FL 180 you no longer fly with a standard altimeter setting, and your theoretical clearance depends upon how current your altimeter setting is.

Remember too, that as you descend the density of air traffic increases enormously, and not all of these low-flying pilots have the experience or equipment that their higher flying brethren do, nor are they required to have them. A student pilot needs only eight hours to solo, and his airplane need not be equipped with transponder, radio, anti-collision light, or other sophisticated traffic control devices. Chances are he will have his head buried in the cockpit more than would a more experienced pilot, and he will be relatively unconcerned, during transition, with maintaining proper quadrantal altitudes. The Airman's Information Manual (formerly The Airman's Guide) lists all of the SAC low-level routes, but how many civilian pilots actually heed their restrictions?

What I've been building up to is that the human eye scanning outside the cockpit is the best traffic separation device for most low altitude applications. Your eyes can overcome the potential hazards brought on by the lack of RADAR separation; by local altimeter errors; reduced vertical separation; by increased traffic density; and by sharing the airspace with simply equipped planes and inexperienced pilots. Our eight-engined Goliath could have been felled quite easily by a one-engined David. Look out and live! ★

Lightning... HAZARD OR NUISANCE?

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

Lightning has long been considered a nuisance but not much of a hazard to aircraft in flight. But the Air Force as well as other aircraft operators, the FAA and CAB are beginning to wonder if the hazards of lightning strikes aren't greater than previously thought.

In June of 1964, an F-84 was making a firing pass on a dart towed by another '84 when both aircraft were struck. The tow pilot received a jolt which knocked his hands off the controls but he was otherwise unaffected. The other pilot almost lost his life. The intensity of the charge blinded him momentarily and the jolt numbed his left arm and leg causing him to lose control of the aircraft, which went into a descending right spiral. Disoriented, he thought the aircraft was in a left spiral. Realizing this pilot's condition, the tow pilot joined on his wing and talked him into a pullout less than 3000 feet above the ground.

Another case, last August, involved a C-97 which caught fire as the result of a lightning strike. The aircraft was cruising at 17,000 feet over the Rockies when the strike occurred. There was an explosion, and flames appeared near the Nr 2 engine. The engine was shut down but the fire, fed by a leaking fuel line, was extinguished only by diving the aircraft at maximum allowable speed. Although the left flap was nearly destroyed by fire, a successful no-flap, three-engine landing was made on a 5400-foot runway at an elevation of 4800 feet.

Lightning started Nr 2 engine fire that endangered this C-97 while cruising at 17,000 feet. Increased airflow, during dive, finally extinguished flames that caused great damage to left flap.

While reports of aircraft damaged by electrical discharges are increasing, it is certain that many more aircraft are damaged than reported, since most occurrences are reportable under Para 4d (8) AFR 127-4 as "events considered to be worth reporting as an aid in preventing aircraft accidents." (OHRs are now required on all lightning strikes and electrostatic discharges by Para 29c, AFR 60-16B.) During 1964 there were 45 AFR 127-4 reports, and through May of this year there were 36. Apparently there is no "season" for electrical discharge, consequently it appears 1965 will record an impressive number.

The most common USAF aircraft electrical discharge event consists of the discharge or strike occurring at the nose radome and exiting the aircraft at a wingtip. The top of the rudder and protruding antennae are also frequently struck. C-130s lead the number of incidents with the C-124 running second. As would be expected, most discharges occur in the lower levels (near the 0° C. isotherm), over half occurring at 10,000 feet or lower, with the median at 8500 feet. The highest altitude reported was 34,000 feet.

STATIC DISCHARGE OR STRIKE?

Frequently it is difficult to say whether an electro-static discharge or natural lightning strike occurred. Apparently it makes little difference as far as the effects on an aircraft are concerned, although there is a theory that aircraft-generated discharges cannot produce the energy required to cause damage. Approximately half of the pilots submitting reports state they were in thunderstorm areas. Some reported stratus clouds with no precipitation, however, most indicated precipitation was occurring. Occasionally, discharges occur in the clear, after the aircraft has left a cloud deck.

Lightning phenomena as a hazard to aircraft are continually under study by both governmental agencies and private industry. Early this year a C-130 nose radome was struck while the aircraft was descending for landing. There was an explosion, followed by a fire in a pylon tank. Fortunately the fire extinguished itself on final approach just prior to touchdown. AFSC is conducting extensive research as a result of this incident. Recently the CAB determined that the probable cause of a commercial jet accident over Maryland in 1963 was a lightning-induced explosion in a fuel tank. These incidents serve to remind us of the possible disastrous hazards associated with lightning. Incidentally, it has been estimated that the airlines over the U. S. experience up to 500 electrical discharges per month.

GREATEST HAZARD

Fuel tank vents have long been suspect as a path for lightning (or lightning caused flame) to the potentially explosive fuel-air mixture in the fuel tanks. The Lightning and Transients Research Institute (LTRI) considers this to be the greatest explosion danger and recommends that fuel tank vents be located in areas least subject to lightning effects. As noted earlier, most lightning strikes occur near 0° C, where gasoline forms too rich a vapor-air mixture to explode and kerosene too lean a mixture. JP-4 vapor on the other hand, forms a more explosive mixture. Consequently, since a more or less precise combination of factors must exist, JP-4 is significantly more vulnerable to explosion than either gasoline or kerosene. Research in this area is continuing.

Lightning phenomena, while under extensive study, are quite controversial among pilots. LTRI says "Little can be done in the immediate vicinity of an aircraft to control whether it is struck by lightning, since the aircraft, which is relatively small, can have little effect in determining the overall stroke path which may extend for several miles." Yet, many experienced pilots say the aircraft is a specific factor in helping set off electrical discharges.

LTRI says that all discharges which cause damage to an aircraft are lightning strikes which terminate at the ground or in another cloud. LTRI also says that static discharges are not capable of damaging even thin aluminum. Many pilots feel differently. Some airline pilots of over 20 years experience state they have never experienced a natural lightning strike. LTRI is producing valuable knowledge about the effects of lightning on aircraft, using both artificial lightning strokes in laboratory conditions and the study of natural lightning. Their research vessel THUNDERBOLT operates out of Miami, Fla.

Note damaged rudder of C-124. Aircraft was struck while flying below 10,000 feet.

While we have chalked up most of our electrical discharge experience as no more than incidents, it is apparent that potentially hazardous conditions exist. Furthermore, in view of past USAF experiences, it is apparent some "incidents" were actually sobering events which bordered on catastrophy. Consider the B-57 making an instrument penetration in a thunderstorm with the field reporting near minimums. A lightning strike punched off one tiptank shortly before touchdown. That one could have been a disaster except for professional crew performance. A flight of four F-4C's were passing between thunderstorm cells. Cloud-to-cloud lightning was observed passing through the formation. Two of the aircraft flamed out, although both made immediate restarts. The lightning strike was suspected of causing a temporary interruption of engine airflow. This incident occurred at FL 340.

To one F-105 outfit in Germany it must seem for sure that lightning can strike twice in the same place. This unit experienced five strikes in

T-38 LIGHTNING STRIKES

The troops were on the last leg home on a navigation proficiency flight. The weather forecast included a few scattered (there is no such beast—a few is 5 to 15 per cent, scattered is 15 to 45 per cent) thunderstorms to FL 450. While cruising at FL 350, the pilots entered light cirrus. In a few minutes the clouds became thicker and turbulence was encountered. The front seat pilot saw three lightning strikes on the nose of the aircraft. The pilots climbed to FL 390 after clearance was received from center. Center confirmed tops of clouds at FL 450.

After the lightning strike the compass card precessed 50 degrees from the magnetic compass. The airspeed indicators dropped to 150 KIAS then to 130 KIAS. With the help of the center, the aircraft was vectored to another T-38 base for letdown at the home field. During the VFR letdown the airspeed indicators dropped to zero, but came back to normal readings in the traffic pattern.

The pitot tube had two burn spots; the rudder had one. The nose cone had a small chip from one strike. The magnetic azimuth detectors leaked but it could not be determined if that was caused by the lightning strike.

Center radar cannot steer you around lightning, and normally they have their radar polarized so they can't even steer you around a storm. The best plan, and incidentally the one used by those who have tangled with thunderstorms, is to give them a wide berth. You CANNOT do this flying in cirrus clouds in an area known to be populated with thunderstorms. This holds true whether they are forecast isolated or numerous—over 45 per cent.

ATC Approach to Safety

two consecutive days in April this year.

As a caution, do not let lightning or static discharge lead you to a false conclusion. Case in point: The left engine of a transport failed and was feathered. A few minutes later it appeared that lightning hit the aircraft and soon the right engine quit. The crew bailed out. Accident investigators found that the inboard fuel tanks were empty and that the selectors were set on these tanks (outboard tanks were full).

Although Pilot Factor was the primary cause, two of the contributing causes are of interest in this discussion: 1) Weather, in that it assisted in leading the aircraft commander to false conclusions as to the causes of engine failure; 2) Mental Fixation, in that the pilot, copilot and flight mechanic temporarily acquired one particular line of thought to the exclusion of others.

We have discussed lightning at length but we haven't said what the pilot can do to avoid it or prevent major damage. Obviously there isn't much we can do. Avoiding thunderstorms is something we all try to do, but it is difficult to avoid *areas* of thunderstorms. We have little control in avoiding the 0° C. area where most discharges occur. It might be wise to remember that discharges frequently occur in continuous precipitation, not necessarily in thunderstorm areas. A most probable time of occurrence is during climbout or penetration when the pilot is most occupied with flying the aircraft.

We can look for reduction of the fuel-vent explosion problem in the current research being conducted. Use of flame-arrestor screens and lightning diverter rods are being investigated as are fuel vent locations. Since wingtips are frequently struck, bonding, shielding and location of external tanks are being studied.

In the meantime, our best bet is to avoid, when possible, thunderstorms, the 0° C. level when precipitation is present, and icing areas, particularly those producing rime. Continue to report electrical discharges and lightning strikes and the atmospheric conditions existing at the time, for these reports are invaluable to scientists trying to create the protection necessary to keep lightning a nuisance rather than a hazard. ★

CUT WITH MY OWN KNIFE

FIGURE 1

Here's a little tip from the PE troops. Don't just jam your survival knife into the pocket of your flying suit with the cord wadded every which way. (Fig. 1). A bump could release the blade, you might not be able to get the cord untangled when you need it, the opened blade could inflict an injury, or cut the cord and you could lose the knife. Here's a better way (Fig. 2). Wrap the cord neatly around the upper part of the case, leaving approximately six inches of slack, then, with the hook left open to be ready for the four-line cut, insert the knife into the pocket as shown in Fig. 3. *(Our thanks to Robert E. Brock, SSgt USAF, Ret., Norton AFB, Calif.)*

FIGURE 2

FIGURE 3

THE IPIS APPROACH

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

Q. In the event a pilot flying in the low altitude structure requests and receives from ATC a VFR/OT clearance along airways, what minimum altitude must he comply with if an MEA is designated? ***(Major Paul James, 1st CEG, Barksdale AFB, La.)***

A. Pilot should comply with VFR procedures prescribed by AFR 60-16, Par 33(a). Since it is the pilot's responsibility to maintain clearance from all obstacles, the MEA would not be mandatory.

