AEROSPACE

SAFETY

UNITED STATES AIR FORCE

SEPTEMBER 1962

USAF FIFTEENTH ANNIVERSARY

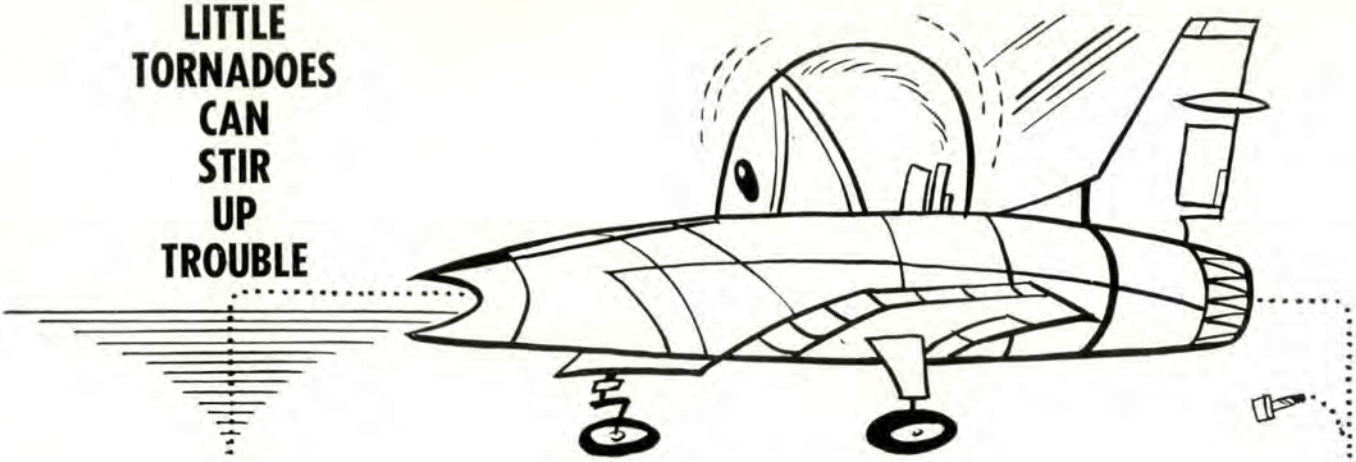
1947 **1962**

44.7

5.8

FIFTEEN YEARS OF SAFETY PROGRESS

LITTLE TORNADOES CAN STIR UP TROUBLE



Small tornadoes are always a possibility near engine inlets when the engines are run at high speeds. Air is being sucked into the engines at high rates of speed and the resulting distortion of air in this area causes these whirlwinds. You may already have seen them during runups on wet pavement. Ordinarily they can't be seen but they exist and can be damaging. The damage occurs when foreign objects are lifted from the ground by the tornado and then are gulped into an engine.

Many studies have been made over the years to determine how foreign materials are pulled into the engines. It has been found that the little tornadoes make some big contributions.

Early in the '50s some tests were run here to check on foreign material entry into the engines. Items were suspended in the air from strings, some were dropped through the inlet stacks, and some were laid on the floor. With the engine running at top speed, nothing went into the engine although some of the items were moved.

NACA, replaced by NASA, also conducted some tests which showed the effects of the little tornadoes. In the tests, an engine in the 5000 pound thrust range with a top speed of 7950 rpm and an inlet area of 2.3 square feet was used. The distance from the ground to the center-line of the engine was variable. The whirlwinds or vortices were generated during some of the operating conditions. A vortex would propel foreign objects upward, and then they would be drawn into the engine. Vortex formation was dependent upon engine speed, distance from the ground, surface wind and intake design.

When the engine was operated at 100 per cent speed, the center-line was 8.5 feet from the ground, and a wind was blowing from the rear at a velocity varying from 12 to 17 miles per hour, vortices formed. They also formed when the engine was operated at 80 per cent rpm with the center-line 4.5 feet from the ground, and a side-wind of five miles per hour was blowing. Although the energy of the formations was considerably more at higher speeds, vortices formed when the engine was run at 50 per cent rpm in head-winds of one to five miles per hour.

A shallow pan filled with water was placed in front of the engine 8.5 feet below the center-line. When the engine was operated at 100 per cent, a vortex formed and the disturbance at the water surface indicated a circular motion of the air at the base of the vortex. Water drops whirled upward and outward in a helical path between the pan and the engine inlet.

Pebbles laid in front of the engine 4.5 feet below the center-line were lifted into the air by the forces acting at the vortex base. When exposed on a smooth surface, the pebbles usually were moved out of the vortex path by tangential forces around the vortex, but when placed close together, some were lifted into the air. They were projected into the air in greater quantity when partly constrained by surface obstructions.

As the vortex passed over them, the pebbles appeared as if a small explosion had occurred among them, scattering them into the air in random directions. Slow or arrested movement of the vortex generated more action among the pebbles than faster vortex movement. After the engine was shut down, numerous pebbles were found in the inlet screen, which had been installed to prevent engine damage.

These tests showed that objects large enough to cause engine damage could be lifted from the ground and drawn into an engine inlet. Combining knowledge obtained from the Evendale and NACA tests, it can be concluded that occurrences of this type of damage are dependent upon engine speed, inlet characteristics, height from the ground, wind velocity and direction, and ground surface conditions.

Since you have little or no control over most of these items, you are left with only two solutions. Cleanliness is the most important. If there are no foreign objects, then no damage can result. In cleaning runup areas and runways, pay particular attention to cracks or obstructions which help particles to be lifted into the inlets. Use runup screens wherever possible to stop the foreign objects in their path of destruction.

A word to the pilots is in order, too. Whenever possible, keep enough distance between your plane and the one ahead of you to prevent the generation of the little tornadoes in front of you, and to prevent the blowing of gravel, concrete, or whatever is available into the path of your engines.

Great strides have been made in the past ten years to reduce foreign object damage. It hasn't yet been eliminated so there's still work to do. ★

•

IN THIS ISSUE

FALLOUT

SHOW OFFS

Recently I noted a "near miss" which set my heart pounding. I had walked over to where an F-101 and F-106 were parked and shot the breeze with the pilots. Naturally they thought their birds were the very best and amid claims and counterclaims we all had a lying good time. Anyway, the two jet jocks planned to start engines together and give the on-lookers (of which there were quite a few) a look at a real max performance takeoff.

I guess this is a natural feeling. I've experienced it myself when I've had an F-104 on static display somewhere. What with no buzzing anymore and no acrobatics over the airpatch allowed, it's about the only way left to "show off" for those of us still juvenile enough to have to "play" with a million dollar machine.

Back to the story. I climbed the high bank below Baseops and watched the show. Well, the '106 lit-off okay, got up a head of steam, lifted the nose gear off to about a 30-degree angle, and S-U-C-K-E-D the gear out from under himself! Well, for the next one and a half seconds, my stomach departed for parts unknown and the old heartbeat just plain stopped dead! I don't scare easily, especially watching somebody else, but this guy really got through to me. Anyway, he made it. The F-101 was tame and looked like the Dash One type.

Maybe that fellow could use a "pre-takeoff-in-front-of-crowds" lecture!

Maj Robert McCook, SCANG

We're concerned, too. People die this way. Ref: "Quarterly Report" in June Aerospace Safety Magazine.

GAR-2A

Regarding Missilanea, item "GAR-2A, Hot Day-Sticky Tar-Nicked GAR" (July), it appears that the loading crewmembers were not using the required handling frame for the GAR-2A type missile (Stock No. 1740-562-7295).

With the high degree of proficiency demanded by major air commands on weapons loading, I certainly feel that the use of this piece of equipment as directed in pertinent weapons loading directives would have prevented the resulting damage to the missile. The crewmembers apparently were not following the "Supervisory Control Sheet," (T.O. 1F-102A-CL-16-1-1) or other Tech Orders developed for loading and unloading F-102A aircraft. I think it would be worthwhile to mention this apparent oversight in a future issue.

TSGT LAWRENCE T. BARRETT
HQ 30 AIR DIV (SAGE) (30CIG)
TRUAX FIELD, WISCONSIN

A recheck with our Missile people proves you are right, Sarge. The aircraft was an F-101 and not a '2. On the '101B you do not use the handling bar. Thanks for your letter.

COVER

This month's cover by staff artist Dave Baer commemorates the Air Force's 15th anniversary. That descending white line is one we can all be proud of and grateful for. It depicts the reduction in the aircraft accident rate from 44.2 to the current 5.8.

Getting the rate down hasn't been an easy job and as the rate gets lower the job becomes more difficult. Nevertheless, this must continue to be one of our major goals. We know that progress can still be made because even during this, our fifteenth year, some of our accidents have been preventable. Wonder what the picture will be on our 20th Air Force birthday?

•

Chief, Literature Branch
Lt. Colonel Jimmie L. Tissue

Editor
Major Thomas J. Slaybaugh

Managing Editor
Robert W. Harrison

Feature Editor
Amelia S. Askew

Art Editor
CMSgt. Steven A. Hotch

SUBSCRIPTIONS—AEROSPACE SAFETY is available on subscription for $3.00 per year domestic; $4.00 foreign; 30c per copy, through the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony and conclusions of aircraft accidents printed herein have been extracted from USAF Form series 711, and may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in accident stories are fictitious. No payment can be made for manuscripts, submitted for publication in the Aerospace Safety Magazine. Constributions are welcome as are comments and criticism. Address all correspondence to the Editor, Aerospace Safety Magazine, Deputy Inspector General for Safety, USAF, Norton Air Force Base, California. The Editor reserves the right to make any editorial changes in manuscripts, which he believes will improve the material without altering the intended meaning. Air Force organizations may reprint articles from AEROSPACE SAFETY without further authorization. Prior to reprinting by non-Air Force organizations, it is requested that the Editor be queried, advising the intended use of material. Such action will insure complete accuracy of material, amended in light of most recent developments. The contents of this magazine are informational and should not be construed as regulations, technical orders or directive unless so stated.

VOLUME EIGHTEEN NUMBER NINE USAF RECURRING PUBLICATION 62-1

HIGH SPEED THUNDERSTORM

Pilot Handbooks of every USAF aircraft recommend one airspeed, or a selected number of airspeeds, to use in penetrating turbulent air or thunderstorms. This airspeed is between minimum control or stall speed and maximum airspeed of which the aircraft is capable. The proper speed for thunderstorm traverses is set as low as possible to alleviate loads imposed on the aircraft by the gusts, but still high enough to give the pilot good control response.

The Aeronautical Systems Division (ASD) of the Air Force Systems Command has undertaken to deliberately violate this basic rule of thunderstorm penetrations. Since May 1960, 20 storm traverses have been made by pilots of ASD, flying F-106 aircraft at speeds in excess of Mach One. Seven other storm runs were made in an F-106 at speeds in excess of 400 KIAS at 15,000 and 20,000 feet altitude. The purpose of the 1960 tests was to prove the capability of the F-106A aircraft to penetrate storms at high speed so that the Air Defense Command could fulfill its assigned mission. The purpose of the 1961 tests was to carry through storms instruments, designed by the National Aeronautics and Space Administration (NASA), to measure turbulence intensity. These same measurements had been taken in previous tests, including the ASD thunderstorm work of 1960. Now it was necessary to go through the turbulence at high speed so that NASA could determine the characteristics of turbulence which will effect the flight of supersonic bomber and transport aircraft.

Mach numbers reached during the projects were from 0.85 at 15,000 feet to 1.9 at 40,000 feet, resulting in airspeeds from 620 to 440 KIAS. Time spent in the turbulent areas ranged from 26 seconds to four minutes and covered distances from five to 26 NM. The maximum acceleration of 3.8G was experienced in 1960; however, during one penetration in 1961, a +2.4 G-load was followed in one second by a −2.3 G-load.

Special preparations were undertaken for the projects. For instance, the standard Fiberglas radome of the F-106 was replaced with a metal nose cone for the 1961 tests. Figure 1 shows the value of this change.

Figure One

This chunk of metal was torn from the nose cone during a 26-second run at Mach 1.63 and 40,000 feet altitude. Another piece was torn from the opposite side of the cone, in the same relative location.

The other change made to the two test aircraft was to have the ignition turned on continuously during the storm traverses to prevent any chance of engine flameout, even though there had been no previous indication that the J-75 engine would not operate satisfactorily in heavy precipitation.

Instrumentation for the 1960 tests was designed to measure basic aircraft and engine performance. However, the instruments used in the 1961 tests consisted of accelerometers, gyros, strain gages, control surface position recorders, temperature and pressure probes, and two vanes mounted on the nose boom. This elaborate set of measuring devices was designed, installed, and maintained on the F-106 aircraft by NASA.

Other than the two aforementioned modifications and instrumentation, the aircraft were essentially in standard tactical configurations for the project.

Important information, in addition to NASA gust data, was gained during these two projects. It was found that F-106 aircraft can penetrate thunderstorms at high altitude at speeds up to maximum Mach number of the aircraft. Of course this procedure should be used only when the mission so requires. In other situations, the airspeed recommended in the Pilot's Handbook should be used. The so-called "Standard Thunderstorm Procedures" outlined in every flight manual are just as good at supersonic speeds as they are at more normal velocities. Naturally, however, greater gust loads can be expected as speeds increase up to approximately Mach 1.2 for the F-106.

Three other types of aircraft have been used by ASD to penetrate storms more than a hundred times during the past two years. In every one of these, airspeed was established prior to entering the storm and then the resultant power setting was maintained throughout the traverse. During the penetration a constant attitude and heading were maintained.

The engine/aircraft combination performed very satisfactorily throughout the programs. Never was there an indication of engine surge or stall during flight conditions ranging from ice crystals to "like-flying-through-a-lake" rain. The aircraft responded well to all corrections made by the pilot.

Damage to the 1961 test aircraft was extensive because of precipitation erosion. In addition to the nose cone damage already mentioned, rivets all along the leading edge of the wing were peeled back, and in some cases, broken off because of rain, etc., scrubbing along the aircraft skin (Fig. 2).

Fig. 3 shows the TACAN antenna after only one flight through precipitation at Mach 1.3 and 30,000 feet altitude. This component had to be replaced twice.

Sheet metal washers along the leading edge of the canopy (Fig. 4) also were peeled back and torn when the precipitation came tearing back across the aircraft. Even the Plexiglas was eroded along its leading edge.