Q. The operational limits for interference-free area prescribed for an "L" VOR facility is 40 NM. Why is it that some airways are established using "L" facilities in excess of 40 NM? ***(Captain Donald R. Brown, 4600 Operations Sq, Ent AFB, Colo.)***

A. Service Volume Areas (SVA's) apply to direct flights in controlled airspace within each route system and not necessarily to airways. Airways have been specifically route checked, and aircraft operating at or above the MEA will have no problem with interference from another facility. You will have to comply with the 80 NM distances between Nav Aids below 18,000 feet for IFR direct flights in controlled airspace. Controllers will not clear you unless they can provide navigational guidance.

Additionally, by requesting VFR/OT you can be cleared for a direct route of flight that does not meet SVA.

See FLIP II, page 91, and FAA ATC procedures manual ATC 7110.1B, Par 283, for additional information.

POINT TO PONDER

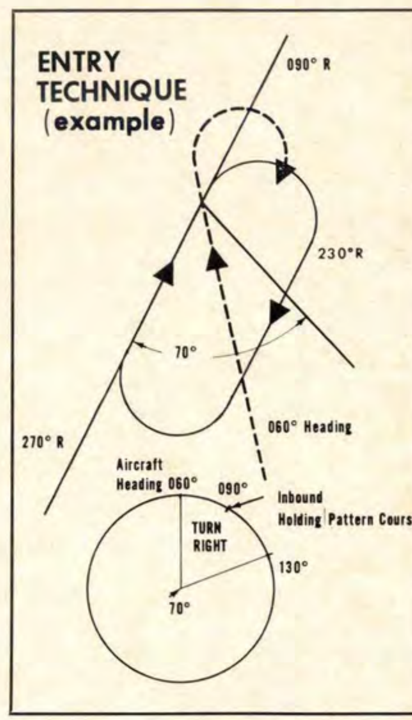
A convenient method to determine holding pattern entry has been suggested. It is submitted for your consideration.

Check 70 degrees to the right (left, for a non-standard pattern) of the aircraft's inbound heading at the holding fix. (For planning purposes, estimate this heading prior to reaching the fix.)

If the inbound course of the holding pattern is located within this 70-degree zone, the turn to enter the holding pattern is made to the right. (Left, for a non-standard pattern.)

If the inbound course is not within this 70-degree zone, turn outbound in the shortest direction to parallel the inbound course. If on a convenient heading, the teardrop entry may be used.

In the example (Figure 1), the aircraft heading at the fix is 060 degrees and the inbound holding course (standard holding pattern) is 090 degrees. The inbound holding pattern course is within the 70-degree zone, therefore, turn right to parallel the inbound course. ★



NOTE

Reference IPIS Approach, January issue. The lost communications procedure on which the POINT TO PONDER was based, has been changed. Check the Revised Lost Communications Procedures in FLIP Planning, Section II, FLIP Enroute Supplement, or FAR 91.127.

HOW FAR IS UP?

Major T. J. Slaybaugh, Hq USAFE, APO New York 09633

A flight of three jet fighters recently accomplished three low approaches to a field that had a 4000 foot ceiling. They never became contact! During their letdowns the recommended altitudes were relayed to the flight leader by the PPI controller. (PPI approach equipment does not incorporate elevation indicators.) On one approach the controller instructed the flight leader to descend to 800 feet and vectored the flight right over the field. The flight leader acknowledged but still never broke out of the solid soup. Following the third attempt, all three pilots abandoned their aircraft because of fuel shortage. Three minutes later another flight of three broke out VFR at 4200 feet after a similar PPI run.

Investigation definitely established that the leader of the first flight misread his altimeter by 10,000 feet and never descended below 10,800 feet.

What you have just read was copied, verbatim, from the December, 1954, issue of FLYING SAFETY.

Now, here's a little gem. During a routine navigation flight, a T-33 pilot with passenger arrived at his destination, a midwestern field, and was cleared for penetration. Reported weather was slightly above published minimums and our pilot started down from what he thought was 27,000 feet. GCA had been contacted and two unsuccessful runs were made. During both attempts GCA had had no target on the precision scope. Now our boy tried a TVOR approach with radar assist. This, too, was no good. Somewhat desperate by now, the T-33 was flown to the nearby municipal airport and an ILAS approach was tried. Again foiled, the pilot climbed to what he thought was 7000 feet and he and his passenger used the next-of-kin switch and a nylon letdown. As you can suppose there was no fuel left for a try at the alternate.

A review of the taped transcript between T-Bird and radar control revealed that the pilot reported he was at 700 feet indicated during one point of the landing attempts. Since this was about 124 feet below the ground elevation at the military base and 300 feet below the ground elevation of the municipal airport, it was apparent to the accident board that our boy was misreading the altimeter. (The pilot stated later that he thought he must have been in a valley!) According to the pilot and passenger it took them about 10 minutes to descend from "7000 feet" in their parachutes. About 17,000 feet would be more like it for this time interval. Small wonder that the precision scopes never picked up the target. This pilot had never at any time come much closer than 10,000 feet to the ground. Rather hard to break a minimum ceiling from that altitude.

This accident account is reprinted from the September, 1959, issue of FLYING SAFETY.

Let's jump now to mid 1965. With weather partial obscuration, measured 1400 overcast, one mile in rain and fog, two pilots in a T-Bird made six successive GCA approaches and two PPI approaches, to altitudes as low as 300 feet in an effort to land at an island base. At no time did they see water or ground. No one on the ground heard the aircraft during any approach, although it should have passed over the field at very low altitude on several approaches. Precision approach units at the base of intended landing and at a nearby base were unable to obtain radar

CAUTION

It is possible to set a majority of the standard altimeters with a 10,000-foot error by continuously rotating the barometric scale until it disappears, then again reappears. When setting the altimeter make certain that the 10,000-foot hand is reading correctly. ★

(Taken from AFM 51-37, Instrument Flying, page 4-4.)

contact. ASR contact was lost at two miles on all five approaches.

Later, to verify that the pilots had made their approaches 10,000 feet too high, approaches were flown at 10,000 feet in another aircraft. Ground speed, as computed on the T-Bird, was found to be 150 knots, (120 knots IAS at 10,000 feet being approximately 150 knots TAS). When the check aircraft was flown at 10,000 feet ASR contact was lost at two miles.

Obviously, in 1954, we knew we had an altimeter problem. Just as obviously, we had it in 1959 and we still have it in 1965.

Let's quote more from the 1954 article, *because it is pertinent today.*

Inspection of the altimeter will readily show that at certain altitudes the 10,000-foot indicator is completely covered by the 1000-foot needle. Even with the needle not covered, it is small and hard to see, especially at night.

Although the 10,000 indicator is the big problem child, there are many recorded incidents where errors of 1000 feet jump into the picture.

Wright Air Development Center realizes the problem and is currently developing and testing new instruments designed to give a clearer presentation of altitude. But, until a new one is developed, we have to live with the hard-to-see altimeter with the hide-and-seek 10,000-foot needle.

And, as readers who pilot Air Force airplanes know, most of us still have to fly with this altimeter. They've added the barber pole hatch marks that begin to appear at 16,000 feet and are completely visible at all altitudes below 10,000 feet; also, the longer 10,000 foot needle with the inverted triangle at the end. This may have helped in some cases, but obviously didn't in the case of the eight-passes-then-punch T-Bird jocks.

But, if altimeter misreading can be condoned, this duo erred the right way. They read it lower than they actually were. Those who have read it higher than they actually were are dead, or, at least, scared almost to death. A case in point.

Four jets were making a night, IFR, beacon approach. Procedure turn was to be performed at 11,000 feet. The flight reported procedure turn, and, upon turning inbound, suddenly broke out of the overcast with their airscoops just clearing the tree tops. Yes, they were at 1000 feet, not 11,000. Another case of misreading the altimeter by 10,000 feet.

Can you read these altimeter settings accurately in one minute? Pilots should be able to. Try yourself and see, then check to see if you missed any.

Accident and incident files record many such cases. How many more have gone unreported because of monitoring copilots, navigators and wingmen? And there's just plain luck — breaking out above forecast ceilings, between two hills, over lighted areas.

After the most recent fiasco, the T-Bird project officer at Norton did some research on the problem and came up with the following:

An F-100 became airborne under IFR conditions before the pilot recognized his altimeter was 10,000 feet in error with proper station pressure setting. Subsequent investigation determined there had been complete rotation of the setting dial prior to flight, resulting in a 10,000 foot error with the proper station pressure setting.

A B-47 on an assigned operational mission was scheduled to rendezvous with a KC-97 for air refueling. Visual letdown and contact with the KC-97 were accomplished and upon completion of air refueling, climb back up to 30,000 feet was made. Upon reaching this flight level (30,000) the aircraft commander reduced power and the aircraft was leveled off. At this time the instructor pilot occupying the rear seat noted his altimeter reading 20,000 feet. A cross-check of the pilot's, co-pilot's, and navigator's altimeters disclosed that the aircraft commander's altimeter read 10,000 feet higher than the other two. The mission was completed using the copilot's altimeter without further incident. Investigation revealed no previous altimeter maintenance. Position knob must have been rotated by unknown persons on the ground prior to flight and not noticed by flight crew during preflight.

A B-47 accident occurred during VOR letdown. The aircraft struck the terrain at approximately 4200 feet MSL. Most probable cause, misinterpretation of altimeter reading on part of crewmembers.

Transport pilot's statement "As I scanned my instruments prior to starting engines, I noted my altimeter approximately 500, low or high. On closer inspection I noticed the hatch marks to be out of sight and the 10,000 foot marker at the bottom of the case, on the figure 5. The resulting altitude was 50,860 feet. The Kollsman window was at approximately the correct setting. I had flown this aircraft as pilot the day before and the instrument was correct. There were no flights between the above-mentioned flight and the one we were starting. To set this instrument so far in error was not accidental. It took hard, deliberate effort. It took two pilots 10-15 minutes to put the instrument back to field elevation. Possibly you have some idiot who considers himself a practical joker, but I feel this was a deliberate effort at sabotage. (Pilot's instrument only one tampered with.)"

Here are a few more, very briefly, to show that virtually no pilot using the ancient, three-handed dial altimeter is immune:

A B-50 pilot was unknowingly a thousand feet or more lower at the time of turn to base leg than prescribed traffic pattern altitude and upon beginning a standard descent struck the ground.