The vari-ramps of the air intake ducts (Fig. 5)

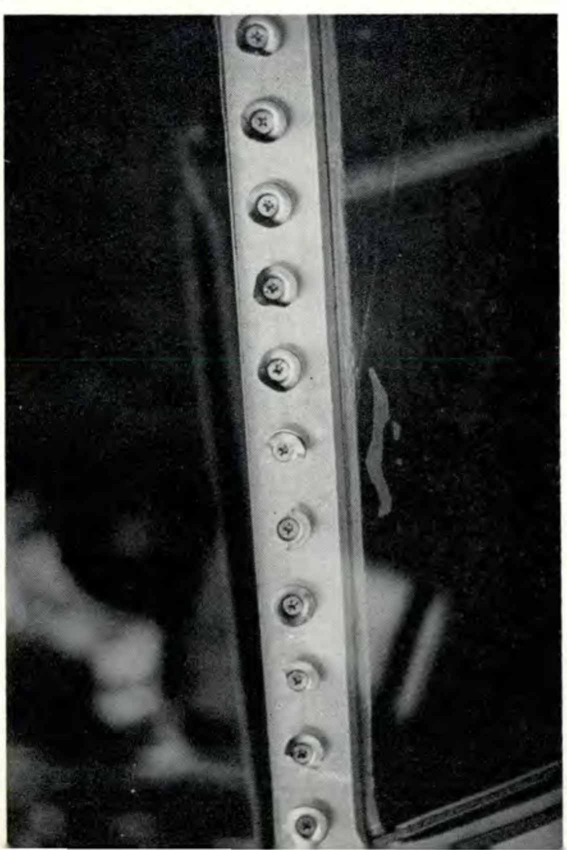
PENETRATION

1st Lt George P. Roys, Directorate of Flight Test, Hq ASD

Figure Two

Figure Three

Figure Four



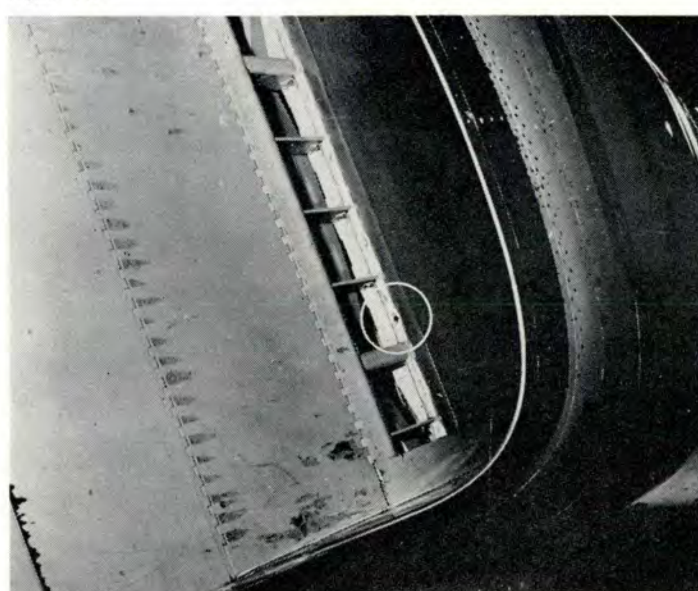
sustained hail damage on three occasions. The photograph shows a hole punched in the metal by one hail ball.

Other components which received damage from one type of precipitation or another were various temperature and pressure probes, the painted surfaces, and the nose cone (hail dents).

Another important result of the 1961 tests was the first attempt to correlate gust data with information from specially designed ground radar sets. These sets, operated by the Weather Bureau, have the capability of distinguishing between different levels of precipitation intensity. The radar scope can show the storm with successively larger amounts of precipitation taken away from the presentation. The return signal strength of the radar beam is a function of the amount of, and drop-size distribution of, the precipitation from which the radar beam is reflected. The radar set attenuates this return signal so that more and more of the reflected beam is cut out of the scope presentation. In effect, it is possible to locate the area of the storm having the highest precipitation intensity.

Figures 6 and 7 are two examples of how a "precipitation profile" of a thunderstorm appears, with the flight path of the test aircraft shown. From preliminary studies of these examples, and others, it appears that aircraft flying in regions where the precipitation intensity is greatest, and where the gradient of lines of

Figure Five



THUNDERSTORM PENETRATION

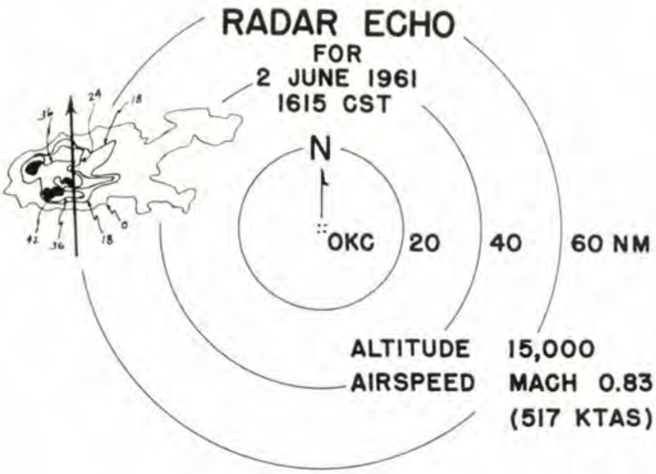
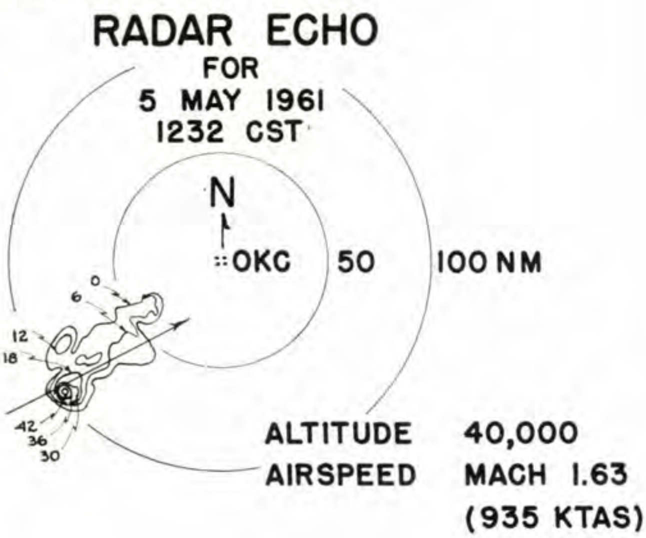


Figure Six

Figure Seven



equal attenuation is steepest, will experience the highest gust velocities. Fighter aircraft are affected more on the roll axis than any other. Being flipped into banks of 30 to 45 degrees was not uncommon. However, with fighter type control response this posed no great problem for pilots expecting this situation.

All tests involving flight through thunderstorms by ASD aircraft and pilots have been undertaken in a step-by-step process. Both basic and newly-discovered knowledge were used continuously which enabled the test team to collect the desired data with a minimum of damage to aircraft. Close monitoring of test procedures by engineering, meteorological, and pilot personnel brought about the accumulation of valuable data for everyone concerned.

In summary, it has been found that:

(1) F-106 aircraft can penetrate thunderstorms at high speed

(2) standard thunderstorm penetration procedures are suitable for flight at all speeds

(3) severe damage to aircraft can result from erosion caused by precipitation encountered at high speed

(4) soon there may be a method found by which ground-based radar can easily pinpoint areas of expected maximum turbulence and precipitation intensities

(5) and last, but not least, thunderstorm penetrations, at any speed, in any aircraft, are not recommended. ★

● ● ●

SMOKING JACKET

During June, a transient T-Bird remained overnight at George Air Force Base, California, and the pilot (as pilots often do) left his jacket on the seat and went off to survey the local facilities. The next morning the desert sun began its torrid work. The T-Bird's canopy was closed, and the cockpit temperature began to soar. The concave surface of the canopy concentrated the sun's rays on the shoulder portion of the jacket and soon Indian signals appeared in the cockpit. A sharp transient alert crewmember noticed smoke. When he opened the canopy to investigate, the smoldering rayon jacket ignited. He pulled the jacket from the cockpit and snuffed out the fire, saving the Air Force one each T-Bird.

All drivers of canopy-type aircraft (and ground crews) should be aware of spontaneous combustion dangers from sun-ray concentration through canopies. Another point: masks and helmets become quite gooey as they melt in these summer cockpit "ovens."

Our thanks to Capt Norman C. Smith, FSO, George AFB, Calif. ★

PERSONALITY

COLONEL
JAMES P. HAGERSTROM
TACTICAL FIGHTER BRANCH
DFS

With the advent of the Atomic Bomb the art of aerial warfare was overwhelmed by those followers of Clausewitz who contended that war can be reduced to a mathematical certainty. To the fighter pilots of the world this thesis not only lacked appeal but its validity across the board was questioned. The Korean war, with the first jet versus jet air-to-air combat, supported the fighter pilots' proposition that the man not the machine is the determinate factor. Without the factor of personality the enemy's ten to one odds, by the mathematical approach, would have given him a decided victory. As a historic fact and a precedent for the future this did not happen. The victory belonged to man.

What has all this to do with Flight Safety? Just this: Although it looks good, the accident prevention program which adheres to the pure statistical approach lacks in practice the most important element, *personality*. It is man not the machine that prevents the accident.

Years of experience in the Flying Safety business prove to me that the commander's interest is by far the most important factor in the success or failure of the program. This, of course, is easy to write about but most difficult to put into practice. But let's take a "for example" of the outward manifestations of a commander's interest in aircraft accident prevention.

A squadron commander leading Red flight on a close support mission low over an Army reservation gets the terse call, "Lead! Red 4, my engine quit!" Before lead could answer Nr. 3 advised, "Pull up and bail out." As Nr. 4 was zooming for altitude the squadron commander calmly advised Nr. 4 to set up best glide speed and heading to the nearest air base some eight to ten miles away. He then dropped back to the wing of Nr. 4. Going to tower frequency he had the runway cleared for an emergency landing. Remaining on wing he talked Red 4 into a difficult straight in approach. As minimum bail out altitude was reached he assured Red 4 that the altitude-distance was OK for the landing. Flying wing down to the flare, he instructed Red 4 at the flare to hit the gear handle. A successful landing was made and another combat capable aircraft saved.

Sounds easy? 'Tis easy but only because the squadron commander's personality was injected into the situation. Only because the experienced mind of man in a position of opportunity was able to dominate the circumstances.

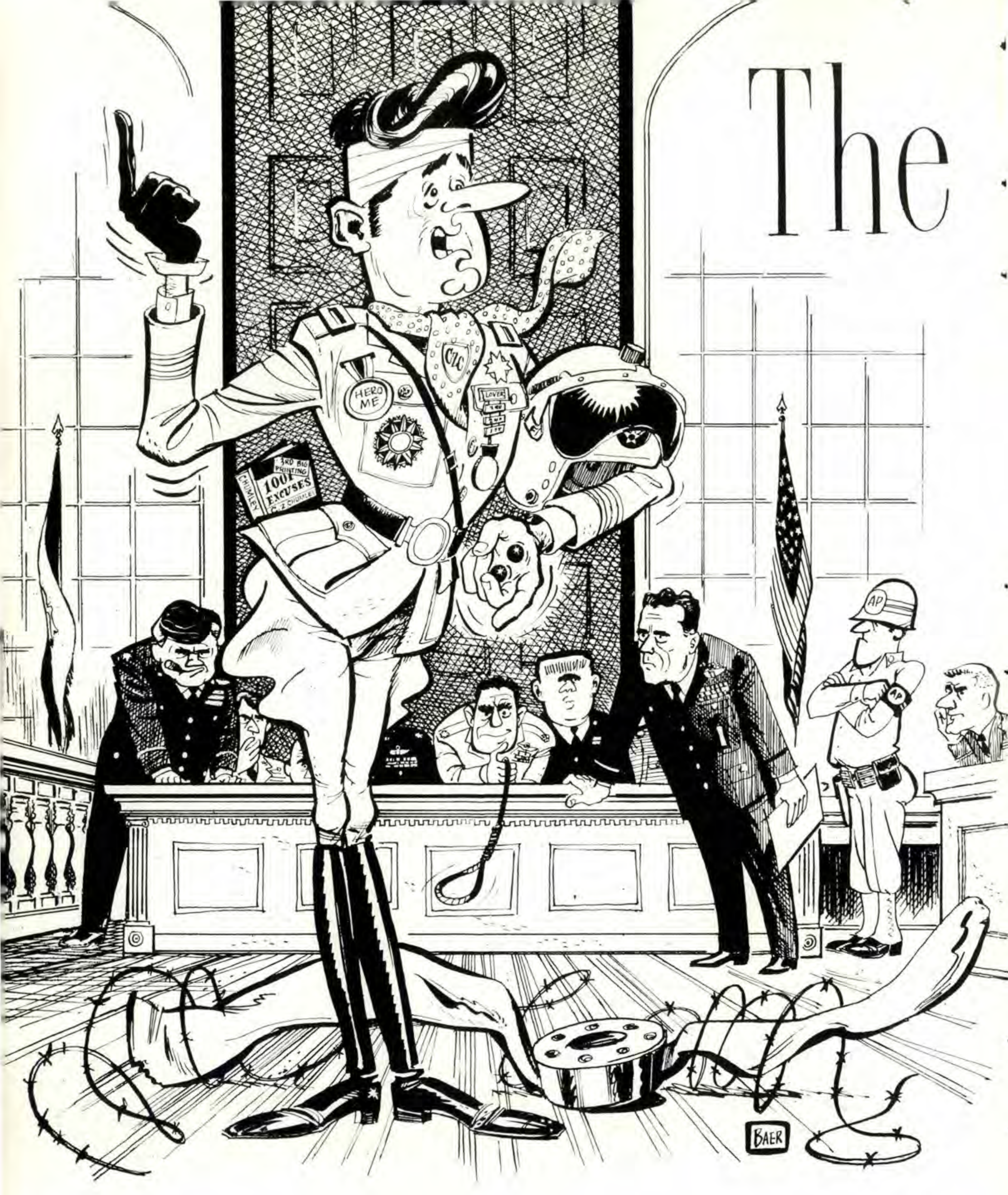
Was the risk to Red 4 warranted? Yes, because to the practiced eye and mind of lead a try should be made, with refusal at minimum ejection altitude.

Take man's personality from this situation and what do we have? Low altitude flameout by the book would probably call for a zoom to a successful ejection but a not so successful bash.

Looking at the other side of the coin brings to mind the accident prevention program which was put into effect in a World War II advance flying school. AT-6 pilots were experiencing the usual toll of ground loops. As the preventative measure the base commander put out a base regulation against ground loops. The only personality being injected into the program was the base commander's signature.

There must be a moral to these stories such as: You can't legislate accident prevention, or you can't apply finite rules to infinite situations. But, keeping it simple, let's settle for: You must have *Personality* in the *Prevention Program*. ★

The


HERO ME
LOVER
3RD BIG PRINTING
1001 EXCUSES
C.Z. CHUMLEY
CHUMLEY
AP
AP
BAER

Ground Came Up

The chairman of the accident investigation board, a 20-year veteran with silver leaves on his shoulders, looked incredulously at the witness. "Captain Chumley, would you repeat that last sentence, please? I just want to be absolutely sure I heard you right."

"Of course, sir." Captain C. Z. Chumley pulled himself up in his chair, straightened his tie and said, "The ground came up and hit the airplane."

The chairman thoughtfully drummed the table as he shifted his gaze out the window and into the far distance. "This is exceedingly interesting, Captain. Such miracles have not been witnessed for some two thousand years. Now," at this point his voice and expression suddenly changed, "what in the . . . do you mean, 'the ground came up and hit the airplane'? And, Captain . . ."

"Yes, sir," said Chumley.

"You'd better make it good."

At this point in the proceedings Chumley reflected back on the events that had brought him to his present predicament. Takeoff from Noname AFB had been routine. The three-hour flight was for the purpose of delivering a small part to Zilch Air Force Base. Weather was CAVU at departure. Destination was reporting fair weather, although there was a squall line in between that had passed Noname AFB the previous night. Chumley had decided that the front offered no serious problem, so he had taken off with the part and an ancient Major whose years of service had broadened not only his outlook, but other assets as well.

About 30 miles from destination, after successfully traversing the squall line, Chumley had leaned back to rest his eyes, turning the aircraft over to his passenger who hadn't flown an airplane since he washed out in a PT-22 in 1941.

"Just hold 'er straight there, George," said Chumley in approved aircraft commander style. "I'll close my eyes here just a mom' and get ready for landing this little dude." With that he leaned back in the seat and soon was dreaming of happy hour just 30 miles ahead. They'd spend the night and go home in the morning, he decided. No use bucking that squall line twice. They'd let the weather blow by and drown out the chill at the club. Chumley had been there before and knew the entire crew. Charlie, the bartender, made the Air Force's best and biggest martinis. As for Gladys, well there WAS a fine waitress.

Chumley was jolted out of his reverie by a sudden yaw and interruption in the smooth drone of the U-3A's twin engines. One had surged momentarily then quit. The aircraft started making wild gyrations and the Major had the wheel full back against his middle. He turned it violently, seeking some means of getting this heaving monster back to straight and level.

Reacting more from instinct and training than from alertness, Chumley tried to straighten up, couldn't in the wildly gyrating aircraft, and reached for the feathering switch. At that moment the Major decided to try a different approach, so he jammed the control column full forward. Chumley's hand missed the target and hit the other feathering switch. Instead of feathering No. 1, which had quit running, he put No. 2 out of action.

Not only that, but he had loosened his safety belt when he leaned back to rest, and when the Major pushed the wheel forward, Chumley slammed into the column, adding his weight to the forward stick position. They were roaring nearly straight down on dead engines and Chumley got a momentary glimpse into what reentry must be like.

"Pull back on the wheel," he yelled.

"I can't — you're leaning on it."

Finally Chumley managed to get one hand on the pedestal and the other against the panel in such a way that he could get some leverage. He pushed with all his might and popped back against the seat cushion where he was suddenly pinned without being able to move. He rolled his eyes to the right and saw that his "copilot" now had the stick full back again. The aircraft was still descending in a high speed, nose high stall. Chumley groaned and also marvelled that the wings were still intact.

The Major, fascinated by the turn of events, seemed frozen. All he could say, over and over, was "the ground, it's coming right at us. The ground's going to hit us. What's going on here?"

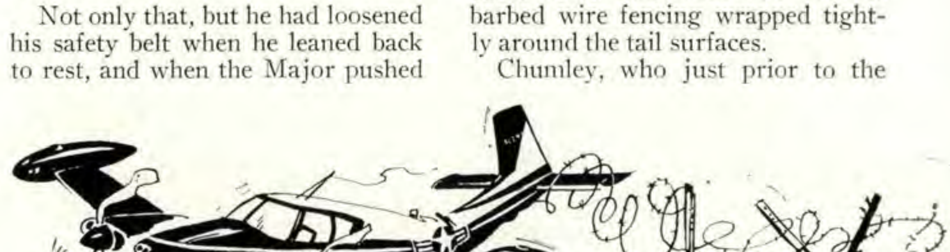
"Push forward on the wheel, you idiot."

"Make up your mind; you said to pull back."

"Don't argue—push."

Just then the aircraft mushed through the tops of a small stand of trees, ripped out a hundred foot swath of bushes, hit the ground and plowed furrows with the props on each side of the fuselage track. It came to a halt with 250 feet of barbed wire fencing wrapped tightly around the tail surfaces.

Chumley, who just prior to the



crash had managed to fasten his seat belt, and was thus saved from going through the instrument panel during the rather sudden stop, leaned back and ran his hand over his face. "Madre de Dios, what next." He leaned forward and turned off the switches, noticed that his companion was gone and followed him out the door.

He found the Major talking to a man in overalls, who, Chumley surmised, was a farmer and the owner of the pasture in which they had suddenly dropped a load of junk.

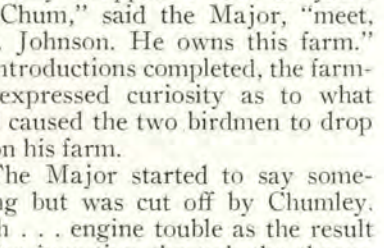
"Chum," said the Major, "meet, Mr. Johnson. He owns this farm."

Introductions completed, the farmer expressed curiosity as to what had caused the two birdmen to drop in on his farm.

The Major started to say something but was cut off by Chumley. "Uh . . . engine touble as the result of ice ingestion through the throwback bar. Caused the figbar to shut off the petrol. Happened so fast we couldn't do a thing about it," Chumley offered.

"So you had to feather 'em both," said the farmer.

"Feather . . . ? Why, yes, as a matter of fact we did." Chumley studied his interrogator for a long moment. This man apparently was more than a country bumpkin and seemed to know something, at least, about aircraft. "You . . . uh . . .



know anything about airplanes?" asked Chumley.

"'Little. I ran an airport for 30 years, until I retired and bought this farm. Used to fly the airmail in the old days. But I spent most of my time as a mechanic.'

"Well, ha, ha, whatta ya know? I suppose you're an expert on these U-3s?"

"Yep. 'Got a three-ten sitting in that hangar by the barn.'"

Chumley devoured this bit of information and decided that further conversation about the nature of the trouble that caused the accident would not help, in fact might be down right dangerous. He hadn't yet had time to devise a plausible explanation for the accident and it was just possible that this farmer-mechanic-airmail flier might be called to testify before the accident board.

"Gotta phone?"

"Sure, come on up to the house."

A few minutes later Chumley was talking to the ops officer at Zilch AFB.

Chumley forced himself back to the painful present. This was the point he had been dreading. What could he say? Lamely, he repeated himself, "the ground came up and hit the airplane. I know it may seem odd to the members of this board, but that seemed to be exactly what happened. There was so much confusion. All that ice, then that terrific downdraft."

"Ice? Downdraft?"

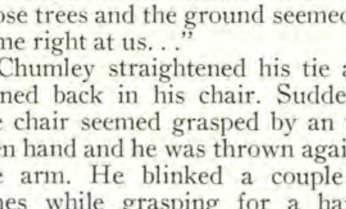
Suddenly Chumley saw a way out. Yes, this was it—he had them. Confidence returned and he began to orate in the best C. Z. Chumley bar side style. "There we were, fighting ice, hail, turbulence and lightning all over the sky. I though any minute we'd buy it. Finally we broke out and I could see the wings. Gentlemen, you won't believe it, but the ice was that thick." He held his hands a foot apart, then narrowed the gap slightly.

"Of course, I had carburetor heat on, the airplane slowed down and going by the book. But we just couldn't carry the ice. I thought for a few moments we might make it, that the ice would melt off in time —we were losing about 500 feet a minute, you know. But the combination was too much. The engines were losing power, then that terrific down draft. Gentlemen, I literally held that airplane in the air with my own two hands. But, alas," he paused dramatically—the room was completely silent—"flesh and bone can do only so much. I couldn't hold it. So I picked the best spot possible and put 'er down as gently as possible."

"Captain Chumley," said the board chairman, "your story is very touching. I have a couple of questions. Why didn't you have the gear down? Why were both engines feathered?"

Now master of the situation, Chumley answered without hesitation. "Well, sir, it was obvious that we were going in. The problem then became one of saving the airplane and our lives. With the engines out, I feathered to give us as much glide as possible. I wasn't sure we could clear the trees with the gear hanging, so I kept it up until the last moment. Then it just didn't have time to come down, so I left it alone, figuring that the additional drag at a critical moment, along with the ice and the downdraft, might just be that extra straw. Then we went into those trees and the ground seemed to come right at us. . ."

Chumley straightened his tie and leaned back in his chair. Suddenly the chair seemed grasped by an unseen hand and he was thrown against the arm. He blinked a couple of times while grasping for a handhold. Then the hearing room disappeared. The accident investigation board dissolved. The familiar panel of the U-3A came into focus. The



Major beside him was struggling with the controls, one wing was pointed at a farmhouse below, the nose at a distant barn.

Wide awake now, Chumley got on the controls with a "guess it's about time I did some of the work, Flaherty. I got it."

A worried looking Major released the controls and settled back in his seat as Chumley smoothly brought the aircraft back to level flight.

"Whew, I was beginning to think this thing had a mind of its own."

"Bet you thought I was asleep. eh," Chumley said. "Of course I had an eye on things all the time. A good IP doesn't take over until he has to. But then he knows exactly what to do. By the way, the martinis tonight are on you."

"Uh, yeah," Flaherty said uncertainly, then, "is there a train from Zilch back to Noname? Think I'll go home that way." ★

READ THE PILOT'S HANDBOOK

Richard J. Pennoni, Aerospace Research Development & Design Engineer, DFS

Published flying instructions used to be short and simple. For example, the pilot's Handbook on a WW I airplane consisted of one page as shown at right. Operational instructions are contained entirely in the one column entitled "Hints on Flying." We know that these would not suffice for flying our modern complex machines; now we have voluminous Dash-One Handbooks. Their size alone discourages thorough reading, but it is necessary that every pilot study and understand all data in the Dash One pertaining to his aircraft. It may save his life! Here's an example from a recent bomber accident to prove the point.

After several race track patterns at low level the final RBS run and climbout were accomplished. During climbout No. 1 and No. 4 engines exploded. The aircraft was vectored for an emergency landing and crashed approximately two miles short of the runway while under GCA control. The impact was left wing low, with the nose high, through a small stand of trees which tore off a portion of the empennage. The aircraft was relatively intact after sliding about 700 feet, but became entirely engulfed in flames upon coming to rest. One crew member escaped, but the other three, including the pilots, perished.

The aircraft never actually intercepted the glide path on approach. At five miles, GCA advised that it was 200 feet low and at two and one-half miles it was still 150 feet low. Investigation revealed that ice ingestion caused loss of thrust. In fact, ice ingestion had caused complete failure and seizure of the compressor on two engines and severe damage to the first stage rotor blades on the other four. There was no evidence of engine malfunction or damage other than that caused by the ice ingestion.

Testimony indicated that anti-icing had not been used prior to the first engine explosion. The failure to use this system allowed heavy ice accumulation in and around the engines. This was ingested at high power settings during climbout, causing degradation of thrust and loss of engines. The anti-icing system should have been turned on prior to entering the area of forecast icing conditions. This is prescribed in the Dash One Handbook which states, "If icing conditions cannot be avoided, anti-icing system should be turned on prior to entering the icing area." The pilot's Handbook goes on in great detail as to the effects of ice buildup about the engine inlet and the possibility of immediate engine failure from ice ingestion when operating at high power settings.

Did the pilots know this one portion of the flight manual? As I said earlier, the Dash One Handbooks are voluminous—this one exceeds 500 pages in addition to safety of flight supplements—but the information is published for you to read, to study, to understand and to save your life! The days of the "Hints on Flying" are gone forever. ★

SPECIFICATIONS CURTISS MODEL JN4-D MILITARY TRACTOR

GENERAL DIMENSIONS:	
Wing Span—upper plane	48 ft., 7⅜ in.
Wing Span—lower plane	33 ft., 11¼ in.
Depth of Chord	59½ in.
Gap between Planes	60 in.
Stagger	16 in.
Length of Machine, overall	27 ft., 4 in.
Height of Machine, overall	9 ft., 10⅝ in.
Normal Angle of Incidence of Panels	2 degrees
Dihedral Angle	1 degree
Sweepback	0 degree
Angle of Incidence of Horizontal Stabilizer	0 degree
AREAS:	
Upper Planes*	167.94 sq. ft.
Lower Planes*	149.42 sq. ft.
Ailerons (each 17.6 sq. ft.)*	35.20 sq. ft.
Horizontal Stabilizer	28.70 sq. ft
Vertical Stabilizer	3.80 sq. ft.
Elevators (each 11.00 sq. ft.)	22.00 sq. ft.
Rudder	12.00 sq. ft.
Total Supporting Surface*	352.56 sq. ft.
WEIGHT:	
Net Weight, machine empty	1430 lbs.
Gross Weight, machine loaded	1920 lbs.
Useful Load	490 lbs.
Fuel (21 U. S. Gals.)	130.0 lbs.
Oil	30.0 lbs.
Pilot	165.0 lbs.
Passenger	165.0 lbs.
Total	490 lbs.
Loading per sq. ft. Supporting Surface	5.45 lbs.
Loading per R.H.P.	21.35 lbs.
PERFORMANCE:	
Speed, maximum, Horizontal Flight	75 miles per hr.
Speed, minimum, Horizontal Flight	45 miles per hr.
Climb in 10 minutes	2000 ft.

HINTS ON FLYING (Right Hand Tractors)

(1) Look over machine in general way.
(2) Be sure of gasoline, oil and water.
(3) Test motor for revolutions.
(4) Be sure controls are working properly.
(5) Start off full power directly into wind.
(6) Watch your direction carefully and counteract with right rudder the machine's tendency to turn to the left, due to the propeller's air blast striking the left side of fin more forcibly than the right side.
(7) After attaining a few feet headway, raise the tail with controls and keep it in this position to prevent machine from leaving the ground until it is well past its minimum flying speed, at the same time watching your direction carefully. If your course permits keep your machine on the ground until its maximum ground speed is reached. Then, very easily and smoothly, take it off the ground. By following the above plan of a high speed takeoff a large degree of safety is assured, for if engine trouble develops soon after, you have surpassed the machine's minimum flying speed and you have a good chance to pick a landing spot that would not be possible if the takeoff were made at slow speed, for the machine would immediately start sinking on loss of power and also lose its controllability to a large degree.
(8) The most dangerous place for engine failure is just after leaving the ground.
(9) When once under way it is advisable to attain a safe altitude as soon as possible, and it will be found that the best results can be attained by a high speed, low-angle climb rather than a slow speed, large angle. A steady, fast climb is the best for all purposes.
(10) After a height of not less than 800 feet, a turn can be contemplated. It is advisable to reach a higher altitude if possible, but do not attempt one lower unless necessity demands to miss obstructions or to play safe on a certain forced landing spot in case of engine trouble. ★

diagnosis: disaster

You should have heard what my doctor said! According to him, just one more shock could spell the end of me. One more sudden strain could bring my old ticker to a sudden stop!