A B-47 pilot misread his altimeter by 1000 feet. The aircraft contacted the ground 11 miles from the runway, then pulled up and landed on the base.

An F-89 pilot crashed into a ship 2¾ miles from the field.

An F-86 pilot misinterpreted his altimeter during descent and struck the ground.

An F-101 pilot struck the ground 1300 feet below assigned altitude.

An F-86 crashed during penetration turn.

An F-84 pilot misset his altimeter, then crashed at night, in heavy rain, when 900 feet low on final.

An F-102 crashed 10 miles short of the runway during a night approach when pilot misinterpreted his altimeter.

(Ed. note: In many of the above, as well as other similar accidents, the accident cause reported by the investigation board is undetermined, with misreading of the altimeters listed as "most probable." It must be so, interrogation of deceased being impossible.)

There are many more cases, but this sampling should, by now, convince any doubters that better altitude information must be provided if accidents from this cause are to be prevented. The cross-hatched-below-16,000 feet window and the longer, inverted triangle 10,000-foot pointer may have helped some, but these mods haven't provided a safe solution. Starting in 1966 the Air Force is slated to receive its first batch of counter-drum-pointer altimeters (see article on page 13). Initial installation is in production T-38's.

Pilots need no introduction to the instrument shown here. For a picture of things to come, take a look at the one pictured and discussed in the article on the next page.

In the meantime, for what limited good it might do, let's review some of the recommendations made by investigators through the years.

RECOMMENDATIONS

That copilots, navigators and radar observers monitor clearances and altitudes and advise the pilot of deviations.

That pilots brief their crews on intended approaches and minimum altitudes.

Proper cross-checking of altimeters is important.

That radar operators be suspicious when targets fail to appear and ask the pilot to double check his altitude.

Use the radio altimeter (whenever available) as a supporting instrument to the pressure altimeter.

During marginal or deteriorating weather conditions, go to an alternate, particularly if the flight isn't going as smoothly as it should.

Establish initial GCA level off altitudes in excess of 1000 feet above terrain in case the pilot should misread his altimeter by 1000 feet.

Require all crewmembers to read and report altimeter readings to prevent possibility of error on the AC's part, as well as malfunctioning altimeters.

Establish standardized procedures for use of the radar altimeter.

Development of a direct reading altimeter.

Properly set altimeters, and question any setting markedly different from the forecast setting.

Make ILS or GCA approaches whenever available.

SUMMARY

There are some well known deficiencies with the altimeters we presently try to fly by.

Misinterpretation due to the complexity of presentation is certainly one. One researcher who has long fought for a better altimeter is convinced that, had we been able to fly over 100,000 feet in recent years our present altimeter would have been further complicated with a fourth needle.

Another deficiency is the lag inherent in the standard Air Force three point altimeter. This deprives the pilot of precise information during some critical portions of flight.

Icing of static ports, water freezing in static lines and tape left on static ports after aircraft are removed from the wash rack can also cause erroneous readings.

And there is the design deficiency that permits pre-setting so that a reading erroneous by 10,000 feet can be set. Some altimeters now have stops to prevent this (reportedly, years ago, it was learned that a drop of solder would be an effective fix.) Some background on this is in order.

During 1959 the Directorate of Aerospace Safety attempted to bring about installation of stops in altimeter setting mechanisms to prevent missetting with resultant 10,000 foot error in either direction. This feature was not adopted until early 1964 when new instruments were furnished with stops installed. Corrective action in the interim was issuance of safety of flight supplements in all flight handbooks calling attention to the hazard. There are many altimeters in the inventory which do not have stops installed.

Finally, remember these faults of our standard altimeter and benefit from experiences such as recounted in this article. History shows that so long as we try to fly using this instrument we will have accidents because of it. Finally (page 13) it appears that the Air Force Pilot is slated to receive a better altimeter. Don't relax. You don't have it yet.

Counter Drum Pointer

Early in 1966 the Air Force is slated to receive the first of the new AIMS Altimeter Systems, a sophisticated, computer-operated device featuring a counter-drum-pointer (CDP) cockpit presentation. First installations will be made in production T-38 aircraft with subsequent retrofit scheduled for other high and medium performance aircraft.

The system meets requirements of the AIMS altitude reporting program, which requires greater accuracy and transducers capable of furnishing an encoded signal to the aircraft transponder equipment. Availability of the encoded signal enables ARTC to interrogate any aircraft and get its altitude automatically and instantly. The AIMS accuracy objectives are $\pm$ 250 feet for all speeds and altitudes.

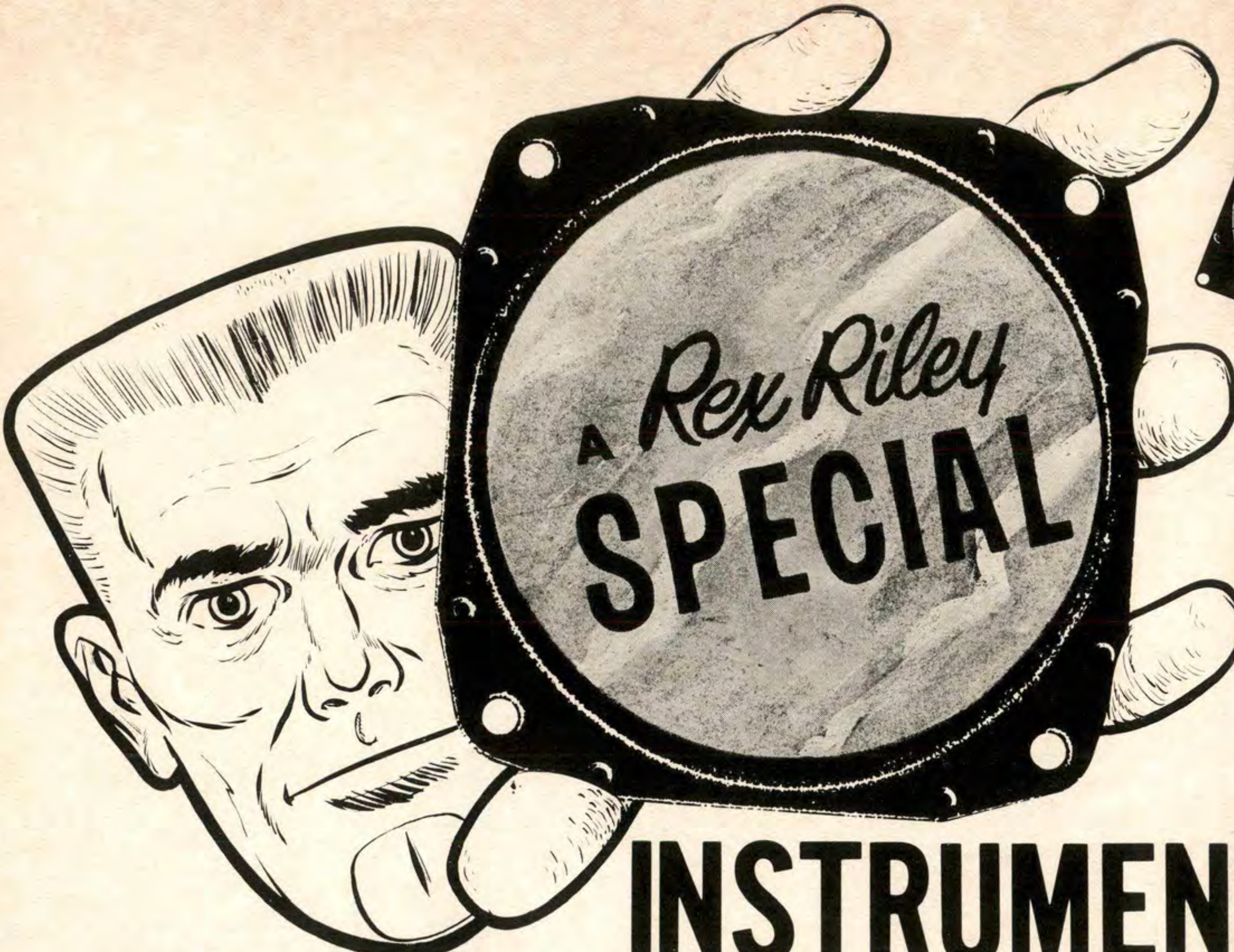
Aside from the familiar circular scale and X100 pointer, the CDP presentation differs somewhat in appearance from the present three-pointer altimeter. Starting at the left of the instrument (see illustration) and reading from left to right there are two counter windows and one drum window (white). The numerals presented in the counter windows indicate 10,000's and 1000's of feet, respectively. The drum window numerals always follow the pointer number, thereby indicating 100's of feet. The redundancy between pointer and drum window indications was incorporated to provide the pilot with altitude trend information that he has been accustomed to reading on the present three pointer altimeter. As a result, the altitude may be read directly by referring only to numerals displayed in the windows, or, by observing the counter windows and the pointer position.

The new altimeter is driven servo-pneumatically. In the event of electrical circuit malfunction it automatically goes into STANDBY mode of operation. In the STANDBY mode, the altimeter reverts to strict aneroid operation and continues to display altitude to the pilot with the same degree of reliability and accuracy as the present non-servoed altimeter; however, in the STANDBY mode, altitude information is no longer transmitted automatically to the ARTC. The pilot is alerted to this condition by the appearance of a red STANDBY flag that appears on the altimeter face. A switch is provided on the altimeter that enables the pilot to attempt to return the instrument to its normal mode of operation. This switch may also be used to manually place the instrument in the STANDBY mode of operation, when and if the pilot has reason to satisfy himself that the unit is operating properly.

Experienced Air Force, Navy, and Army pilots compared this altimeter to other displays during an extensive flight evaluation exercise. They overwhelmingly preferred the counter-drum-pointer as the best choice. In addition, pilots of the Instrument Pilot Instructor School (IPIS) and the Directorate of Aerospace Safety who flew with the CDP altimeter agreed that it is a significant improvement over the standard three-pointer display. Comments ranged from "very good" to "the best altimeter I have used and undoubtedly the easiest to learn to use." Perhaps the biggest improvement the CDP offers is that the completely digitized display requires no interpretation, just observation.

During the flight evaluation, several design deficiencies were discovered in the laboratory models of this altimeter. Discrepancies included a tendency to "hang-up" and whip in STANDBY mode, partial concealment of the counter-drum information due to the shape and size of the pointer, slow counter movement in the 1000-foot change point, and possible confusion due to similarity of number presentation of the counters and drum. Corrections have been made (some of the changes are visible in the illustration above and production models will contain these improvements).

In summation, the new altimeter design promises to provide a decrease in probability of misinterpretation, greater accuracy, less lag in altitude presentation, and eliminates the possibility of presetting the 10,000-foot error when adjusting the baroset. All of these improvements to this most basic of instruments are vitally important to upgrading flight safety. ★



INSTRUMENT

LOOSE PARTS IN CASE

INSTRUMENT TROUBLE. Once in a while ol' Rex gets pretty hot under the collar. In fact, if . . . but first let me tell you what happened to get Rex this way. First off, a couple of weeks ago one of the troops was gripin' about having had to make an approach at near minimums with an attitude indicator that was practically worthless. Said this was the third time in the past month that he'd had instrument trouble.

So Rex inquired around and found that almost everybody in the outfit had a similar complaint. That did it — Rex went down to the shop and asked a few questions. The notes he took weren't encouraging. He then compared write-ups in the Form 781A and reviewed the 66-1 data. Here's just a bit of what he found:

- Five gyros received from Supply were found to be defective during bench check.
- Another five indicators had to be removed from fighters because of pitch oscillations, tumbling, slow erection.
- Attitude indicator jumps up and down five degrees in pitch — defective gyro. Overhauled by . . .
- A pilot write-up mentioned an attitude direction

PITCH OSCILLATIONS

FAILED BENCH CHECK

T TROUBLE !

PARTS MISSING

indicator (ADI) that would not indicate less than 35 degrees of pitch. Defective gyro.

• On first flight after installation, OFF flag flickered and indicator showed 90-degree bank and 20-degree climb.

• Within past two months 22 vertical gyros received from Supply had numerous discrepancies that could not be repaired at field level.

• Over a period of time, two hundred and ninety-nine — **that's 299** — airspeed indicators received with parts missing. Overhauled at . . .

Well, that's enough. Does this seem compatible with what we've been teaching pilots for years —*"trust your instruments."*

All this made Rex so mad that he's been thinking seriously of gathering up a pile of this junk. Then he'd fly it to the overhaul facilities and present the facts. Maybe then, with the evidence at hand, the overhaul facilities would revert to 100 per cent quality control of the essential flight instruments. *Then* we could continue to teach our successors to "believe your instruments; they are reliable." ★

DEFECTIVE GYRO

GRASS CLIPPINGS

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

I have a neighbor who's an out and out square. He never gets nagged at, cussed out, or exiled to the sofa. He works five days a week exactly from eight to five. He has never in his life forgotten to mail a letter, nor has he ever forgotten to remember an anniversary. He has never been broke six days before pay day and has never run out of gas on the freeway. His car always looks like he just washed it, and worst of all – the absolute cap on the stack –

HIS LAWN NEVER NEEDS MOWING!!

Oh, his grass grows just like mine, but the difference in his velvet carpet and my shag rug is MAÑANA. Or, as they say in Old Mexico–THE ART OF DELAYED ACCOMPLISHMENT. Or, as the Dan Webster says – PROCRASTINATION – to delay, to postpone, waste time.

Every Saturday at precisely 1259 hours, my neighbor fires up his rotary rock slinger, carefully letting it warm up for one full minute. (He read that in FAMILY WEEKLY.) At precisely 1300 hours, he moves the snarling machine briskly forward and spews forth the first clippings, none of which will measure over ONE-QUARTER INCH LONG.

One of those particular Saturday afternoons I'm glued to the old TV 'cause Jim Piersall has one leg over the fence on his way to murder a wiseguy in the bleachers. And it happens – "Elwood's mowing his lawn." (Of course the initial decibel level is always low down in the hint range.) Piersall is now vaulting the second row. "ELWOOD IS MOWING HIS LAWN!!!" (Up 200 dbs.)

"Huh? What's that?" Course you KNOW what it is; it's Delovely with fist on hips.

"I said," (down 150 dbs into the holier-than-thou range) "Elwood is mowing his lawn. Don't you think you've waited long enough?"

Now Delovely doesn't REALLY care about a short green carpet out front but a tricycle is lost somewhere between the front porch and the curb and the kid is really buggin' her about it. So I trudge out before Piersall gets to the ninth row.

And after the deed is done (my long green lawn is now short yellow stubble; that'll show her) good old Elwood is bending my ear on how we should have handled the Cuban situation. And then, with absolutely no provocation, he does it: "You know what's wrong with you, John, old boy?" On such short notice the best I could do was, "No, what?"

"You're a Procrastinator!" he said, derogatorily. "You put off mowing your lawn for three weeks and you KNEW it was inevitable. That grass surely can't grow shorter. You just procrastinate, that's all," he droned on, monotonously. "Tell me, John, old boy," (I'll old boy you in a minute, you . . .), "tell me, do you procrastinate pulling up when you put your airship in a dive?" (I knew it; he's got every Tom Swift book ever printed.)

Maybe it was my tightening lip or the look in my eye. At any rate, he canned it just before my decision to IRAN his impeccably straight nose. BUT as he disappeared into his hospital-clean garage, he twisted the knife once more. "Think it over John, old boy. If you don't believe me, just compare our grass clippings."

Compare our grass clippings! He not only has a sterile garage, his brain is sterile too.

Grass clippings! GRASS clippings!

Boy! Elwood, you really are loose in the flue. Those clippings aren't long. There's not a one over an inch and a half long. Course that mower mulches it up pretty well. What the heck, I can prove it. I'll just measure the distance from the sidewalk up to the handle bars of the trike. Now let's see — it measures SEVENTEEN AND FIVE-EIGHTS INCHES!!

Now, that can't be right. Delovely didn't have her glasses on when she was hunting the trike, that's all. (Course *I* was the one who finally located it, and THEN only after the second mow-around.)

You don't suppose . . . naw, can't let old coghead next door get to me.

Back at the game Pee Wee was summing up the statistics with no mention of the mayhem that must have occurred in the center field bleachers. And the first commercial comes on. "DON'T DELAY! DON'T WAIT! DO IT NOW! NOW FOR THE MOST FANTABULOUS DEAL OF YOUR LIFE! DON'T WAIT! DO IT NOW!"

"Yes," I mumble under my breath, "or your grass clippings will measure SEVENTEEN AND FIVE-EIGHTS INCHES."

I AM cracking! I got even. I jumped up and turned off the TV much harder than I usually do.

Enter number two daughter. "Daddy, what does this mean — 'he who hesitates is lost,' huh, Daddy?" Lucky she should come to an old authority like me.

"Well, honey, that means that if you fiddle around or delay doing what you SHOULD be doing, you'll miss the boat." (Typical authoritative analysis.)

"Well, Daddy, what does THAT mean?" (This kid MUST take after her mother.) "Honey, climb up on my lap and Daddy will tell you a (war) story and that will show you what I mean," I said in a fatherly tone.

"One day not long ago, I had to make a rum-run, er, ah — an administrative flight to El Paso. Dad had to get up real early to get out to the base and plan his trip. Well, the alarm clock went off that morning, but daddy thought he would just wait 30 more minutes before he got up. And he fell asleep and didn't get up for an hour and fifteen minutes more.

"Now, Daddy had to run real fast to get his airplane ready to fly and he only had time to read the NOTAMS for El Paso and NOT for the points in between. What? Oh, Notams are things like notes from the principal. But anyway we took off and everything was peachy until we tried to tune in a little town called Zuni. We couldn't get the radio station and Daddy got lost."

(Not a bit of sense in telling the kid about the Air Guard interceptors herding us out of Old Mexico.

And no use mentioning the reaming by the Old Man and his caustic remarks about delaying getting up until the last minute. I personally think it was dirty pool hiding a notice of temporary shutdown of Zuni Radio in as unlikely a spot as the NOTAMS.)

"So you see, honey, if Daddy had not put off getting up, he would have had time to read the note from the principal and he would have known that he could not fly over Zuni."

The poor kid walked away looking kinda blank. Maybe the one about the time I waited too long to break off an air to air gunnery pass and swallowed 21 feet of target cloth would have been easier to understand. Course, at the time it was darned hard for ME to understand.

Or maybe the one about the time I tried to stretch the glide in that T-Bird at Willie and donated three gear to the junk dealer. (The Board said, "Pilot error in that the pilot delayed too long in applying power to avoid landing short.")

DELAYED . . . FIDDLED . . . WAITED . . . PROCRASTINATION . . .

And there was that time when I drove by the dispensary and for no reason at all just decided to wait and get those shots later. As I recall, the annual records check got the same identical treatment.

Just a bad habit I'm going to break one of these days. (A true procrastinationist even delays to start to break the habit.)

The day I almost punched out of a T-Bird was a result of waiting — waiting for a rainy day stand-down to bone up on the Dash One.

High grass and dirty cars aren't too serious. They are social items that can only result in dirty looks from the neighbors and lost tricycles. But this postponing studying emergency procedures and sacrificing flight planning for an extra forty winks can flat get you KILLED.

So to put a stopper on a story, all this got me to thinking: MAYBE WE'RE NOT COMPLACENT AT ALL. MAYBE WE JUST DELAY FACING REALITY. MAYBE WE JUST DELAY BONING UP. MAYBE WE PROCRASTINATE OURSELVES TO THE LIP OF THE GRAVE.

So I long ago decided to try to kick the habit. And it isn't easy. There are all sorts of things working against me. Baseball versus mowing; good gunnery scores versus an almost-out-of-range breakoff; and a good James Bond novel versus the Dash One.

But I must be making a slight headway, 'cause it seems like I'm being nagged at less and enjoying it more. I'm getting along with Delovely and the C. O.

And I even get along fairly well with Brick Brain next door. He has matured a great deal. The remarkable thing is that he's not half as square as he was in the days *before* I got my smooth green velvet lawn. ★

The trip had been one long series of frustrations — he'd been stuck here for five days waiting for a part that never arrived. He'd made a fix of his own, not by the book, maybe, but it worked. Now he was ready to go.

"Lucky 64, tower, standby for clearance in one minute."

"Six four." Finally; now if they'd just hurry a little he could get going. Boy, did he have a pile of things waiting for him at home!

"Four-two-niner, this is the aircraft behind you. You appear to have fuel leaking out of your right external tank."

"Rog, thanks." He thought it over for a moment, decided it wasn't anything serious.

Two minutes later Air Force 8429, Flight Lucky 64, was cleared and rolling toward a junkyard 500 miles away.

Destination was 1850 miles southeast of here but there was to be an intermediate stop for fuel a bit over 1000 miles east. Takeoff was uneventful; as he climbed to cruise altitude the aircraft seemed to be behaving in acceptable fashion. If it continued to do so he might make it home in time for a home-cooked meal, his first in a week.

For the first hour the flight was uneventful, except for the center advising him that he was quite a bit off course (50 miles) shortly after he'd made a turn to a new heading. They'd given him vectors to get him back on course. Another half hour had elapsed before he noticed that his fuel wasn't feeding correctly. He calculated for a few minutes, then cursing softly, faced reality and admitted that he couldn't make it. Better get 'er on the ground at the nearest base. That would be Salem.

". . . Center, Lucky 64, I've got some kind of fuel trouble, will you vector me to Salem Air Force Base immediately?"