After he gave me the news, he asked what my trouble was. Poor fellow, I should never have told him. Right in the middle of my story, he left rather suddenly, said something about seeing *his* doctor. I don't want that to happen to you, but I feel compelled to tell my story to someone. The release of pent up emotions may be of some help.

You see, my name is Saint Christopher, and I'm assigned as Director of Traveler Safety. This is a full time job, and ever since my UMD was cut during the last manpower survey, we've been working double shift. This alone would be bad enough. The fact is, you Air Force types really upset my workload. You are giving me ulcers, my liver is off course, and my hypertension is getting worse and worse. I can say frankly, it's all your fault.

You travel so fast, and you're in such a hurry, and you do such stupid things!

Now this doesn't apply to all of you by any means. Most of you help me help you, and I appreciate it. In fact, some of you actually help me help others! There are a few, though, who have me on the verge of collapse.

If I could physically fly your airplane, or guide your hand, or control your pencil! But I've got to do this the hard way, and I do mean hard. Let me give you a few examples of what I mean.

Consider the SIBNEC type. That's "Skip Intelligence Briefing, Nothing's Ever Changed." Sure as he gets his gloved hand on an aircraft, the call sign's new, the tanker fleet has changed orbit point, and all the radio frequencies are different. At the last minute, it's up to me to save the day and guide this erring astronaut to a "lucky" tanker find after "a good guess" at navigation.

Then there's the SVFR man, with S for sneak. This usually involves the old reciprocator type who should know better but doesn't. Usually I recognize an old acquaintance here. He tries it again, because I developed a severe case of indigestion that other time leading him through mountain passes, around TV towers, and moving power lines out of his way.

A real case of heartburn always develops while working with the GGH type. He has "Gotta Get Home," and slightly broken airplanes, severe weather, and crew duty limits dare not stand in his way. With a burning desire to be home, or strict orders from the "Com-

Maj. R. J. Broughton, USAF

mander-in-Chief," this type calls for my utmost efforts.

Of course there's the DKR type, who tries my patience. This Fellow Doesn't Know the Rules, and so he flies along blindly, depending on me and my team mates to keep him out of trouble.

My current health status really began the other day when a reasonably middle aged Air Force troop combined all the types in one cockpit, on one flight plan, and on one day. It may bring on another attack of DTs. But here, let me tell you about it.

As our hero left his well populated on-base quarters on this particular morning, the CIC (Commander-in-Chief) sez, "Remember Dear, bridge at the Jones' at 1900. And don't be late because the children must be fed and you have to help get them ready for the baby sitter, and, and, and, AND."

With this pre-briefing, our hero found his way to the office to be greeted by a request, "Fly to X More Air Base to drop off three passengers, it's urgent."

Now hero is a genius with the computer, which he always keeps in his desk for such emergencies. A quick spin told him the sad story: flying time plus refueling made return by "CIC" time doubtful. "Sorry," sez hero, "the press of office duties prevents my journeying, much as I need the time, since I have not flown for 40 days and 40 nights."

Obviously the Operations officer was against me, for without coordination or a request for guidance, he insisted, and hero was on his way. When I saw this, I started one of my dizzy spells, and began to perspire.

Now hero was a shrewd one, and soon found a way to make the trip, and still comply with "CIC" rules. He would make a passenger stop, thus saving the time of clearance filing, and by flying VFR all those disgusting delays would be avoided.

The plan was made, without the guidance of me, my associates, or the weather officer.

It would be an oversimplification to say the flight could not be made VFR. When hero's proficiency, the squall line en route, general low ceilings, and adverse winds were considered, the flight could not be made—Period! Ouch! There go those shooting pains in my back again!

Hero briefed his passengers carefully. I distinctly heard him say "Good Morning" to the one with the birds on the shoulders. With never a thought (and I mean that literally) he was off and soon skimming the base of the mist and murk. For all my effort, it wasn't ten minutes but what hero had done it again. He was solid IFR, over mountainous terrain, below minimum altitude. Right here he followed my advice and made a snap decision, and failed again! It irritates my sciatic condition to say it, but the genius decided to orbit while he called for an IFR clearance. When I saw him going round and round mid the hills, it made by head swim.

I pulled until my shoulders ached, and finally got him to climb and to stay clear of the hills. I know you have rules about flying IFR without a clearance, but somebody had to act, and that's my job.

Hero had trouble with his instrument flying, and my eyes became bloodshot trying to keep tabs on him. Somehow I did it, though I know I'll never be the same again. Finally, hero was on final approach, clear of clouds, and all he had to do was land, and the mission was over.

It was an obvious failure on my part, but I relaxed. I know I shouldn't have, but I did. Hero touched down in the immediate vicinity of the runway, breathed a sigh of relief and calmly ground looped!

Is it any wonder I'm on the edge of nervous collapse? Is it any wonder I've been forced to apply for R&R? I'd tell you some other stories, but my bus leaves any minute—wait!

I've had it again! Here comes a jet pilot with 30 minutes to go and only 20 minutes worth of gas. Now what can I do? Sometimes I wonder why I go to the effort. Save him this time and it won't be long until I'll have him on my hands again. I actually believe some of them honestly think their way is S.O.P. My achin' back, can't somebody get through to them? Show them it doesn't have to be this way. Make them fly with one of the many professionals who never give me any trouble.

I wonder if I can volunteer for schizophrenia! ★

THEY SAVE LIVES

Francis H. Springer, Ground Safety Director, Keesler AFB, Miss.

Late last winter the pilot of a high flying jet successfully parachuted from his crippled craft. He landed in the top of a tree near the Pearl River in Picayune, Mississippi. Contact was made shortly thereafter with rescue aircraft by use of the emergency radio carried by the pilot. The decision was made to delay recovery until morning as the pilot was uninjured and comfortably settled within the branches of the tree. During the night, ground rescue personnel prepared quickly and efficiently to penetrate the swamp to recover the pilot. By dawn the next morning the rescue party was in place and the pilot safely recovered from his nesting place in the tree.

This is but one case that points up the importance of search and rescue units such as the one at Keesler. Here, dedicated men form the ground search and rescue team. They include 10 air policemen, one ground safety officer, two medics, two vehicle drivers from the motor pool, two maintenance specialists from the Air Base Group and six skin divers from the Fin Twisters Club. Team Commander is Major C. W. Roush, Chief of Security and Law Enforcement.

The team was organized in 1959 as a result of a command decision at the Tech Training Center. The proximity of large bodies of water, treacherous streams, forests and swampy areas provided a high potential for personnel to become lost, seriously injured or drowned. The one overriding requirement was that the team have the capability of moving promptly and efficiently to the aid of persons in distress.

The base provost marshal was given the assignment of organizing and training the team and to have a unit in operational readiness at all times. Interest was high and growth rapid. There has long been a waiting list of volunteers. Indicative of the humanitarian consideration is the fact that many members, such as the skin divers, provide their own equipment.

The command post is an 8 x 18 foot trailer van procured by the Air Police, then modified by volunteers in their spare time. The trailer is kept in operational readiness 24 hours a day and the team can be assembled and dispatched in less than 30 minutes.

The entire team can be self sustaining in the field for several days. The trailer is equipped with gasoline powered electric generators, a field cook stove, eating utensils, ice box, refrigerator, bed rolls, blankets, water storage tank, gas masks, cots and all sorts of emergency tools, skin diving equipment and flood lights. Boats, a boat trailer and an 18 hp motor round out the major items of equipment.

The trailer has an antenna that can be connected to an Air Police Radio vehicle. In case the emergency site is near the base, direct communications can be established with Air Police headquarters and the Center command post. If the site is not within radio distance to the base, the team leader posts portable radio operators to serve as relay stations for initial communications.

The team has been called out for drownings, two aircraft crashes and two hurricane alerts. They have operated in mosquito and snake infested rivers, swamps and bayous of Mississippi and Louisiana.

The team itself has a perfect safety record, despite the risks inherent in such an operation. The Keesler ground safety officer is a member of the team and devotes his efforts to accident prevention, both during practice and in actual rescue operations. He always contributes a lecture at training sections.

Two months after organization, the team was put to a thorough test. A B-58 crashed 85 miles from the base and the team spent 35 days at the crash site performing rescue and security functions.

In accord with the motivation that established the unit in the first place, it is always ready to answer a call for help; is on standby for local Civil Defense organizations in any type emergency and forms an important part of the Base Disaster Operation Plan. ★

• • •

AS YOU FLY, ASK US

Your neighborhood AWS forecaster can't give you the word on the best culinary establishment or which VOQs have adjacent swimming pools. He has, however, connections with the most extensive weather service in the world, and you don't even need a credit card to receive his service.

When departing from a military base, you receive personalized service. All the base facilities are at your disposal—from the local belle who serves that refreshing cup of coffee to the alert man who "fills 'er up." Your weather service fits in the same way. The service is there for the asking.

Facilities aren't this convenient when you stop at a field without a military base operations. In addition to closing your flight plan, you may have to chock the bird, supervise the buying and distributing of fuel and perform both post and pre-flight inspections. Neither do you receive the same weather service. In fact, at some military bases, there is only local weather service during certain hours. So how can you receive the weather word in these two cases?

Paragraph 53a(1), AFR 60-16, allows you considerable leeway to obtain weather information when departing airfields without military base operations. You may obtain weather information from any accredited forecaster (individual designated as such by the AWS, U. S. Weather Bureau, U. S. Naval Weather Service, or ICAO member states). If you can't contact a forecaster, you may obtain weather information from observers or teletype sequences. If facilities are not available, you could even write "Weather facilities not available" in Section D, Form 175, and go. This, however, was not the intent of this paragraph so you can expect an early revision.

How available are weather facilities? Right at the nearest telephone. Eight weather-briefing facilities have been established by AWS to continue tailored weather service for all military pilots regardless of departure point. Specific instructions with telephone numbers are contained in Flip Enroute-Supplement, U. S. If departing a civilian field or a military base when a forecaster is not on duty, you can use this service. You may need a coin to raise the long-distance operator, but the service is free to you—just call station-to-station, collect.

You may decide that this is just too much trouble and you'll pick up whatever "poop" you can from the Weather Bureau (WB) or Flight Service Station (FSS) briefer. To help with this decision, you should consider the following.

• WB offices and FSSs do not receive weather observations from all Air Force bases—only those from their same general area. Even though some hourly observations might be available, there is no guarantee that special, late or corrected *observations* will be received. They do not receive *forecasts* from all air bases nor do they receive Air Force clear air turbulence bulletins.

• WB and FSS briefers do not evaluate and update forecasts received from centralized sources. They are not versed in operational requirements of Air Force aircraft.

• USAF NOTAMS are transmitted over AWS weather communications nets. WB officers and FSSs will receive NOTAMS only from those USAF bases in their general area. They do not have NOTAMS from all USAF bases. At each AWS briefing facility, Base Operations has an extension on the phone used for briefing. After the weather word, you can receive the NOTAM word from the clearance officer and dispatcher.

You may be willing to accept a quicker, less-specialized weather service, but remember the limitations. Weather services are not competing among themselves for your patronage. Each service has a specific job. So, as you travel, ask the dealer best equipped to support your requirement.

P.S. Same thing applies when in flight. Pilot Forecaster Service can serve you better than ARTC or FSS. ★

Maj Wilson V. Palmore, Hq Air Weather Service, Scott AFB, Ill.

EJECT and LIVE

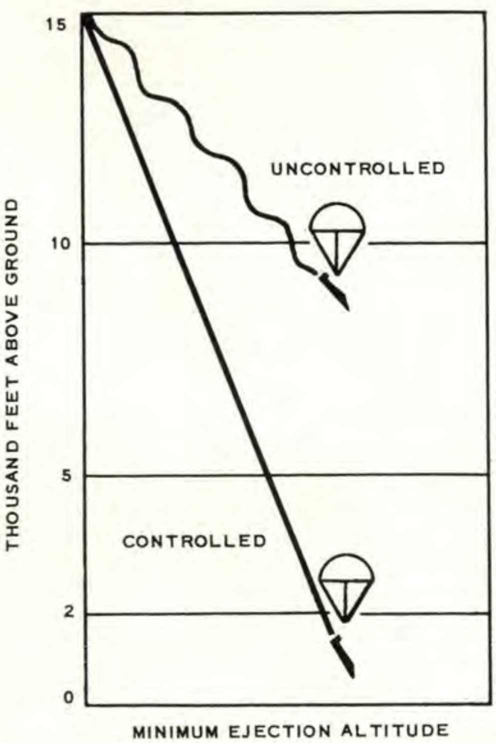
When you consider the problem of ejecting have you ever thought of the factors working against you? For instance, one of the standard type altimeters currently in use has the following errors: scale error, hysteresis error, friction error, lag error, position error, variation of pressure to standard atmosphere, variation of altimeter pressure setting to actual ground height above sea level.

The first six of these errors are controlled through standardization and calibration of the altimeter. The last has to be controlled by the crewmember. Ordinarily these errors are small and rather insignificant, however, in a high speed, uncontrolled dive they mount up very rapidly. It is possible in a high speed dive to exceed the unwind speed of the altimeter, adding a considerable error to the reading.

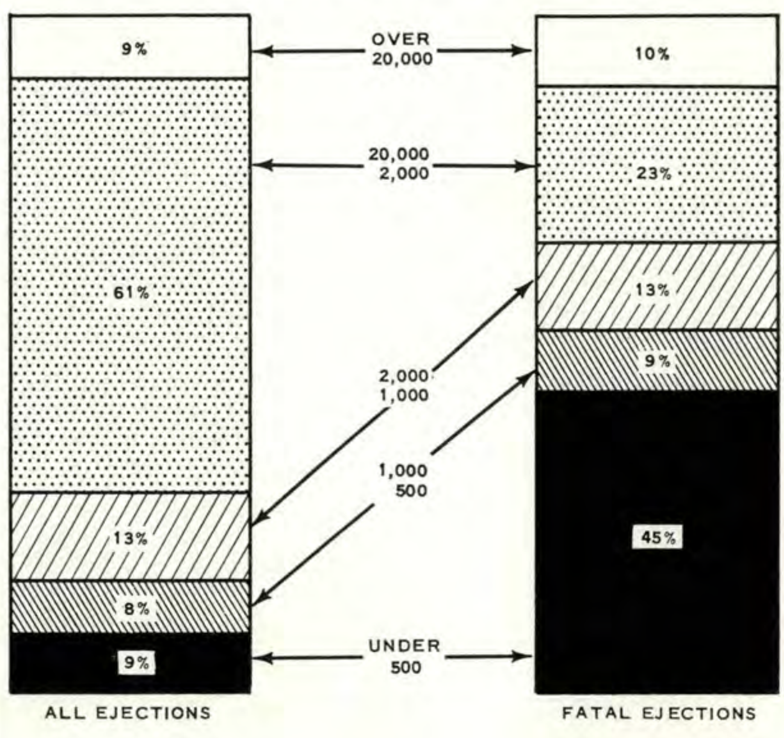
Improvements in aircraft escape systems have greatly increased the success of ejection during low level emergencies. However, when an emergency occurs at altitude, do not delay ejection under controlled conditions below 2000 feet and during uncontrolled conditions below 10,000 feet.