"Lucky 64, standby . . . Okay, 64, you are cleared to Salem Air Force Base. Turn right heading one niner zero, maintain flight level three one zero."

"Rog, one nine zero, three one zero." A moment later the controller gave him a distance of 98 miles to Salem. He did a little more figuring; he should be able to make it, but it was going to be close.

Twenty-nine minutes later Lucky 64 ran out of luck and the pilot was killed when he ejected too low to escape. The crash scene was 26 miles from the end of the runway. Witnesses said the aircraft was descending then pulled up suddenly and fell almost straight to the ground. About a second before impact the pilot ejected but the parachute didn't open. The first men on the scene found Lucky 64's pilot still in the seat.

Their first look at the wreckage convinced the accident investigation board that their work was cut out for them. Although the wreckage wasn't scattered over a very wide area, it was well broken up. Considerable fire damage was evident. There was one clue — the pilot had changed his destination because of a fuel problem. After requesting vectors to Salem he had advised the center as to the amount of fuel remaining in flying time. Although, it was close, the pilot evidently thought he had enough fuel to make it. He had not declared an emergency. He had, however, asked for lower altitudes several times and indicated that he would descend at idle power to conserve fuel. There was also a

Lack of parts, jerry-rigging maintenance, impatience . . . these stole the luck of . . .

lucky 64

paradox in that the wreckage gave indications of a fuel-fed fire.

By the time all the material was assembled a picture began to be formed. Some of the lines were hazy but as the investigators sifted the evidence they began to come into focus. The picture told a story: mechanical difficulties, a pilot away from home base for more than a week on a flight that was to have taken only four days; exasperation on the pilot's part because he couldn't get the aircraft repaired quickly, finally performing unauthorized modifications in order to get the engine started. Then, his problems apparently solved and expecting clearance momentarily, he'd been told of a fuel leak. Who knows? At any other time he may have taxied back to find out the cause. But this time he didn't. Gethomeitis? Who has a better answer?

Then over an hour of uneventful flight followed by the rueful decision to change his destination because of fuel trouble. Center had queried him as to the nature of the trouble, but the only reply was "fuel."

To the investigators it was obvious that there had been a great deal of fuel aboard when the aircraft crashed; they estimated between 3000 and 4000 pounds. What, then, had been the problem? Why had the pilot declared fuel trouble and diverted from his flight plan to another base?

Lucky 64 was one of three fighters that took off on a cross-country training mission nine days prior to this accident. During the last portion of this flight, Lucky 64 apparently was flying with an inoperative main boost pump. This plus the fact that he could not get the aircraft started caused Lucky 64 to remain behind when the other two aircraft took off on the return flight.

For the next five days the pilot worked on the aircraft himself (he was not at an Air Force base). Meanwhile arrangements had been made for necessary parts to be flown in to repair the aircraft. However, on the morning of the ill-fated flight the pilot called his home base and cancelled the parts order saying the aircraft was now in commission.

His "fix" consisted of altering the starter system. This enabled the engine to be started.

After determining that the engine would start, the pilot had breakfast, then filed for the first leg of the trip home. It was while waiting for takeoff that another pilot spotted fuel leaking from the right external tank and advised the pilot of this fact.

Everything after this until he became concerned about fuel, more than an hour after takeoff, apparently appeared normal to this pilot. However, his flight planning indicated that he was in a hurry—there were several discrepancies. Then he got off course nearly 50 miles and was directed back to course, a heading he was flying at the time he became alarmed about his fuel state. The fact that he was several minutes ahead of plan indicated either stronger winds than anticipated or careless flight planning.

After requesting vectors to the alternate base the pilot told the center that he had fuel for about 25 minutes flying time. The crash occurred 29 minutes later. Witnesses stated that during the last few seconds of flight the aircraft was "flipping back and forth" or "weaving from side to side." Just before the crash the aircraft pulled up into a sharp, nose high attitude — possibly for an ejection attempt — then nosed down and hit the ground.

The primary cause of this accident was attributed to poor fuel management on the part of the pilot. The contributing causes reinforced this determination: The pilot took off with the main fuel tank booster pump inoperative — a red cross condition; he took off knowing an external tank was leaking; he was unable to transfer fuel because of malfunction in the fuel system from an unknown cause.

Add to this another possible contributing factor: There was no supervision — this pilot was strictly on his own despite the fact that the aircraft had several things wrong with it, including one safety of flight item, and the aircraft was not on an Air Force base.

This tragedy occurred to one pilot in one fighter aircraft. The crash was in a fairly remote spot where there was no hazard to lives and property on the ground. Therefore it received little, if any, publicity. Nevertheless, it is a classic case of what can happen when gethomeitis and lack of supervision conspire to take their toll. ★

Get-home-itis and impatience, finally a do-it-yourself mod job to get engine started ended pilot's career. Investigator points to jerry-rigging repair job.

Missilanea

AGM-28 DOWNLOADING—An AGM-28 missile was being downloaded and the H2-33-A positioning trailer was towed under the right wing of the B-52. The trailer was disconnected from the tug. As the tug proceeded from under the missile on the outboard side, its arm rest came into contact with the engine, damaging the leading edge of the inlet diffuser. The diffuser had to be removed and returned to the depot for repair.

The primary cause of the mishap was improper judgment of clearance by the tug driver. As a result, the following maintenance practices are being placed in effect at the unit concerned:

- Disconnect the trailer from towing vehicle forward of the missile.
- Towing vehicle will not be operated, parked, or positioned under any portion of the missile — at any time.

Good procedures! Lets all exercise care around missiles and aircraft and cut out these careless mishaps.

Maj Edwin D. Jenkins
Directorate of Aerospace Safety

FALLEN FALCONS—A driver was attempting to exchange tractors in preparation for towing a flatbed loaded with AIM-4A and AIM-4C (Falcon) missiles. Prior to disconnecting the tractor from the flatbed the diver cranked the jackpad down on the right side, but neglected to crank the left jackpad down. When he drove the tractor from under the flatbed, the flatbed tipped, allowing five of the missiles to slide to the ground. The missiles were sent to the depot for damage assessment and repair.

The flatbed was a new type requiring each jackpad be lowered individually, whereas the flatbeds the driver had previously used were equipped so that one crank lowered both jackpads. Tractor drivers have been rebriefed to visually insure that trailer jack pads are lowered before removing the tractor. In addition, flatbeds having jackpads requiring individual operation will be so marked.

Personnel error in the ground handling (loading and transportation) of AIM-4 missiles continues to be the primary cause of mishaps, accounting for over 60 per cent of Falcons damaged.

Capt. R. A. Boese
Directorate of Aerospace Safety

ARM! DISARM! Most missiles now emplaced have two configurations of arm-disarm switches, styles A and B. *Each configuration requires a different technique for removing the safing pins.* Failure to recognize this difference may lead to jamming of the style B switch and possible aborted missile launches.

Style A is used on the stage separation system of missiles initially installed in the first four Minuteman Wings to become operational; style B is used on the third-stage thrust termination system. Subsequent missile changes incorporate the style B switch for both stage separation and thrust termination purposes on Wing V missiles.

To remove the safing pin in the style B switch, first, engage the special wrench per T.O. 21M-LGM30A-2-10; second, carefully but firmly push the safing pin straight into the missile until a definite stop is reached; third, release the pressure on the safing pin slowly counterclockwise until a stop is reached; and fifth, pull safing pin straight out.

To remove the safing pin in the style A switch, the procedure is the same as that for style B except after depressing the pin into the missile, the pin in its depressed position is rotated counterclockwise until a stop is reached. Thus, step three for style B as noted above is eliminated for style A.

Emphasizing this difference in procedures another way, the safing pins in style A arm-disarm switches are removed by depressing and then turning counterclockwise whereas in style B switches the pins must be permitted to back-off after depressing and before turning.

Boeing Minuteman Service News

The Fable of the Ogre

Lt Col Reuben B. Moody, Vandenberg AFB, Calif

Once upon a time there lived an ogre. He earned his livelihood by functioning as a missile safety specialist for a ballistic missile squadron. The ogre was not pleasant to behold and his manners were fierce. His eyes were beady and usually bloodshot. On his arms there were many stripes. His voice grated on the ear. When in an evil temper, which was usually the case, he seemed to move about in an aura of fire and brimstone. It was rumored that, on the occasions when his ire was extremely aroused, lightning bolts had actually been seen to flash from his glittering eyes.

There also worked in the squadron many technicians who administered to the divers machines and devices of the place. The technicians feared, detested and thoroughly loathed the ogre, for it seemed to be his pleasure to continually harangue and harass them in the performance of their duties. Hard hats must be worn in certain areas. Protective clothing must be donned when doing certain tasks. Checklists must be strictly observed. Safety inspections must be accomplished. These, and many others, were the dictates of the ogre and woe to the technician who violated them.