The illustrations on these 2 pages should be carefully considered by every crewmember. ★

Uncontrolled, 10,000 ft terrain clearance depending on type aircraft. Controlled, 2000 ft.



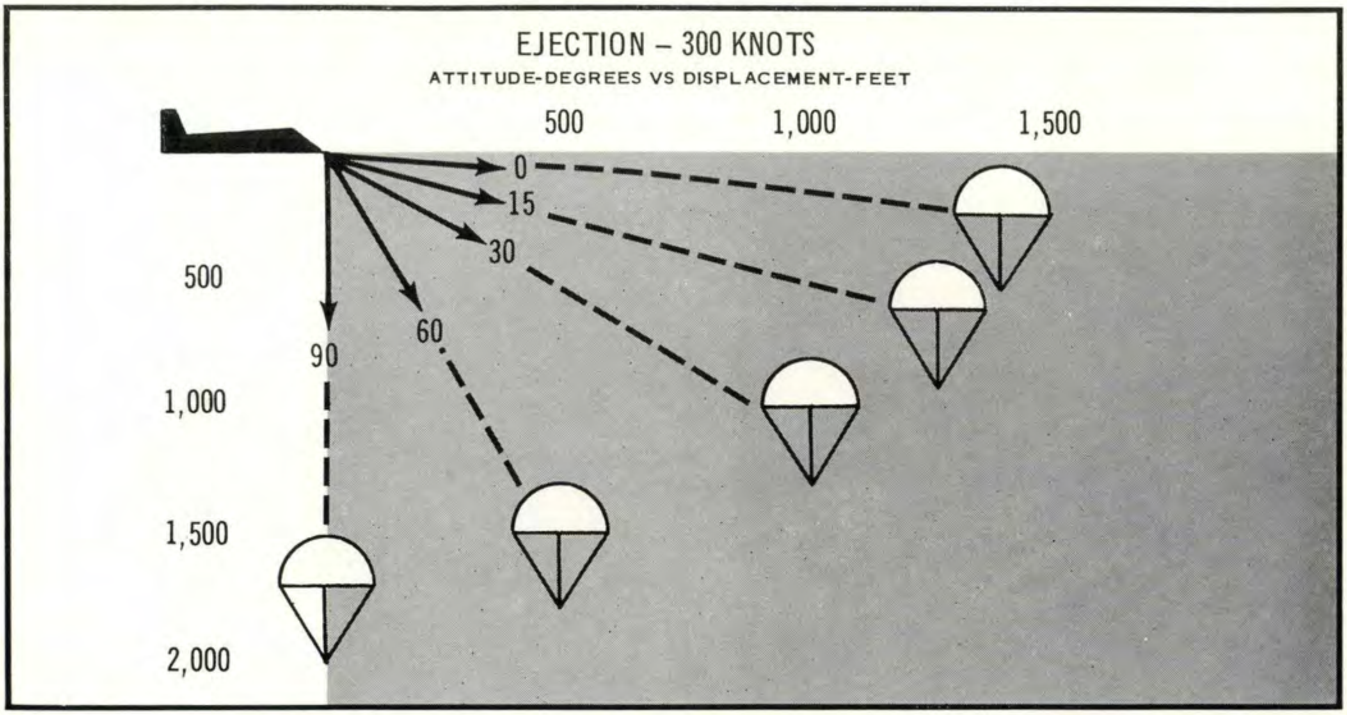
Fifty-four per cent of fatal ejections occurred at or below 1000 ft terrain clearance.



AIRSPEED

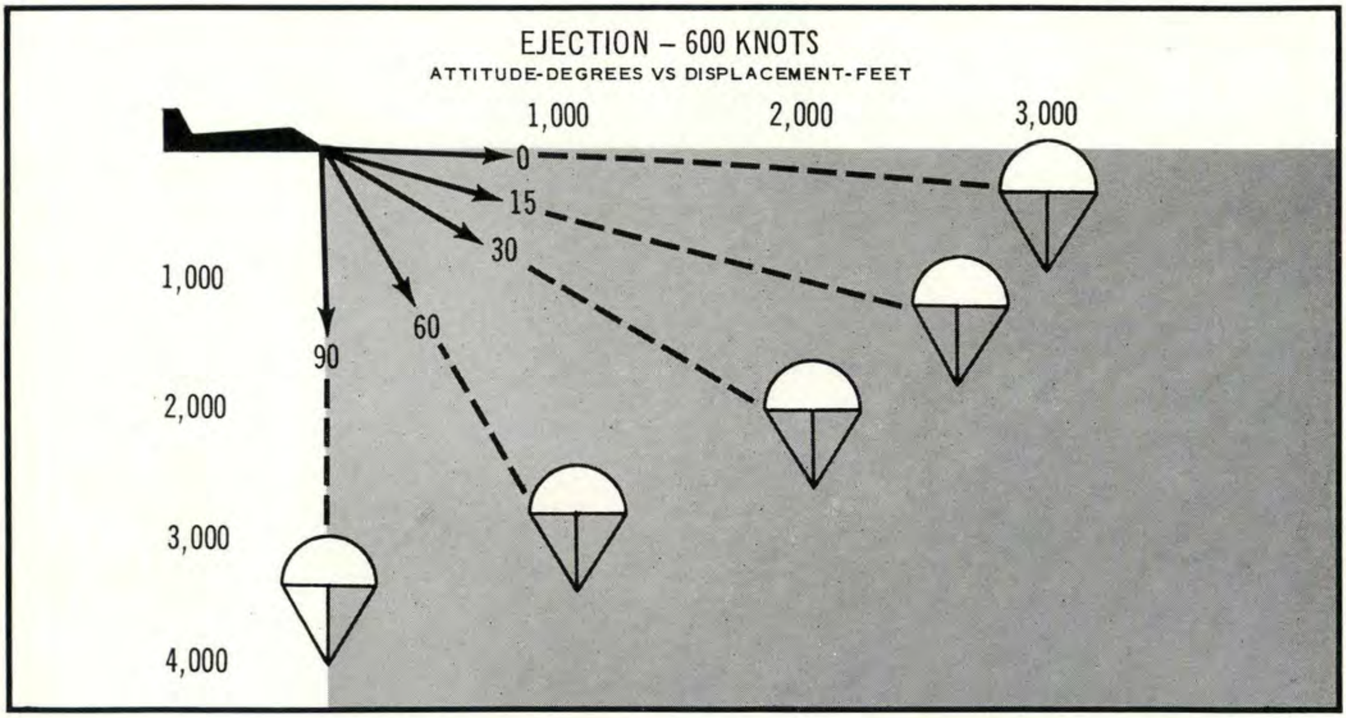
Knots	Ft/Sec
100	170
200	340
300	500
400	670
500	840
600	1000

Free fall terminal velocity 180 ft/sec. At 600 knots you are traveling at the rate of roughly 1/5 mile per second.



Above, at 300 knots in a 90-degree dive, you will lose almost 2000 feet prior to chute deployment.

Below, at 600 knots in a 60-degree dive you will go through approximately 3000 feet prior to chute deployment.



"Altitude above you is like runway behind you."

☆ MIDYEAR *report*

☆ FLIGHT

ENGINE DEPENDABILITY Increased dependability of engines in single engine aircraft is considered to be one of the most important contributions that can be made in the reduction of aircraft accidents. Currently, engine failures and malfunctions account for about 20 per cent of all major accidents. Improved reliability is considered an achievable goal and one that is receiving considerable attention. Specifics in this area include:

J-65 Major deficiencies include main bearings, compressor blades, turbine blades and lube pump splines. A modernization program has been presented to the MOD review board with tentative scheduling calling for initiation of the program in December with delivery of 40 modernized engines. Delivery rate is to increase to 75 per month with completion date set for December 1963.

J-79 Major problems have been compressor stalls, number two main bearings, afterburner operational reliability, afterburner pigtails and teleflex sleeve wheels. Project "Hardcore" was established to update the -3A engine to the equivalent of the -11 engine. Some of the engines have been shipped, but not as rapidly as scheduled; the slippage due to delay in delivery of compressor stator blades to the prime AMA and main fuel control overhaul problems.

J-57 Problem areas have been main fuel manifolds, afterburner flame holder failure, afterburner pigtails and spray bars, turbine front bearing supports, cast turbine blades, main bearings, N1 compressor rotor spacers and fuel pump splines. Overhauls since 1 May 1962 have been modernized. Using commands started inputs into the modernization program in July. Scheduled completion date is the end of calendar year 1964.

R-1320-103 An Engineering Change Proposal to strengthen pistons and pins, articulating and master rods to modify the -103 engine to the -103A configuration has been established. Delivery of the first engine was scheduled for September.

FLIGHT CONTROLS Flight Control Systems in high performance aircraft have caused considerable concern. Such problems have contributed to two B-58 accidents, two F-105 accidents and numerous KC-135 incidents. Status of corrective efforts is:

B-58 An impound-inspection procedure has been instituted for all aircraft experiencing abnormal flight control conditions. To date, no major discrepancies have been found. Aircraft were grounded pending completion of contractor-Air Force technical evaluation. A tech order change provides for improved structural components, disengages the autopilot and accomplishes a safety functional status inspection. Design, flight test and qualification of an angle of attack indicator has been authorized, and the target date for retrofit kits has been set for 1 November.

KC-135 Forty-two incidents of marginal takeoff performance and/or erratic control during rotation occurred during heavyweight takeoffs. In the former, the aircraft had marginal acceleration and climb capability after unstick. In the latter, control problems of elevator force lightening and porpoising occurred. As a result:

- Stabilizer trim charts were revised to include a greater nose-up stabilizer setting for takeoff to reduce required elevator deflection.
- Rotation speed was increased approximately three knots.
- Engineering changes have been proposed to improve elevator effectiveness.
- Support has been given to incorporation of an angle of attack indicator.

ESCAPE AND SURVIVAL EQUIPMENT

Preservation of life is considered equally as important as the prevention of accidents. DIG/Safety personnel, particularly in Life Sciences, have been urging immediate procurement of a personal locator device and development of improved escape and survival equipment. A brief status report on major projects in this area follows:

PERSONAL LOCATOR BEACON Present equipment has been reported by using commands as grossly ineffective. Several meetings of the Personal Equipment Advisory Group have been held to discuss needs, examine equipment that is available, and to determine the type beacon most suited to Air Force requirements. The Deputy Inspector General for Safety has advised Headquarters USAF, ASD, and all Personal Equipment Advisory Group Task Group members of his support of immediate procurement of personal locator devices. Support was also given to messages which stated objections to changes of specifications previously agreed upon by all commanders.

LOW LEVEL ESCAPE SYSTEMS Installation of rocket catapults and man-seat separators has long been recommended. Current status is:

The F-104, F-106 (interim seat), B-58 (interim seat), T-38 and some F-102 aircraft employ rocket power seats. The rocket catapult modification for F-100 aircraft is underway. The supersonic "B" seat is being installed in F-106 aircraft. Qualification testing on the B-58 encapsulated seat is continuing. Funding for modifications to include rocket catapults and man-seat separators in T-33s has been approved by AFLC. Flight and sled tests to determine minimum forward speed requirement for zero altitude ejection have been completed. Automatic man-seat separators have been installed on the F-100, F-101, F-102 and the F-105. Engineering change proposals for this equipment are in work for the T-37 and the R/RB-66.

PARACHUTE CANOPY RELEASE "Drowned, missing and presumed drowned" is the second leading cause of ejection fatalities. Failure to survive parachute water landings has been related to difficulty in actuation of the parachute canopy release. Several promising commercial items are currently being evaluated by ASD.

C-124 Aircraft

PROP SHAFT FAILURE During the period January 1961 through June 1962, fifteen prop shaft failures occurred in the R4360-20WA engine installed in the C-124A aircraft, two of which happened in flight. The first indication of this problem was when oil began seeping through cracks in the nose casing. Some prop shafts were cracked across as much as 50 per cent of the circumference. Re-working all propeller shafts at the time of overhaul, plus replacing all nose sections at each 500 hours, failed to eliminate the problem of broken shafts. To correct this deficiency: The C-124C engine (4360-63A) is being installed on all C-124A aircraft, completion date to be September 1963.

DETERIORATION OF ELECTRICAL WIRING Over the years of operation, the electrical wiring on the C-124 has deteriorated considerably. Since this aircraft has eleven different wiring configurations, adequate inspection and troubleshooting have created a safety-of-flight problem of concern to major command operators, the prime AMA and DIG/Safety.

The first step to correct the problem involves an evaluation by the manufacturer of the present electrical wiring system, followed by furnishing the Air Force no more than three wiring configurations for the C-124 fleet.

The second step will be undertaken by WRAMA: a further evaluation of the wiring system by tearing down selected aircraft to determine present conditions. Target date for completion of this evaluation is set for January 1963. Based on findings, a rewiring program for the C-124s should be initiated.

☆ MISSILE

ONE COMPARISON — 250 accidents and incidents during the first half of 1962 as against 167 for the same period the previous year points up the necessity of continued emphasis on accident prevention. This increase is not a valid comparison, however, as there were more missiles in the inventory in the first half of 1962. Further, no standard rate of measurement has been evolved for missile accidents/incidents as is the case, for example, in the rate per flying hour by aircraft. (A rate computation method for missiles is under test.)

One of the most encouraging prospects, safetywise, is the writing of a mil-spec that is to go into missile weapon systems contracts. This mil-spec will provide for the programming of safety into weapon systems development and require that safety specifications be met just as performance, life expectancy and other specifications are now met. This action exemplifies accident prevention thinking of selling safety at the source as a means of preventing after-the-fact expensive modifications.

Personnel and materiel continued to be the two largest contributors to the missile accident/incident picture during the first six months. Ground handling was the major problem area in GAMs, GARs, FFARs and MB-1 rockets. Damage resulted from improper handling during loading and downloading and during maintenance. Other personnel errors included incorrect attachments, broken nirdomes and inadvertent drag chute pin pulling. Guidance failures pointed up less than desired reliability standards.

A serious bulkhead reversal problem came to light in the SM-65 weapon system. Personnel error and equipment deficiency allows bulkheads to be collapsed or reversed by incorrect differential pressure between fuel and oxidizer tanks.

Incidents have occurred due to lightning strikes. Money has been allocated to conduct a lightning investigation program.

Several airmen received minor injuries by being sprayed with ammonia when disconnecting ammonia couplings during routine servicing. A meeting was held with the manufacturer in July to discuss the entire ammonia problem area and to decide on corrective action.