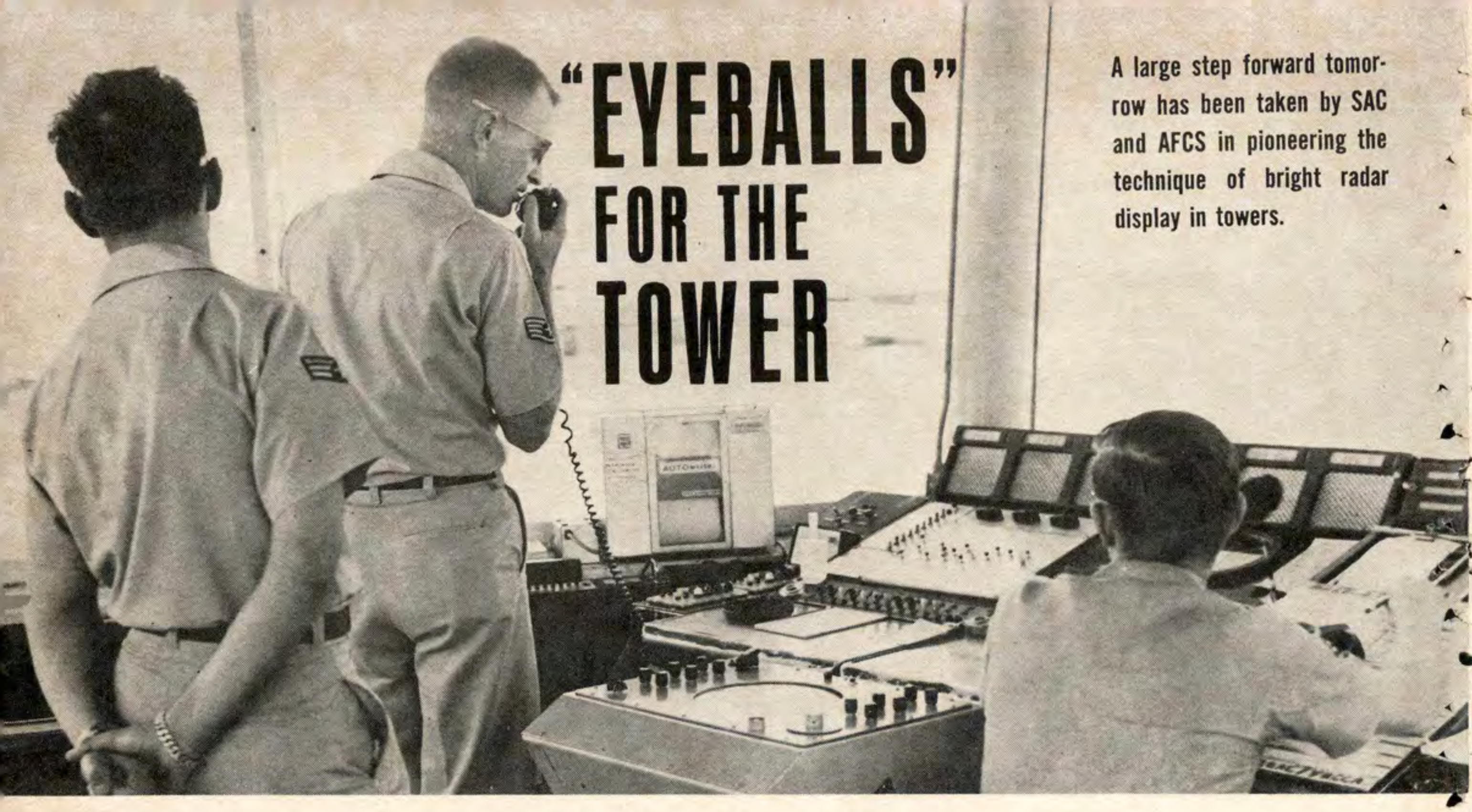
There was much muttering and gnashing of teeth among the technicians. Always they were badgered, plagued and tormented by the ogre. No area within the complex was exempt from his probing and his gimlet eye. Nothing escaped him, and those technicians who disobeyed his edicts were lashed by his tongue and his words were caustic. Beyond the ogre's hearing, the technicians were profane in their references to him and many slanderous remarks were made regarding his possible ancestry. But their mutterings were in vain for the ogre was the chosen of, and protected by, the Commander.

The ogre persevered and increased in his unpleasing ways. His zeal was such and his fits of rage became so frequent that, eventually, he was stricken by the ulcer. This caused his humor to become even more outrageous. But, with the coming of his single ulcer, the ogre fell into disgrace. It was well known the ogre's job required the development of at least two ulcers. He was therefore banished to the hospital and sentenced to a diet of milk and crackers. This was indeed a terrible fate, for the ogre's favorite diet had been to chew on errant technicians.

When the ogre began his exile, there was much rejoicing among the technicians. They were exceedingly glad and they relaxed from the rigorous disciplines which had been imposed by the hated ogre. And lo! The technicians, in the midst of their rejoicing, were visited by a plague of accidents and incidents. A skull was cracked for want of a hard hat. Unconsciousness came to a technician who carelessly breathed of toxic vapors. A fall occurred and a bone was fractured for want of a protective railing. Finally, and most tragically, death claimed a technician when he inadvertently became part of an electric circuit.

The technicians became sorrowful and they had cause to reflect. Through their reflections, they came to realize that their ogre had been a good ogre. His hated edicts, his detested discipline, and his fiery ministrations had heretofore prevented the visitation of the accident-incident plague. They came to realize they had maligned the ogre and they were filled with regret. Collectively the technicians heaved a sigh and longed for the return of their ogre.

And it came to pass the ogre completed the term of his banishment and he was permitted to leave the hospital. From his exile, the ogre returned to the squadron, and there the technicians greeted him with open arms. Again there was much rejoicing and celebration. And they all lived happily together forever after. MORAL: HONOR THY OGRE. ★



"EYEBALLS" FOR THE TOWER

A large step forward tomorrow has been taken by SAC and AFCS in pioneering the technique of bright radar display in towers.

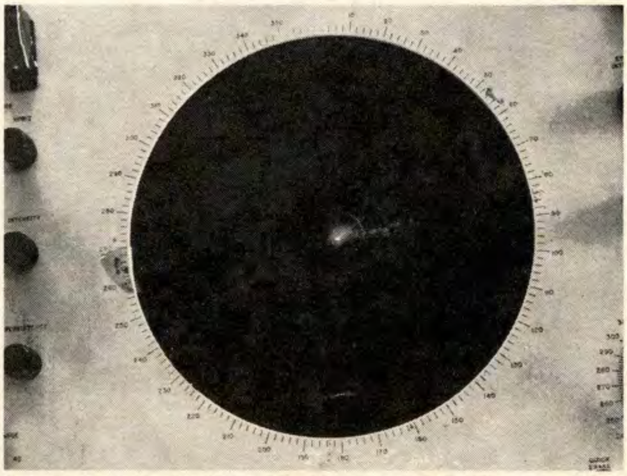
Lt Col Gifford M. Briggs, USAF-Ret.

How many times in your flying career have you just about completed a successful mission only have your nerves shattered through an ulcer-producing near miss in the terminal area? We continually search our souls asking, "Why does this happen?" The air traffic controllers are trained to be diligent and prevent traffic conflicts and the pilot is continually reminded of his responsibility to see and avoid other traffic. The brutal fact is: Neither the controller nor the pilot can see many aircraft, particularly if they are operating at high speed in areas of reduced visibility.

There are other factors. For kicks, add in the guy that's VFR and just happens to wander into the control zone. Our advancement in civilization has also helped compound the problem through SMOG pollution of the atmosphere. Aircraft size is another consideration. Take any two people familiar with an aircraft, say the size of a B-52, and ask them to give you an estimate of distance out on final from touchdown. If you get identical answers, that's fine, but chances are the actual distance is missed by both. Add your smog, night conditions, speed, pop-up VFR traffic, and you come up with one enormous problem.

For many years, particularly since the development of the radar approach control concept for movement of aircraft, it has been recognized that the last 10 miles of the final approach are highly taxing to both the pilot and the air traffic controller's professional skill. Here we have IFR aircraft feeding into the approach sequence with VFR traffic, possibly compounded by an occasional aircraft without radios or with lost communications. To sequence this traffic requires the utmost of coordination between tower and RAPCON. Additionally, it behooves the pilot to put his neck into full swivel to see and avoid other traffic at a time when it is imperative that he concentrate on his landing approach. To feed you into the final, you either remain with RAPCON for full radar service or, if making an ILS run, your communications control is transferred to the tower controller. Chances are, at this point he cannot see you and must rely on only time/distance to integrate you successfully with his closed pattern VFR aircraft. The problems enumerated culminated one day several years ago with a most tragic midair collision of two B-52s.

The technology of aircraft design seems to place more emphasis on speed than visibility requirements. The ever-increasing civil fleet, together with new airports in close proximity, place demands on the human technique for applying regulations which are beyond



Photograph of the Bright Display Storage Tube (BDST) set on the 40-mile presentation with five mile range marks.

their capability. Recognizing this to be a fact, the solution then becomes one of advancing the technology of equipment designed to aid this human deficiency.

The combined efforts of SAC and AFCS have accomplished this by providing the tower controller with improved eyes, capable of detecting aircraft and judging the spacing between these aircraft more accurately. As you have guessed, this extension to the controller's eyes is in the form of Bright Display Storage Tube (BDST) for use in towers. This tube is an adaptation to basic radar and provides a display which can be viewed directly in all light conditions, whether it is a bright sunny day, dull, or dark. The display had to be bright enough so that no light adaptation factors entered into the picture. With these parameters and specifications, we set out to sell the idea to the electronics industry. The manufacturers came up with many suggestions, and attempts to develop this equipment, and, finally, the breakthrough came. After testing extensively at Castle and England Air Force bases, the results were as expected. Here at last was an "eyeball" extension for tower controllers. He not only can "see" farther, but also "see" directly into the sunlight, "see" through the haze, get an accurate fix on distances and perhaps most important of all, "see" the joker who just happens to wander into your flight path when you are at your busiest moment of flight.

This development for flying safety in the USAF is officially nomenclatured the GPA-118. Procurement schedule of the GPA-118 calls for 20 during FY 65, 30 during FY 66, and 30 during FY 67. Major air commands have already established base priorities through the traffic control and landing systems (TRACALS) program so, in the near future, you can expect to have this device for use in your terminal area. FAA is researching the BDST concept and a VIDICON pickup technique for tower bright display capability.

In summation, though, let us part with a word of caution. No matter how sophisticated we become please, for your sake and ours, don't relax your vigilance and responsibility to see and be seen. This cardinal rule for VFR weather operations must remain inviolate. ★

NO NUMBER 44

Lt Col Merle B. Nichols, Directorate of Aerospace Safety

During the month of June the Air Force experienced 43 major aircraft accidents. Here is an account of what could have been Number Forty-Four, but wasn't. Everyone involved (especially the pilot, who just by chance happened to be the safety officer) did everything just right! The original message tells the story as well as we could, so there has been only minor editing.

Approximately 10 minutes after level-off at 39,000 feet, the pilot of a T-33 felt an explosion in the aft section of the aircraft, accompanied by a loss of thrust, RPM and EGT. The gangstart system was immediately activated but RPM and EGT decayed rapidly to zero. After determining that further airstart attempts would be futile, the pilot turned off the gangstart switch, stopcocked the throttle and declared an emergency. He received an immediate vector toward Perrin AFB and a TF-102A was vectored into chase position. The T-33 pilot turned off all electrical equipment except UHF radio and set up a tech order glide. The chase pilot saw three holes in the bottom of the fuselage adjacent to the turbine wheel stripe but reported that there was no evident of fire or major aircraft damage.

As the T-Bird passed through 28,000 feet, the pilot determined that it would be impossible to glide to Perrin. He was given a vector to the Paris, Texas, civilian airport (Cox Field), 30 NM away, which has a 4500-foot runway. When he decided to attempt a flameout landing, the Paris police department was notified to dispatch a fire truck and ambulance to the airport, which was closed for the evening. Runway lights were turned on because of impending darkness.

During descent the canopy and windscreen frosted over, causing the pilot to divert his attention by having to scrape the canopy for adequate visibility. The T-33 arrived over Paris at 12,000 feet and began a 360-degree descending turn to high key. The TF-102, which descended to the runway to clear traffic, reported that the runway was clear and appeared adequate. The landing gear were lowered on final approach when the landing was assured. A smooth touchdown was made 300 feet from the approach end. The pilot used maximum braking and opened the canopy at 80 knots, but was unable to stop on the runway without blowing the tires. The aircraft stopped after rolling one foot into the unprepared overrun.