Benefits are expected to accrue as a result of an all

• *MIDYEAR REPORT (Cont.)*

commands letter enumerating guide lines for command safety programs. The 11 points stipulated in this letter include:

1. Demonstrated command interest in the safety programs and associated safety problems.
2. Regular and frequent safety council meetings.
3. A strong safety organization manned with qualified personnel.
4. Vigorous support of the safety program by key staff supervisory personnel.
5. Command directives that prescribe and describe the safety program.
6. A safety education program.
7. A system for scheduling command safety surveys and staff visits.
8. An administrative system for systematically following through on the correction of safety deficiencies.
9. Safety checklist standardization for all similar command units.
10. An active, aggressive hazard reporting system.
11. A good accident/incident investigation system including a pre-accident investigation plan with board members trained in investigation procedures.

☆ GROUND

A mid-year look at the Ground Safety picture calls for strong action. At the end of the first six months 250 people had been killed in ground accidents. Projected, this means 500 per year. This is the problem—not the rate, not comparison with previous performance, not revision of accountability procedures—but saving the lives of 500 people a year. Hand in glove with this is the prevention of all accidents. For the statistically minded the overall accident rate is 17 per cent above the previous year. This is only partially offset by an 11 per cent strength increase.

At the halfway point the disabling injury rate was down—encouraging until you consider the complete picture; there were more disabling injuries, but the increase had been offset (ratewise) by more people.

The problem pattern hasn't changed significantly. We don't have to combat new hazards; we have to do a more effective job on the old ones. The private motor vehicle is still the No. 1 killer. By June 30 a total of 191 Air Force personnel had lost their lives from this cause alone, 28 more than on the same date a year ago. We have achieved an unenviable rate of more than one per day. Seventy per cent of all PMV accidents are one car accidents, and the finger of blame points straight at the driver. We can't fall back on materiel, design deficiency, undetermined, miscellaneous, or any other category. This one we have to face squarely in the mirror.

WHAT IS NEEDED:

COMMAND SUPPORT. Inadequate command support is easily spotted during surveys in lack of direct action by the commander—letters, messages, firm controls and disciplinary action when required.

Proper implementation of AFR 125-14, the point system for violations, would help. In several cases six or seven moving violation citations had been issued before the individuals were involved in fatal accidents. How many deaths could have been prevented if action had been taken by the commander on the *first* moving violation citation? Less than one per cent of all drinking driver accidents result in courts martial. The matter we are concerned with here is one of life and death. Hard-nosed action is mandatory. Let's solve the problem, not find excuses for inaction.

BETTER REPORTING. It's basic that all accidents must be reported if headway is to be made in prevention. Yet, repeatedly we find commands that have not established adequate validation procedures. In addition, too many accident reports are being sent forward with inadequate descriptions of what happened, how it happened and why it happened. Unless all accidents are thoroughly investigated, the cause factors determined, and properly reported, corrective action to preclude a recurrence of that accident cannot be taken.

IMPROVED COORDINATION. Ground Safety, not being an action agency, must depend upon staff and support activities to implement directives and safety requirements. Surveys have disclosed glaring discrepancies. In some cases guidance from ground safety was completely lacking. In a number of others, ground accident reports were not even submitted to interested staff activities for their review and action. Often, action was vague and inconclusive. There were specific instances when the staff activities relied on ground safety to take the necessary accident counteractions and ground safety depended on the staff to do so. Consequently, nothing was done. This is "follow up" action in its most ineffective form.

COMBINED EFFORT. Combined effort is required by all commanders, staff officers and ground safety specialists together with cooperation by all individuals if real progress is to be made. Were *any* of these applied the following case would have been extremely unlikely—were combined efforts exerted it would have been impossible. A government motor vehicle driver finally became involved in so many driving accidents that he had to be removed from the position. His new assignment—an instructor in the motor pool's driving school. ★

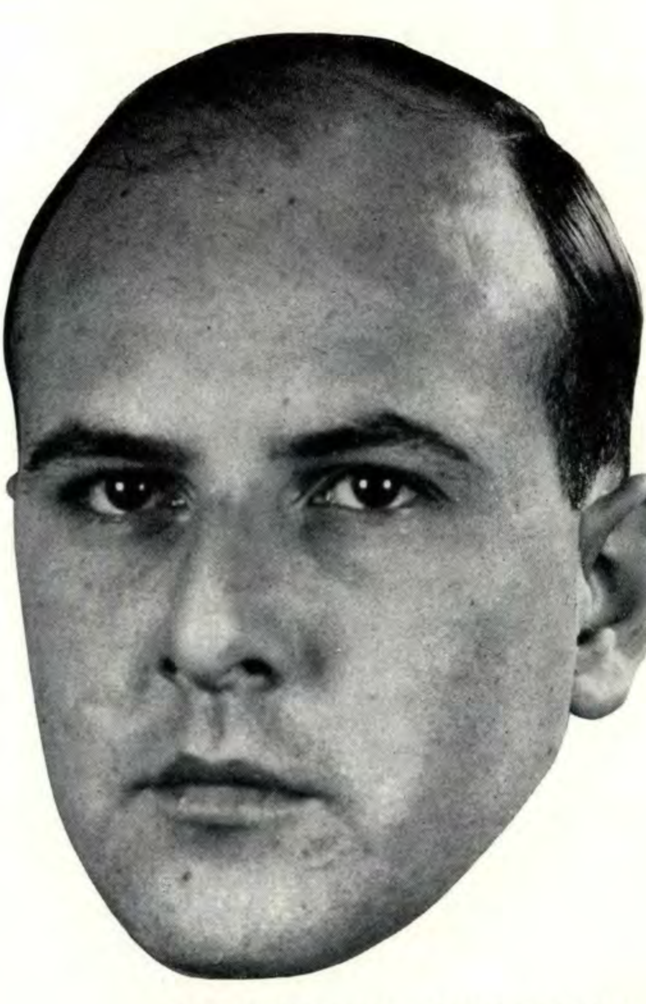
WELL DONE • First Lieutenant Jon C. Kahl

10th Tactical Fighter Squadron, 50th TFW, Hahn AB, Germany

First Lieutenant Jon C. Kahl displayed a high degree of professional airmanship when he safely landed his F-100F aircraft with the engine fuel control stuck at the full military power position. Lt Kahl advanced power to climb over a lower cloud deck. Upon retarding the throttle the RPM stayed at 99¾ per cent and the EGT was 660°C. By retarding the throttle to idle, the RPM would slowly drop to 97½ per cent. Lt Kahl notified the Wing combat operations center of his difficulty and was advised to attempt a landing at Spangdahlem, which has a 2000-foot longer runway. He found that with the gear and flaps down and speed brake extended, the aircraft would maintain 225 knots in level flight. Each time he lowered the nose he would rapidly pick up to 250 knots or more. With 3000 pounds of fuel remaining he set up an extremely loose overhead pattern and turned final four miles out, 100 feet above the terrain. By pulling G on the turn from base to final, he slowed his aircraft to 225 knots, but as he approached the runway the airspeed increased to 260 knots. Assured that he could make the runway, Lt Kahl turned off the engine master switch and stopcocked the throttle ½ mile from the overrun. He touched down at 195 knots approximately 1500 feet down the runway. The drag chute was deployed at 175 knots. By using aerodynamic braking and then maximum wheel braking, Lt Kahl stopped his aircraft—with 2000 feet of runway remaining. He was not forced to jettison the external stores.

Subsequent investigation revealed an internal failure of the engine fuel control.

Lt Kahl quickly analyzed his emergency, sought the advice of his combat operations center and, after determining the controllability of his aircraft, landed it safely under adverse conditions. This demonstration eminently qualifies him for a WELL DONE. ★



MATERIEL FAILURE and

Hardware deficiencies accounted for more than one-third of the major aircraft accidents in 1961.

Colonel Walter R. Waller, Directorate of Maintenance Engineering Air Force Logistics Command

This points up one of the Air Force Logistic Command's major problems — providing timely corrective action for materiel deficiencies. Fortunately, the majority of these deficiencies do not directly affect or jeopardize the safety of operating crews. Although the problems are important, standard corrective action normally can be followed.

The major problem is those deficiencies that jeopardize the safety of ground and aircrew personnel, unnecessarily risk loss of equipment and, indirectly, decrease mission capability. To cope with these, AFLC has established special procedures designed to quickly resolve these problems.

The objective of these procedures is "Early Recognition and Expedited Correction." This responsiveness begins as soon as AFLC is notified that an accident or serious incident has occurred. The technician or engineer at the applicable Air Materiel Area (System Support Manager) takes immediate action to determine whether materiel failure or malfunction was a cause factor. This is accomplished by contacting the base accident/incident investigating personnel within 24 hours of the occurrence. This provides an indication as to whether equipment failure is involved; whether the base needs immediate technical assistance from the AMA; and whether exhibits, tape recordings, or special photographs are necessary to enhance the investigation and analysis.

If it is confirmed that materiel failure is at fault, a series of decisions and actions are effected by the AMA technical/engineering personnel. They determine:

- The seriousness or impact and possible affect on other operating aircraft.
- Need for Immediate (grounding type) or Urgent Action Time Compliance Technical Order.
- Whether a flight restriction (Safety of Flight Supplement) is warranted in lieu of grounding action.
- Whether a special inspection is needed to determine extent of condition in other systems and equipment.

Once it is ascertained that the safety of the fleet is not in jeopardy, attention is turned to the task of developing an interim or permanent fix. This involves detailed analysis of the crash, preliminary and supplementary accident/incident reports, electrically transmitted Unsatisfactory Reports, available tape recordings by aircrew members and previous AFM 66-1 data which reflects the item performance; all of which may provide a clear indication of the specific cause factor. If these facts do not readily isolate the trouble and the accident board is unable to determine the specific cause, a Teardown Deficiency Report may be required to pinpoint the discrepant area.

Concurrently an AFLC Materiel Improvement Project (MIP) is established and an AMA management task group is alerted to assure timely actions by all activities concerned. The problem now becomes one of hardware design, redesign, adjustment, modification or replacement. The solution may range from the simple installation of a cotter pin to the redesign of an entire major subsystem. In many cases this determination requires the resources and assistance of one or more AFLC Inventory Managers collaborating with the System Support Manager, using commands and contractors. It may be necessary to establish an interim fix to return the fleet to maximum allowable capability to be followed by a permanent fix, which may require months of redesign, testing, production and installation of an extensive modification. This decision and the scope of the problem in terms of AFLC effort affect the amount of time required to return the fleet to its full operational capability.

A spectacular example of materiel failure. This engine tore itself from the wing as the airplane flew overhead.

Safety

Above, wheel failure and, below, materiel failure due to improper adjustment resulted in loss of the T-38 canopy.

The time required is often considered excessive by those who are not help isolate the cause and provide acquainted with the magnitude of the Materiel Improvement Program. This is not to say that the program is so large that it prevents immediate corrective action where warranted and technically possible. However, the tremendous size of the USAF aircraft and missile inventory and the probability of materiel failures give some indication of the broad scope of operation and create the need for assignment of relative priorities among projects.

The management group mentioned above is officially designated as the Flight Safety Materiel Deficiency Task Group and operates in conjunction with, but separate from the Flying Safety (operator oriented) Program. These groups are established at each AMA. They are chaired by the Director of Materiel Management and composed of representatives from all activities involved in the resolution of materiel problems.

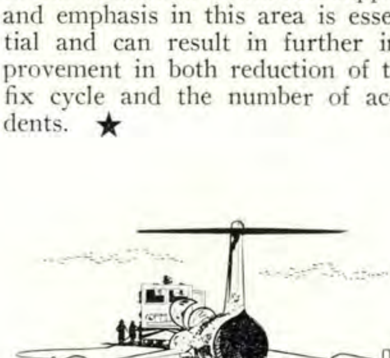
The AMA groups are tied together through a semi-monthly exchange of status information and requests for supporting actions. At these meetings each intervening weapon system mishap is reviewed, action items are established for local and supporting AMA efforts, progress against existing items is measured and excessive or undue delays are brought to the attention of the responsible activity.

Through this task group and the special handling procedures relating to engineering effort, procurement, production, and premium transportation, safety projects are afforded preferential and expedited handling Routine modification procedures, such as formal Engineering Change Proposals and formal Modification Review Board meetings, are waived and special procedures followed for the expeditious approval and procurement of the necessary modification kits.

The question may be asked, "How can the user of the system or equipment assist AFLC to provide better and more timely support in this area?" First, *prompt, accurate and detailed reporting* of mishaps by the user is a prerequisite to timely solution of the problem. Further, accurate reporting of AFM 66-1 data regarding past performance of the equipment will assist the accident analysis. The initial mishap report and past reporting accuracy coupled with AFLC technical assistance can AMA personnel with first-hand knowledge of the details.

AMA technical personnel have considerable experience and specialized training in the techniques of accident investigation; therefore, when materiel failure is known or suspected the accident investigators should request AFLC assistance, if needed, to pinpoint the deficiency. Then, upon return to the AMA, the engineer or technician can make a direct approach to solution of the problem and help to prevent misinterpretation of data involved. Subsequently the user may be called upon to furnish additional information or accident exhibits for TDR action. *Increased discipline for better control of these exhibits is needed both at base and depot organizations.* Also, the use may be requested to temporarily provide an aircraft for proofing proposed fixes to aid the System Support Manager and expedite corrective action.

Compression of the fix cycle is the major challenge and requires complete cooperation among all agencies concerned. Even in this era of "concurrency" it is logical to expect certain final fixes may require months rather than days or weeks to complete. Whereas improvement in this area is difficult to demonstrate significant progress can be shown by the reduction in the number of aircraft accidents caused by materiel failure. Official statistics show a 45 per cent reduction in major accidents during the last five years from 365 in 1957 to 165 in 1961. The importance which AFLC has placed on the Flight Safety Materiel Deficiency Program coupled with assistance of the users has greatly contributed to this reduction. Continued support and emphasis in this area is essential and can result in further improvement in both reduction of the fix cycle and the number of accidents. ★



LOOK FOR THE LIGHTNING BOLT

Maj George H. Tully, Hq Air Force Communications Service

Major Bill Ryan banked the RF-101 and turned smoothly onto the base leg. Rolling out of the turn, he scanned the approach area. Then he cursed softly to himself. Dead ahead and tooling along on an apparently orbital track was a "Goon," its fuselage blazed with an orange lightning bolt that seemed strangely inconsistent with the C-47's leisurely pace.

Ryan eased the throttles forward and broke to the right, head swiveling in the cockpit in sudden new respect for the old "see and be seen" technique.

"Tower," he called. "This is Red Fox Able. C-47 at my altitude and across my track. Do you have him on radar?"

"Roger, Red Fox Able. That is the Flight Check aircraft you were advised of when you requested landing clearance. RAPCON will provide safe separation from Flight Check aircraft. Switch to Channel 15."

Without further incident, Ryan flew a precision approach and greased the jet onto the runway. He parked the bird and hopped aboard a pickup truck for Base Ops. As he moved to the counter to close his flight plan, he discovered he had to squeeze a little to find writing room. He elbowed a brightly painted wooden sign with a flashing red light a little bit further down the counter—did a double take. The light flashed on and off, on and off, and he looked at the sign more closely. It warned that a flight inspection of navigational aids was taking place, and the sign itself included a painting of the brightly painted goon he had almost clobbered.

"Say," he asked a companion, "what's with this Flight Check bit? Somebody ought to put out the word on these low-slow flying birds before one of 'em gets a wide distribution around the local landscape."

"Sir," the operations clerk answered, "the people up in the tower could give you a quick briefing on Flight Check if you have the time, and Captain Adams, the Flight Check pilot, will probably be signing in in about 25 minutes."

"That's not Captain Joe E. Adams is it?"

"Yes, Sir, it is."

An hour later at the Officers' Club Bill Ryan and Joe Adams carefully eased their mouths into the foamy heads of their beers.

"What's this Flight Check, Joe?" Ryan asked. "It looks like a slow form of suicide to me."

"Not at all," Joe defended. "As a matter of fact, our job is to make sure that tigers like you can get to their destination without becoming lost and can land with no problem on arrival. We work for the Air Force Communications Service which has the job, not only of providing adequate, reliable and secure communications, but flight facilities like the TACAN you used to find this base, the GCA you used to land, and the air traffic control instructions you received from the tower.

"How well we do our job depends

a lot on the cooperation and consideration we get from hot pilots like yourself. We know and respect the fact that the kind of birds you fly demand a lot of operating room and an immediate and precise response from our traffic controllers.

"This means that in AFCS, accident free operation is a problem with two sharp edges—we have to concern ourselves with safe operation in the conduct of our own flight check mission; we support the entire Air Force fly safe program by providing the best possible air traffic service and NAVAID facilities.

"So far as safety of flight is concerned, our entire mission is directed toward that end. Here's the way it works:

"AFCS has 12 *Facility Checking Flights,* six overseas and six in the continental United States. We inspect navigational aids according to their scheduled requirements or on a request basis. Right now there are 1670 USAF, foreign, and other NAVAIDS on the books that require AFCS maintenance, operation and flight inspection. We fly T-33s, C-47s and AC-47s, B-47s, T-29s, C-54s and AC-54s loaded with special electronic equipment. Performance of the Flight Checks requires that we operate at relatively low altitudes in and around the terminal areas. We usually have to do the job during daytime VFR conditions.

"We are constantly faced with the possibility of midair collision because we operate at low altitudes flying circular patterns and special maneuvers. Recognizing the collision hazard, we want to be seen, and as a result, our Flight Check aircraft sport the jazziest paint jobs that could be dreamed up.

"Often because of the proximity of high performance aircraft like yours, we have to break off a flight check mission and start over. Think about that paint job and give us some elbow room—it's really your neck we're concerned about in our job.

"The flight inspection of navigational aids and air traffic control facilities is closely related to the flight safety problem. Pilots have learned to depend on the Air Force's navigational aids as surely as old Magellan depended on the stars. With today's airplanes these aids must be dependable for navigation, especially on long flights with high performance aircraft where a small degree of navigation error can be multiplied into a 'miss' of many miles.

"NAVAID accuracy is just as important to the tower controller or the GCA man as it is to the pilot. It enables our controllers to provide the precise air traffic control that is essential to flight safety at 128 United States airfields and 67 bases overseas. We maintain and operate 161 TACAN, 82 TVOR, 24 VOR and 85 ILS facilities in addition to the 176 precision radars being utilized USAF wide.

"On top of that, we have three Mobile Communications organizations ready, willing and able to provide all of the NAVAID and air traffic control support necessary anywhere it becomes needed. The 'Mob' outfits are geared to meet Air Force emergency requirements, and, in the near future, we are getting five specially equipped C-140 Jet Stars to serve as an immediate reaction flight check force for their operations.

"In the flying game, Bill," Joe concluded, "you use all of the facilities that AFCS provides at one time or another—you need their dependability to accomplish your flight safely and efficiently. Assuring their dependability is my job.

"Next time you have a chance to hit the books try AFM 55-14. Your familiarity with Air Traffic Control Procedures and your knowledge of flight check, including the conspicuous paint jobs on our aircraft, will help us accomplish our mission and you, yours."

"You always were a long-winded son-of-a-gun, Joe," said Ryan, "but I don't dig using the T-Bird for this job; you just can't get that kind of electronics into that airplane."

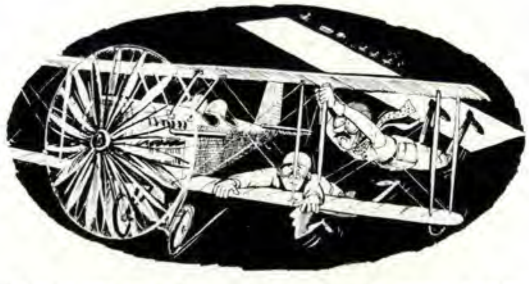
"I'm glad you mentioned that," Joe answered. "Our T-Birds have a special mission within the framework of the Flight Check job. We call it Service Evaluation, and the few birds that we have rack up 300 hours a month evaluating the capability of our facilities and our people to support the combat mission of the Air Force. We like to spring surprise emergencies on our GCA and tower operators—then we record their reactions. We have to know that our people can evaluate emergencies, then give the correct control instructions to assist the pilot to a safe landing. We stress facility accuracy and dependability; the whole works dovetails nicely and it adds up to an increased safety factor for the pilot."

"I just had a horrible thought," Ryan said. "Suppose I'd hit you this afternoon. . . ."

"But you didn't," Joe said, "and that's where that jazzy paint job came in handy. *Look for the lightning bolt.*" ★

• • •

1st Set of Flying Rules—Circa 1920—
Air Force (Signal Corps) Regulations



"Never get out of a machine with the motor turning until the pilot relieving you can reach the controls."

DANGER IN THE KNOBS

There are a lot of hills and mountains around the country where, if you look closely, you'll find broken bits of glass and aluminum that were once parts of the best that man could devise in the way of flying machines. Trees and brush make it impossible to see much of this wreckage from the air, but it is still there, except for fabrics, leather and personal effects long ago carried off by pack rats and other wild things.

Remember all of the planes lost in the peaks between Denver and Salt Lake City? Or the knobs north and east of Los Angeles? A friend of mine lost his life on a peak near Chatsworth trying to get in to the old Grand Central airport at Burbank. He had several thousand hours, many of them logged in Hudsons during deliveries to the British back in '40 and '41. He was raised in the L. A. area and learned to fly there. He ferried many a Hudson out of Burbank and knew the surrounding territory intimately.

Then there was Mack. He was an airline pilot back in the days when they were the glamor boys of the county. His DC-3 slammed into a 6000 foot peak down near the Mexican border with 20-30 people aboard one night. He'd flown the route a hundred times, at least. He was due at the house the next night for dinner. We learned about what happened when he didn't make it.

How many planes have disintegrated against a cliff in the rockies—often just a few feet from the top? On the side of Mt. San Antonio, just east of Los Angeles there's a piece of aluminum that glints in the afternoon sun from its graveyard on a rockslide. Every so often it slides down a little farther. It hit there during the war and has been slowly inching its way down the almost vertical rockslide ever since.

Just a quick glimpse of the crash locator map at Air Rescue Service Hq at Hamilton AFB will give one the shudders. Those little fat-headed pins grow like porcupine quills around the knobs and hills of the western states.

Fortunately this type of accident has become rarer during the past few years. Light civilian aircraft still end up against hillsides too frequently, but air carrier and Air Force planes now fly, for the most part, well above this danger zone. The jet did this for us, taking us above the peaks and the weather that hides them from view. About the only time a jet gets into this kind of trouble is during climbout or penetration. And then technique or mechanical troubles usually lead to the accident. In other words, few jets have to grope their way around, through or just barely over those rocks in the clouds.

That being the case, what's the problem? There's an old saying about complacency breeding disaster. If you've been flying very long, you know the accuracy of this statement. We can't afford to get complacent about low flying aircraft hitting terrain obstructions because we still have more than a few birds that fly down there where the hills and the clouds hang out. It's a pretty long list, too: U-3, C-47, C-54, T-29, C-123, C-124. There are others. And, occasionally, they still barge into mountainsides.

The situation might be analogous to that of smallpox. We innoculate everybody and the disease is practically forgotten by the public. Even some doctors have never seen a case and may have trouble diagnosing it. Let a carrier, possibly from a foreign country, introduce the disease into a community. It can run wild among those not immunized. Even when we think we have a problem licked we still can't afford the luxury of complacency.

So it is with flying. We don't hang around below 20,000 feet much any more, but for those who do the danger is still there for the unwary. Recently three were killed in the crash of an Air Force transport. A short time later another nine lives were lost in a similar crash. Both aircraft struck mountains near the summit. In both cases the pilots were trapped while flying up blind canyons.

During last winter's worst weather an Air Force twin engine plane went in taking four more to eternity, and there's one we still haven't closed the book on. It hasn't been found. (Since this was written the aircraft was found, in a canyon with all aboard dead.—ed.)

This isn't an article about weather, although weather was involved in each example. Neither is it about mountains per se, although mountains were involved in each case. And, it's really not about pilot technique, although you can trace at least part of the cause to this factor.

This is really a kind of reminder—a shot in the arm,

Robert W. Harrison, Managing Editor

so to speak—to those who must operate down where the jet streams seldom roam. Every pilot knows that if he tangles with a mountainside he can't help but lose. He also knows how well those knobs can hide in clouds. And he should know the performance of his aircraft—ability to climb and turn radius—so that he won't find himself trapped in a canyon. To go a little further, he should also know better than to get into a blind canyon. This requires judgment, and you can't beat that as an accident preventer.

NAVAIDS, aircraft performance and pilot proficiency are such today that we should not be losing aircraft to causes mentioned above. That we still do is an indication that that other asset, judgment, is sometimes missing. Add judgment and we have an almost unbeatable combination that should prevent such reports as this: *"while turning to the left the aircraft struck the mountainside 148 feet from the summit. The resulting fire destroyed evidence that might have led to the exact cause of the accident."* ★

• • •

HOUND DOG – *Handle With CARE!*

During the 15 months from January 1961 to March 1962, the GAM-77 Hound Dog weapon system was becoming operational at the rate of about one squadron per month. As each squadron became equipped, it began continual exercise of the system to obtain reliability data and to train ground and air crews. The exercises entailed a routine of constant movement—checkout, transportation, uploading, air exercise of all systems, downloading, transportation and necessary maintenance, in normal sequence. Despite great exposure, there were relatively few serious mishaps.

Of the 18 mishaps which did occur, none was classifiable as a "missile accident" under pertinent Air Force regulations, although three were serious incidents. Two of these were during combat evaluation launches; causes are as yet undetermined. In addition, there were 11 one-time damage events caused by supervisory or personnel error during routine handling phases of the mission. Three of these were during towing operations, one during taxiing, one during the combined systems check, and six during transport aircraft downloading sequences.

The trend of Hound Dog handling mishaps led the Directorate of Missile Safety to query Headquarters SAC and MATS, asking what positive accident prevention steps were being planned or implemented. The MATS remedial program included training, policy redefinition, and managerial emphasis on safety in GAM-77 handling procedures. Specific items:

• Visit of the chief loadmaster from each Transport Air Force to each unit operating C-124s to insure loadmaster adherence to TO procedures.

• Standardization flights for loadmasters.

• Instructor loadmaster from an Air Training Wing observing GAM-77 loading procedures at Tinker AFB.

• AFLC, SAC and MATS determining their respective responsibilities for GAM-77 loading procedures.

• MATS IG and MATS command loadmaster observing loadings and initiating followup actions where deviations from approved procedures were noted.

• Improving correspondence and instructional material to MATS units to preclude further mishaps in this area.

SAC placed emphasis on training, use of checklists, and a special study of the impediments of outer clothing, wind and equipment noise as they restrict visual and aural signals and handling instructions. Items:

• The study pointed to a need for retraining ground handling crews and supervisors.

• Requirement for use of lighted wands and/or whistles during towing operations.

• Control of vehicle parking in missile handling areas.

• Revision of checklists.

• Strict adherence to approved checklists.

• Personnel briefings on hazards associated with special climatic conditions or nighttime operations.

Summarizing, the cautionary advice of the May-June 1962 Missile Safety Officer's Special Study Kit remains relevant:

"The GAM-77 is a Hound Dog; and when he isn't working, he must, like his namesake, be handled with due care and consideration. The mishap record shows that during his puppy years, 1960-61, he was given loving care: only two careless incidents by his handlers with only minor damage resulting. In the first 40 days of this year, however, five handling mishaps have been reported. A probe was bent, somehow, while on board a C-124. Another was bent unloading from the same C-124 because of the misinterpretation of a visual signal. Another was bent against the windshield of a panel truck (again, the cause was error in signaling). Incidentally, he can't scent the target with his nose bent. An inner exhaust cone was also bent during towing. He can't point with his tail bent either!

"The Hound Dog is growing up but he must be given the same tender treatment he has had as a puppy. Towing speeds, radius of turn, procedures, checklists, guidelines, signals, and so on—all must receive meticulous adherence and attention. But most important is the appreciation of the Hound Dog's worth. Maltreatment will reduce his effectiveness in the big hunt." ★

Lt Col Keith Conley, GAM Project Officer, Directorate Missile Safety

AEROBITS

WRONG WAY—Not long ago a brief account of a fatal downwind takeoff attempt was reported in this magazine. This happened to be an old two-fan type, but the lesson was there just the same—it's poor judgment, in any airplane.

Nevertheless, since this accident, downwind takeoffs have been tried several times by T-Bird jocks—with varying degrees of unsuccess. Here are three examples:

1. In May a pilot attempted takeoff on a runway with a jet barrier down. After using about 6000 feet of the 8500 foot runway, he decided to abort. On he went, off the end and into the boondocks. This T-Bird will never fly again.

2. In June another T-33 driver attempted a tail wind takeoff on a runway which did not have a jet barrier. His abort was initiated late, external fuel tanks were jettisoned and the aircraft stopped beyond the runway, undamaged. . . . Those long clear overruns are wonderful.

3. Eleven days later another T-33 pilot attempted a takeoff with a quartering tailwind on a runway with the jet barrier down. Again, the abort was initiated late. This one was destroyed when it went off the end.

Again space in this magazine is being used to remind pilots of the hazards of downwind takeoffs. Consider the judgment factors in mishaps of this kind. In the three cases cited above the pilots could have selected runways more nearly aligned into the wind. Jet barriers were operable and available at each base.

It is imperative that pilots compute ground run distance, takeoff speed, refusal speed, refusal distance and acceleration check speed based on actual conditons affecting the active runway. Further, pilots must take advantage of all safety factors available such as wind, runway length and jet arresting barriers. In one mishap a 12,000-foot runway was available, equipped with jet barriers, but the pilot elected to use a 7050-foot runway. Pilots continue to place themselves, their passengers and Air Force equipment in jeopardy by poor judgment factors such as these. Most pilots have become pretty well indoctrinated in starting takeoff roll from the extreme end of the runway. Still some, are willing to effectively shorten runways by downwind takeoffs. The solution, REFUSE DOWNWIND TAKEOFFS.