Damage to aircraft was limited to three holes in the bottom of the aft section, as a result of three turbine blades and two turbine wheel fir trees being thrown through the fuselage. Estimated manhours for repair came to 44 hours. The left main tire tread measured 1/16 inch at all four 90-degree points, and the right main tire tread measured ⅛ inch at all four 90-degree points. Both tires had even wear, with no flat spots. ★

At one base inspection disclosed 80 improper life raft installations. Someone just hadn't done his homework, which may account for the problem of . . .

LOST RAFTS

T. L. Gulliksen, Senior Design Engineer, Lockheed-Georgia Company

Most users of aircraft that have life rafts stowed in areas other than the pressurized compartment have, by this time, been made painfully aware of the hazardous aircraft control problems which can arise when a raft leaves its nesting place during flight and artfully drapes itself around a control surface. The "after-the-fact" corrective action of flying at reduced speed and lower altitude, hoping that the raft will remove itself from the aircraft, has worked quite well so far, but leaves a great deal to chance.

Since the C-130 first became operational, and reports of life raft losses started filtering back, Lockheed-Georgia Company, along with the services, has initiated numerous study programs and, in fact, incorporated some significant changes into the overall system. These modifications have been quite helpful in improving system reliability, however, space prohibits a lengthy discussion of them. Therefore I will discuss some current problems beginning with raft evacuation.

While conducting our life raft test this past winter, we tried to make a properly evacuated raft eject due to entrapped gas. We were not successful. To perform this test, a full size raft compartment was fabricated using production components. The raft, a Type F-2B, was inflated, vacuum pump evacuated, folded per applicable specification and placed in the compartment along with the accessories container and inflation components. The vent manifold was closed prior to latching the compartment door and the test article was placed in the altitude chamber. Pressure in the chamber was reduced to simulate 35,000 feet, temperature stabilized at minus 65 degrees. At this altitude the compartment door was observed to bulge approximately eighty thousandths of an inch in an area just forward of the latch. During the second cycle of this test, the compartment door was propped open so that raft expansion could be observed. The expansion amounted to approximately eight per cent of volume at 35,000 feet, not enough to force the door. The door was latched and the test cycle repeated with no change in results. From this test we must conclude that a properly evacuated raft will not leave the aircraft even if the vent manifold is not functioning. Of course, if the CO_2 cylinder valve develops a poppet leak, and the manifold is inoperative, the raft will be lost. This is another problem that we'll go into later.

Rafts installed in wing trailing edge compartment. Unvented gas pressures can build up enough to cause door to pop open, loss of raft.

For good evacuation, a constant displacement vacuum pump must be used, not the vacuum cleaner. These pumps have to be maintained. We visited one facility that was using a pump on which the oil reservoir had been dry long enough to gather dust. The thing just cannot pump with a dry reservoir. At another base, the one approved pump had been broken for three months. A vacuum cleaner was being used. This base was reporting raft losses at an alarming rate. Of course, the new vent manifold should have taken care of the residual gas, that's what it was designed for. Why didn't it? According to one of the technicians assigned to raft installation, the question was simple; in his opinion, the manifold operating instructions were not correct and needed to be changed. After the approved pump was repaired and the people at this base started using the vent manifold as instructed, life raft losses became a rarity.

How about the CO_2 cylinder? Three reports were received in 1964 informing us of partial raft inflations during landing, taxi and takeoff. Entrapped gas does not expand at sea level. The aircraft on which these incidents occurred had flown several missions since installation of rafts, another fact which rules out gas entrapment. After receiving these reports, altitude tests were conducted on both makes of cylinder-valve assemblies in an attempt to find a leak path. Although neither assembly malfunctioned during the course of the test, a detailed inspection of one make of valve revealed possible leak paths through and around the poppet. Some slight grooving of the rubber could be seen. Continued high altitude use would, without doubt, increase this grooving until the poppet would not seat and a leak would develop. In addition, minute metal chips were discovered on the valve seat, compounding the grooving problem. To overcome this problem we suggest inspecting the cylinders and valve assemblies more often, and more thoroughly. There should be a maximum of three years between detailed valve inspections. Cylinder weight checks, discharge cable length checks and valve cam safety wire integrity inspections must be accomplished frequently. In our opinion, the existing collapsible cable housing should be replaced with one of a solid length design. Low pressure hydraulic hose would be ideal for the job. Of course, the most "Murphy" proof action would call for a new valve design which combines the raft inflation function with the cylinder-raft vent function.

What about this vent manifold? Why hasn't it put a stop to raft losses if it is correctly designed? The greatest weakness of this safety component lies in the fact that it can be misused. The manifold operates on a pressure differential concept; light pressure against the diaphragm will not overcome the o-ring detent and will be vented, but a pressure surge will close the vent, allowing the raft to fill. During our tests we cycled the vent manifold from ground level to 35,000 feet and down, time after time. Each time pressure in the chamber was increased to ground level, moisture laden air was introduced. After waiting for the moisture to accumulate around the vent opening, pressure was again reduced and the temperature adjusted to 65 degrees below zero. We wanted to cause a vent freezing malfunction. Enough moisture did accumulate at the vent opening to form ice, but we were never able to get the vent opening blocked.

As a further vent function test, we inflated the raft with a cylinder and then deflated it by hand, forcing out as much gas as possible. An entrapped gas inspection was carried out in the altitude chamber and expansion was found to be approximately 30 per cent of volume. Somehow we stuffed this raft with all the overwater survival gear into our test compartment and closed the door after opening the vent. As pressure in the chamber was decreased, the door was observed to "breathe," first bulging and then relaxing. The vent manifold was obviously functioning. At 35,000 feet the door bulge was one tenth of an inch. Had all the gas been vented? To find out we closed the vent manifold before the next altitude cycle. At 25,000 feet it was obvious that we were in trouble; the door bulge was approximately four-tenths of an inch. We decided to decrease pressure still further and, at 26,000 feet, the compartment door buckled, pulling the door mounted latch strikers from under the latch rollers. The door was forced open 30 to 35 degrees by the expanding raft and the CO_2 cylinder was lifted five inches off the support trough. Had this been a live cylinder, it would have discharged at this time.

With this test we were able, in effect, to exactly duplicate the sequence of events which have lead to the majority of our life raft losses. Remember, this raft had previously been to 35,000 feet with the vent manifold open. Now, a lot of airplanes have this vent installed, so why are we still losing rafts? For the same reason that we have always lost rafts. Between a lack of understanding of the part configuration and function, some built in "Murphy" features, and carelessness, we are not getting maximum value from this part. We know of several cases in which the check elements were not removed from the raft inlets when the old manifold was replaced with the vent. With the check elements still in the raft, entrapped gas cannot escape and the vent is useless. In another instance, at a midwest base 80 raft installations were inspected on operational aircraft and, in each case, the vent manifold was found in the closed position. Someone just hadn't done his homework.

Above, modified vent manifold (life raft compartment) in closed venting position.

Right, modified vent manifold in open venting position.

The manifold utilizes an O-ring detent to hold the vent plunger open. Unless the installing document is carefully studied, and the internal configuration of the vent understood, it is impossible to externally determine if the vent is open or closed. Try it, hand someone a vent manifold and the part number 717 tool. Chances are that the person will pull the plunger out and announce that he has it in the venting position which, of course, is wrong. To overcome this problem, we modified the unit used on our test article. The change consisted of machining a slot three eighths of an inch wide and a tenth of an inch deep in the removable cap of the manifold. The exposed portion of the vent plunger was painted insignia red around the periphery. This provides an exposed red warning when the vent is closed and, when properly open, the technician sees only the flush, brass end of the plunger (note illustration). This is a cheap, effective change that can easily be accomplished on all your units.

Finally, one of the most important tasks to be accomplished in overcoming the raft problem is to make sure that adequately trained people are doing the installing. A concise, well illustrated life raft publication would be a tremendous help. ★

Aerobits

TAXI TRAP. After about 5000 feet the taxi line turned right to steer around a hangar building on the left of the ramp. The scanner indicated it would be close. The pilot slowed to a crawl and moved to the right as far as taxi lights would allow. (Taxi lights on the right were moved in from the edge of the ramp to keep aircraft off a portion of the ramp needing repair.) The pilot in the right seat was checking clearance. He saw that the wing tip was too close to the hangar, but he could not transmit on interphone due to a loose mike connection. The pilot realized he was too close and applied brakes. The aircraft came to a stop just as the outboard half of the heater pod contacted the hangar. Operator error. AFR 60-11 requires wing walkers within 25 feet and tugs within 10 feet.

HOT WAX-HOT AMMO — A staff sergeant and a civilian with combined experience of 25 years recently proved that all that time on the job won't of itself prevent an accident. They were inspecting 20 mm. ammunition. The procedure called for the container to be opened, ammunition inspected, and container closed and resealed. Resealing consisted of taping the cover to the container then dipping the top of the can in hot wax. During this process the weight of the ammo was too great for the tape on one can to hold and the lid came off permitting the ammo to fall into the hot wax tank. The men immediately removed the electrical plug from the tank and evacuated the building. About five minutes later, eight rounds of the ammo went off rupturing the tank and allowing the hot wax to escape.

P.S. SOPs are being revised to require use of a wire mesh basket to hold the containers being dipped.

FUMES — About 10 minutes after takeoff, at an altitude of 8000 feet, the navigator began to feel "woozy." He got out of his seat and took a couple of steps toward the bunk then passed out and fell down. Noticing this, the first pilot got him back into the navigator's chair and placed the oxygen mask on the man's face. On 100 per cent oxygen he quickly recovered.

The flight surgeon met the aircraft when it landed and immediately took the navigator to the hospital for examination. A blood sample taken 2½ hours after the navigator passed out showed between 10 and 20 per cent carbon monoxide saturation. The medics speculated that the level could have been as high as 30 per cent but that the victim would not have noticed any problem so long as he remained at sea level. The higher altitude in flight changed the picture.

Prior to takeoff, a large truck was off-loaded from the aircraft, a C-124. This took considerable time. The truck engine was running and the exhaust fumes filled the cargo compartment and drifted up to the flight deck where the navigator was. With the truck off-loaded, the aircraft took off without being properly ventilated. At 8000 feet the navigator passed out and one of the pilots also felt "woozy" for a time.

GUN ARMING FIRE. Wiring entering the power cannon plug directly behind the top right gun of the F-86 is of close tolerance and charging the gun can cause chafing of the wiring. As a weapons mechanic was arming the guns in the arming area prior to flight the top right gun was charged once without problems, but, as the second round was charged, the gun bay ignited in a flash, began smoldering, then the entire gun bay was engulfed in flames. The initial flash was caused by the cable arcing from a live wire to the rear of the gun butt of the top gun. At this point, as the armorer released the handle, the cable jumped over the top pulley and fell across the hydraulic line and shorted itself to the DC power relay, burning a small hole in the hydraulic line and releasing atomized fluid from a 3000-pound pressure line. This fluid ignited. The canopy was melted and the seat headrest was burned. The pilot evacuated the cockpit immediately after the initial flash, but received first and second degree burns on the neck and right arm.