ACCIDENTAL FIRING—Earlier in the year we lost an aircraft commander as result of the accidental firing of the navigator's escape hatch. Recently, two incidents involving the navigator's escape hatch, again point out the need for extreme caution.

First, a starter air adapter which had been placed on board a B-52 aircraft, fell into the navigator's hatch well and released the manual hatch release handle from the stowed position. A descent was made to 10,000 feet, and the aircraft was depressurized. The adapter was removed from the hatch well and the manual release handle reset in locked and stowed position.

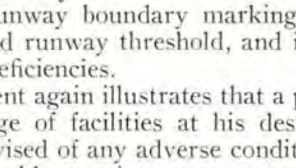
In the second incident, the navigator's escape hatch lever moved to the UP and UNLOCKED position while the aircraft was climbing to altitude. When the instructor navigator attempted to move the lever to the DOWN position, the hatch fired. Fortunately, the aircraft was not highly pressurized.

REMINDER—Be sure that you stow excess equipment securely and keep the escape hatch area clear. If a malfunction is suspected, use extreme caution . . . stay clear of the area until aircraft has been depressurized.

LT COL ROBERT P. ROTHROCK,
BOMBER BR, D/FS

A CLOSE ONE IN THE SNOW—Deployment of a KC-97 was normal until the final approach phase of the GCA. Both pilot and copilot had visual contact approximately 4½ miles from the end of the runway. Initial touchdown was 220 feet short of the runway. As a result of contacting a snowbank, the nose gear suffered minor damage but did not fail. Investigation revealed that the pilot misjudged his position in reference to the runway threshold and was unaware of the lack of prepared runway overruns. Contributing causes were inadequate runway boundary markings, the lack of a clearly defined runway threshold, and inadequate briefing of these deficiencies.

This accident again illustrates that a pilot should have full knowledge of facilities at his destination, that he should be advised of any adverse conditions, and he and his crew should exercise extreme caution in landing under such conditions.



AN H-43B was scheduled for a local training mission to practice pickups of a dummy fire-suppression kit. After a normal preflight and takeoff, the helicopter proceeded to the training area where it landed and offloaded two firemen. The helicopter departed the area, flew a traffic pattern and made a normal approach for hookup. After hookup, the firemen laid the positioner down and took up their stand forward of the aircraft to give signals to the pilot. The helicopter was allowed to drift to the right and forward. The hookup man indicated to the pilot that he was not centered over the kit and to make a correction to the left to reposition the aircraft. The pilot reduced power and applied left cyclic stick. The aircraft descended, the left front gear contacted the fire suppression kit, the aircraft tipped to the right and came to rest on its right side with the kit still hooked up to the aircraft.

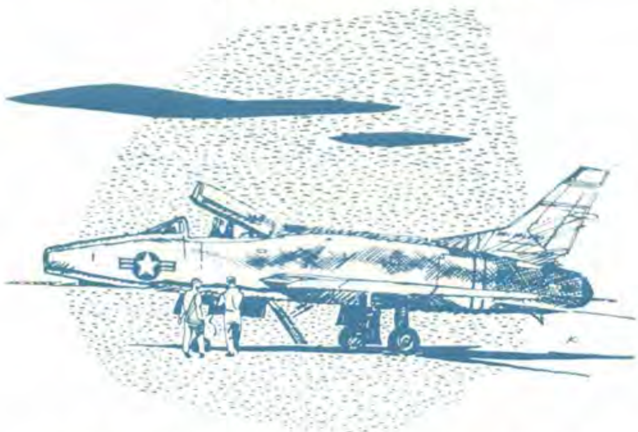
The *primary cause* of this incident was pilot factor: he used improper technique—lowered collective pitch—in attempting to center the aircraft over the dummy fire suppression kit prior to pickup. This reduction of collective pitch allowed the helicopter to settle onto the kit prior to left cyclic correction taking effect, causing the aircraft to roll over to the right and crash.

Contributing causes were:

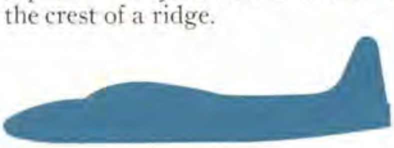
• The dummy fire suppression kit was frozen or partially frozen to the ground.

• The crew briefing was not adequate since all personnel were not present. The pilot did not direct anyone to insure that the dummy fire suppression kit had not adhered to the frozen ground.

LT COL JAMES F. FOWLER,
TRANSPORT BR. D/FS



60 FEET TOO LOW—The F-100 pilot continued his low level mission into lowering visibility and increasing cloud cover. Aware, finally, that he was being boxed in by clouds and mountains he took action. Residents of the little village heard the afterburner cut in as the plane passed overhead. Three miles later the pilot abruptly rotated to a 45-degree nose-up attitude and went into clouds. The last glimpse ground observers had of the plane was just before it disintegrated 60 feet below the crest of a ridge.



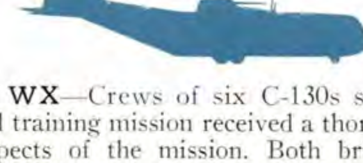
DON'T TOUCH ITEM — Many USAF aircraft have a solenoid located on a gear strut to prevent inadvertant moving of the gear handle from the down position when the weight of the aircraft is on the gear. However, there have been accidents and incidents in which one or more gear have folded when the aircraft was on the ground. On occasion these have been due to admitted erroneous movement of the gear handle when the operator intended to retract flaps. On other occasions gear collapse has occurred for unknown reasons. In any case, it has been somewhat perplexing to try and explain why gear collapse when: (1) the handle shouldn't be activated except when airborne, (2) the system is so designed as to prevent actuation of the handle on the ground. (This also poses a chicken vs. egg question to the board. Is the primary cause pilot error because the pilot actuated a handle he is not to move on the ground, or is it materiel failure or design deficiency that permitted the pilot to actuate the handle?)

Here's a case that may throw a little light on the problem. While taxiing in after an orientation flight the T-33 IP asked that the cadet return his oxygen system regulator to normal. The cadet acknowledged. The gear unsafe horn sounded immediately and the nose gear collapsed. The IP grabbed for the gear handle, but the left main gear collapsed followed by the right main gear. The throttle was stopcocked and all switches turned off. Pins were installed in the front seat. Fire equipment was ordered and the pilot evacuated after telling the cadet to sit fast and not touch anything. The pilot then installed rear seat pins and assisted the cadet from the aircraft.

In accordance with tech order procedures the gear system was checked and functioned properly. Twelve cycles of operation were attempted. The landing gear handle could not be actuated until the strut was within one-half to three-eighths inches of full extension due to positive locking by the solenoid.

Explanation: The fuel load at the time of the incident was 270 gallons. It is felt that the weight reduction due to burned off fuel, the relatively high 76 degree temperature, coupled with a smooth landing had allowed the struts to remain at nearly maximum extension. The airplane was being taxied on a slightly rolling taxiway which allowed the left strut to extend momentarily, thereby actuating the safety switch at the time the cadet inadvertently raised the gear handle.

ONE WINDSOCK—The following USAF/FAA policy concerning the location of the wind sensor has been reaffirmed: "All ATC facilities located on the same base will obtain the surface wind from one sampling device (sensor)." The issuance of conflicting wind factors from RAPCON and control tower facilities could create a flying safety hazard. The sampling device should be located on the surface in close proximity to the runway which provides the most representative wind information.



VFR IN WX—Crews of six C-130s scheduled for a low level training mission received a thorough briefing on all aspects of the mission. Both briefing officers mentioned a hill—the highest terrain along the low level portion of the flight. Even so, for one aircraft the flight ended early on that hillside.

On the way home the flight descended, finally to 1500 feet, except for one aircraft. All crews reported being in and out of clouds and visibility down to one-quarter mile in rain.

The flight continued VFR to turning point No. 3 where the lead aircraft's last transmission was heard. At that point all aircraft except lead climbed to a higher altitude and returned to home base on IFR clearances. Wreckage of the lead aircraft was found at approximately the 1200-foot level of a 1368-foot hill.

Why would an experienced flight leader lead his flight into bad weather at an unsafe altitude on VFR clearance?

We'll never know. ★

LT COL GORDON D. McBAIN, JR.,
Transport Br. D/FS

from far away places

At one of America's best known universities recently a class of 23 began a 12 week course. Nothing unusual, except that the students all wore uniforms and only one of them was an American—a SAC captain. The other 22 were MAP (Military Assistance Program) officers representing 12 foreign nations. Their task: to complete a strenuous academic program in the elements of flying safety and accident prevention.

The program began a dozen or so years ago when the U. S. Air Force began sharing military hardware with NATO, SEATO and other allies under the collective security concept. These free-world partners, using American aircraft and equipment, in turn shared their problems in maintaining an operational Air Force, and found that they experienced accidents and incidents from the same causes.

Allied countries represent a world-wide geographic dispersion, covering both Northern and Southern hemispheres, and the East and West. Every conceivable climate, weather phenomenon and terrain affects their operations. A broad cross section of the world's people is involved in their activities. And, since the vast majority of accidents are caused by people, differences in cultural and technological development and training make the problems particularly challenging. Outside, help is required to reduce costs in lives, equipment and combat capability through accidents.

Originally officers from MDAP (Mutual Defense Assistance Program) countries were invited to the U. S. for on-the-job training with the Directorate of Flight Safety. Here they were taught the elements of a safety program. This included investigation, record keeping and interpretation, field work and various staff level activities. Over 40 officers received this schooling between 1952 and 1957.

In 1958 this program was converted to formal education with the first Flying Safety Officer class for MAP students at the University of Southern California. Fifteen students from seven countries attended this class. The course—still running—was increased to 12 weeks due to language difficulties. The course is taught in English so, although students must pass a language proficiency screening before attending, technical and academic terms are generally new to them and require additional explanation.

The goal is to provide students with a working knowledge of aircraft accident prevention techniques, and the motivation and ability to run an effective accident prevention program. To accomplish this, the following subjects are taught: Aircraft Accident Prevention, Orientation to Aircraft Accident Prevention, Aviation Physiology in Accident Prevention, Educational Principles and Methods in the Accident Prevention Program and Aviation Psychology in Accident Prevention.

In addition to formal classroom work, MAP officers participate in laboratory and allied activities. Included is the human centrifuge program where each student gets to determine his own reactions and tolerances to increasing G forces. Accident investigation problems are simulated at the University crash laboratory. Information obtained here is taken to the classroom for analysis and practice preparation of accident reports. This practical approach transcends language difficulties and, under the guidance of USC faculty members, MAP officers develop understanding and ability in investigation techniques.

Each class also visits an aircraft manufacturer in the

Lt Col Robert Rotstan, Chief, Education Section
Asst for Education & Training Br., DIG/Safety

At right, MAP safety course students visit DIG/Safety to discuss accident prevention with Lt Col Frederick C. Blesse (2nd from left) and Col James P. Hagerstrom (at right). These Fighter Branch safety experts know the operational side of flying as well, Col Hagerstrom being an ace of both WWII and Korea, and Lt Col Blesse, a Korean ace. Below, students attending the USC course probe wreckage for clues.

area. During these visits students are given demonstrations and explanations of latest industrial accident investigation methods.

In all, 180 graduates, representing 32 different countries, have attended this course. A typical class includes students from a number of different countries and at least one American officer who is assigned to provide an exchange of views and a better understanding of USAF safety procedures. These USAF class members—one described his feeling as "a foreigner in my own country, and enjoying it"—find that, in addition to professional subjects, there is a great yearning for knowledge of social, economic and other customs in America.

Attendance of key people is more the rule than the exception. A recent class included the Director of Flying Safety for the Royal Saudi Air Force and the Director of Safety for the Brazilian Air Force, who is responsible for commercial aviation safety as well. Two of the students served also as personal pilots for the heads of their respective governments, Italy and Paraguay. The Belgium Air Force Director of Safety and the creator of the Chinese counterpart of Rex Riley were also in this class.

Two Chinese Air Force officers compare their safety strip with CMSgt Steve Hotch's Rex Riley during a visit to Aerospace Safety Magazine's art department.

Those who have been closest to the MAP Flying Safety Officers Course are convinced that allied safety programs have improved and the free-world has been strengthened through the resulting friendship and understanding. ★

We All Like Cookies, But . . .

Maj Robert L. Hill, 3501st Student Squadron, Reese Air Force Base, Tex.

The degree of self-discipline an individual has attained is perhaps the only valid yardstick of his maturity.

Each of us once knew a child who would furtively raid the cookie jar when alone in the kitchen, but resist the impulse when his mother was watching. This example shows that a child's behavior is greatly determined by external pressures. As this child grew older, he absorbed many rules of social behavior and learned to resist temptation. By high school age he had earned the right to handle money, and to use the family car, by demonstrating the level of maturity and self control his father required. He found that success in school depended directly on the amount of will power he could muster toward sticking with his homework when he would rather watch television or harass the local populace by hot-rodding around town with the gang.

Developing a man-sized, bedrock foundation of self-discipline is a slow and painful process, and a lonely one—for *each man must build his own* out of the materials provided him by his mother, father, church, school and friends.

A man may exhibit a certain degree of self control in the company of his commander, another when surrounded by his friends, and yet a different level when among strangers. I know a man who is afraid to speed past a highway patrol car and ashamed to be a litterbug in his own neighborhood, but when driving without these lawful or social pressures acts like he owns the world. This immature type is still raiding the cookie jar *because no one is looking.*

As officers and pilots you are frequently placed in a situation where you must probe for your own personal level of self-discipline. You may fly with the Standboard, or with your buddies, or perhaps all alone in the airplane. Do you *regress in age,* allow your self control to *erode away* in direct proportion to the removal of external pressures, or is your compulsion to act as you know you should, deeply imbedded in a solid layer of honesty, maturity, and pride of achievement?

Do not indulge in the luxury of allowing rationalization to excuse your minor defections—the man who parks his car improperly or skips a haircut is the same man who will skip a preflight or chase jack rabbits on a local transition flight.

Only *you* can fix the level of your maturity. Only *you* can make yourself into the man your mother and father wanted you to be. Only *you* can create within yourself the self-discipline it takes to keep your hand out of the cookie jar when no is looking. ★

"Never have trouble with an instrument
Check myself, you know . . ."

"Wait 'til Old Blowhard finds out his buddy
isn't a check pilot anymore."

TWO POINTS OF VIEW

"You're joshing, of course, Tidwell.
I never have any weight problems."

". . . And I'm not joshing, my Fat Little Friend. Lose twenty pounds or your standard of living will decrease but quick."

*U.S. GOVERNMENT PRINTING OFFICE 611221