COCKPIT CONFUSION — While taxiing toward the parking area the aero club pilot had to add power to get over a light snow ridge. In so doing he lost control and attempted to stop by applying brakes — toe brakes. This airplane, a Cherokee, has no toe brakes, only a hand brake mounted between the front seat occupants. The IP scratched his hand on the ash tray while grabbing for the brakes but managed to get the machine stopped. Damage to prop and fuselage was estimated at $90.

The student was familiar with other light aircraft with toe brakes but was unaware that this plane has only a hand brake. The instructor was tagged with supervisory error for not familiarizing the student with the unusual brake control.

Another aircraft at another base received damage estimated at $266 as the result of the pilot actuating the gear switch instead of the flap switch while taxiing.

These mishaps as well as others indicate that more attention should be given to thorough cockpit checkout. Ignorance on the student's part of where the brake control is located and use of gear instead of flap switch point to laxity on the part of instructors.

PILOT-TO-FORECASTER SERVICE — The subject of radio discipline now comes up as a problem area on METRO channel 13. Forecasters in busy areas handle up to 3500 completed contacts per month in which information is exchanged. There are many more contacts initiated and answered but in which the desired information is not obtained. This boils down to some pretty busy periods, since obviously the contacts are concentrated into periods of bad weather and daylight hours, the latter because that's when we do most of our flying.

A frequent complaint is that some pilots don't assure the channel is clear before making a call. We tend to do this because we are usually in a hurry to get back on center frequency. Another problem arises when a pilot doesn't check the enroute supplement for the nearest METRO. When he calls "Any METRO" he may very well get more than one reply. This can set up a state of confusion on the ground since METROs cannot hear one another.

It is well to remember that channel 13 is first priority for the forecaster. He will drop what he is doing in order to assist you. Radio discipline on channel 13 is consideration for other pilots as well as the forecaster who is trying to give the service. Air Weather Service is attempting to obtain additional PFSV frequencies which will help to relieve the congested conditions. Incidentally METRO is interested in your flight conditions. The PIREP format is contained in the Enroute Supplement.

Aerobits

TIGHTEN THAT BELT — Many years ago, when the writer was learning about flying from the back seat of a Stearman, these words came through the Gosport, "Got your seat belt fastened?" A downward glance showed the buckle to be fastened so we nodded at the steely eyes staring out of the little mirror. Immediately the plane snapped inverted. And, immediately, a shocked and scared student dropped to the extremes of the loose seat belt. Scrambling feet couldn't find the pedals, the top of the stick could barely be reached with the tips of the fingers, and dirt falling from the floor of the cockpit caught the slipstream and stung as it whipped into an unprotected face.

When, finally, the Stearman was right side up again and a desperate yank had cinched the belt firmly into the midsection we noticed that the normally mirthless eyes in the mirror were filled with tears of laughter. We never quite forgave old "Iceheart" for that lesson, but we never forgot it either.

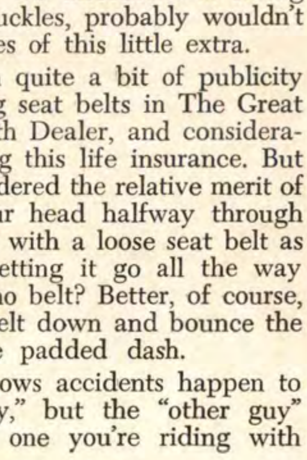
Why recall it now? Because, in our seat belt equipped car, we still have the habit of drawing the belt snug. But a lot of our passengers don't. In fact, many, were it not for the discomfort of sitting on the steel buckles, probably wouldn't avail themselves of this little extra.

There's been quite a bit of publicity about installing seat belts in The Great American Death Dealer, and considerable about using this life insurance. But have you considered the relative merit of restraining your head halfway through the windshield with a loose seat belt as compared to letting it go all the way through with no belt? Better, of course, to snug that belt down and bounce the noggin off the padded dash.

Everyone knows accidents happen to the "other guy," but the "other guy" might be the one you're riding with someday.

WAY OF LIFE—Because of the transport flying commitments and anxiety to accomplish the mission, we as aircraft commanders sometimes are responsible for flying the organization into the "hole." We do this over a period of time by accepting marginally performing aircraft — aircraft where the same components malfunction flight after flight. Instead of demanding that these malfunctions be corrected, we begin to accept these marginal performing aircraft with a shrug of the shoulders and a — "well, this is the way of life." This is not the way of life nor is this attitude conducive to the fulfillment of any peacetime transport mission.

To prevent getting into the hole or to help get out, there are two things all aircrews must remember. First, is the Dash One: your bible. If the aircraft systems and subsystems are out of limits as specified in the Dash One, get 'em fixed! Don't compromise any system which is directly related *in your mind* as a safety of flight item. You owe this to your aircrew and organization. Second, confer with the maintenance officer and establish some type of system to detect repeat writeups in the AF 781A.



Following a recent major accident the aircraft accident investigating board discovered the aircraft involved had experienced 10 repeat write-ups on 10 consecutive flights prior to the accident. Seems impossible, but it happened.

Demand the best and you will receive the best. Accept substandard aircraft and this will become "a way of life."

Maj William M Bailey, Jr
Directorate of Aerospace Safety

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WELL DONE

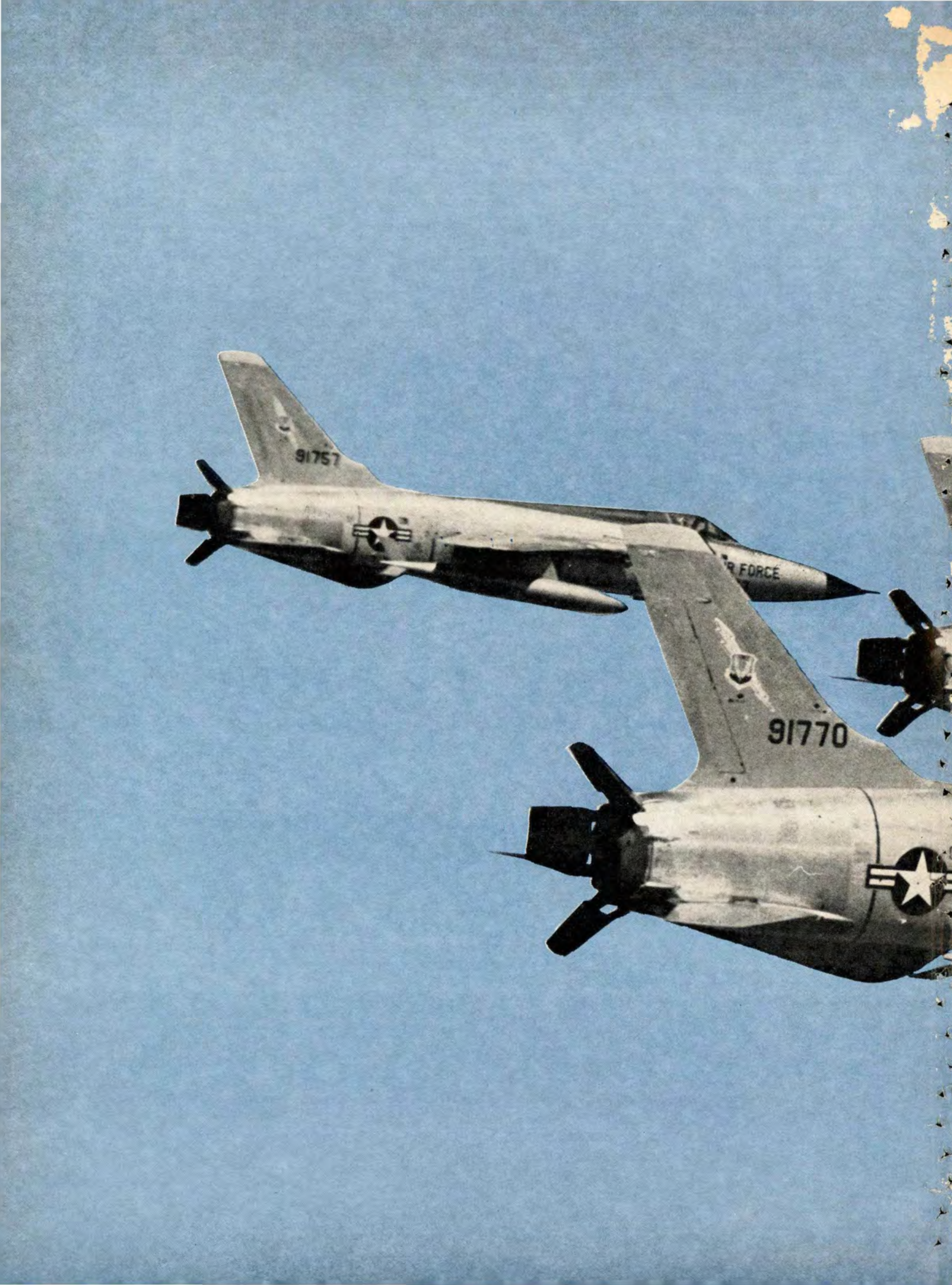
CAPTAIN HENRY P. FOGG

DET 6, CENTRAL AIR RESCUE CENTER (MATS)
KINCHELOE AFB, MICHIGAN

Captain Henry P. Fogg was the Instructor Pilot. The mission was an area checkout for a newly assigned HH-43B helicopter pilot at Kincheloe Air Force Base. The pre-mission briefing included all emergency procedures with particular attention given to the importance of planning areas for autorotative landings. The flight would be over some of the roughest terrain in North America — the heavily forested North Woods and the rough undulating terrain of Michigan's Upper Peninsula.

After a routine take off, the helicopter reached an altitude of 700 feet and leveled off on a heading of 330 degrees. A base access road was followed as far as possible. As the last suitable road for autorotation was left, a quick check of all instruments indicated that all readings were normal. After completing this check, Captain Fogg attempted to find the next suitable site for an autorotation. As he was looking for this site a loud explosion was heard. A check of the instruments revealed the engine had failed! Captain Fogg began an immediate autorotative right turn to the road they had crossed a few seconds earlier. As the turn was made, it was obvious that the distance and hazards of telephone poles, lines, and trees would make the landing very difficult, and the flight path would have to be altered so there would be sufficient RPM to clear obstacles. The only landing area on the highway required that the helicopter complete a 240-degree turn which meant that it was landed with a quartering tail wind of approximately 15 knots. The final flare before touchdown was made rapidly to build rotor RPM lost in evading a pine tree near the intended landing site. The touchdown was made smoothly and the helicopter came to rest with its sling hook only inches away from the centerline of the highway.

While coping with this emergency, Captain Fogg demonstrated his professionalism by making an emergency call to Kincheloe tower before landing on the highway. Once on the highway it was impossible to contact the tower by radio. WELL DONE! ★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