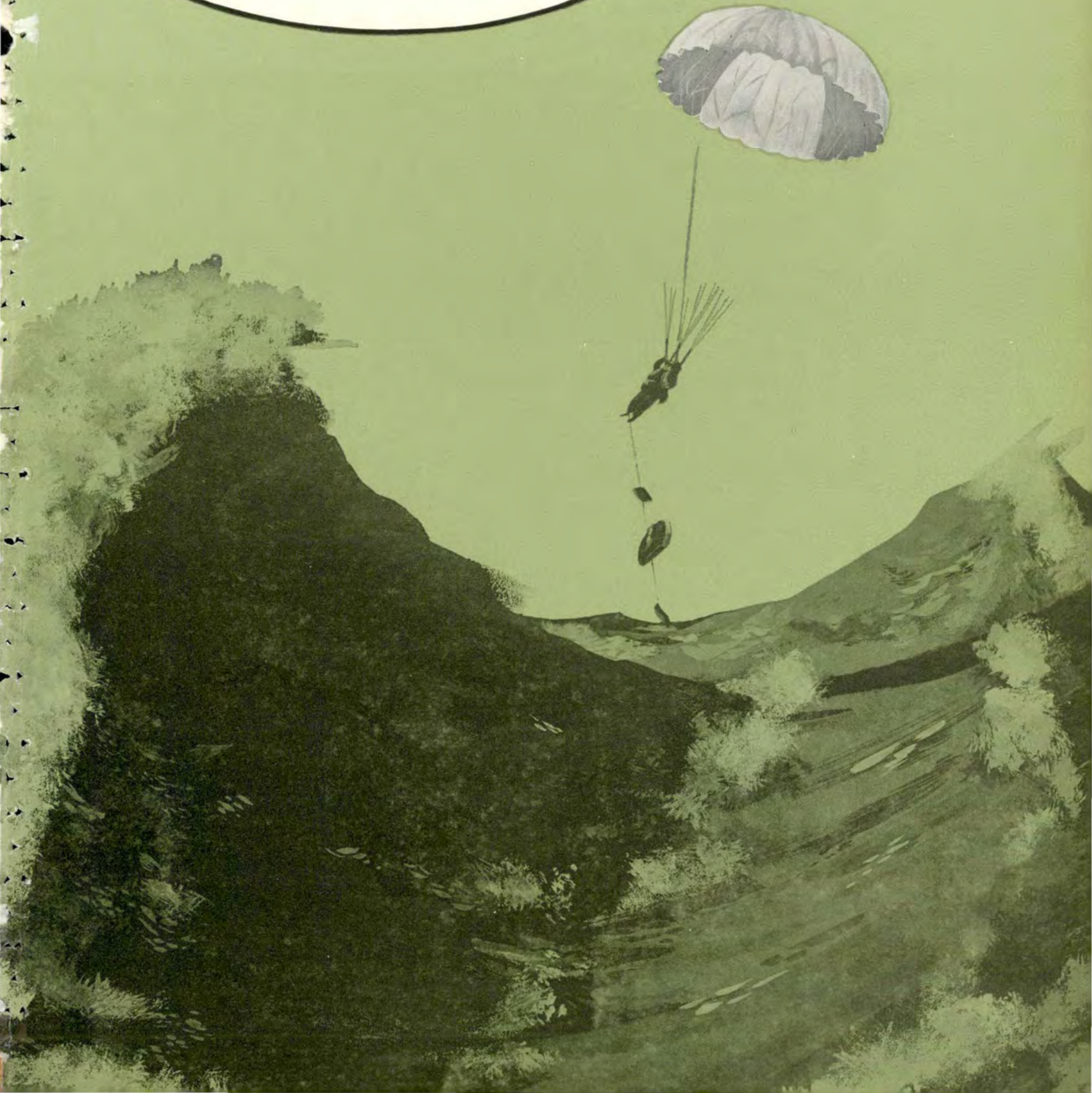
AEROSPACE

SAFETY

UNITED STATES AIR FORCE

APRIL 1965



AEROSPACE SAFETY

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AFRP 62-1 APRIL 1965 VOLUME 21 NUMBER 4

FALLOUT

HIGH TERRAIN LIGHTS

Regarding the article "How Could It Happen?" (January issue), a possible solution would be the installation of lights on the high terrain surrounding the airport.

Col Joseph E. Duval
DCS/Research & Development
Headquarters, USAF

RADIALS AND MAG HEADINGS

Col James G. Fussell's letter (January) regarding Radials and Mag Headings sounds to us like a letter from home. Like so many people we have found it easy to beef about the system but haven't taken the effort to do anything. We have all had problems identifying a radial, intercepting it, correcting to course and relaxing to the point where we thought "I'm going to make it down yet," when that radar controller asks us to "squawk flash" and cooly informs us we are 180 degrees out!

We, as fighter pilots (or so we like to think, even though we suddenly find two big engines and two pilots in the F-4) know what it is to dig out that chart when things don't go just as planned. Even with two guys it's tough in the confines of a fighter cockpit and too time consuming. If we had known what direction to go in the first place, i.e., a mag heading, the rest of the gyrations would not have been necessary.

One other little thing: Somebody, somewhere, figured out one of the finest navigation instruments known to man. They called

continued on page 28

ABOUT THE COVER

Artist's brush catches crewman about to enter water. Article on pages 16 and 17, and first hand account on back cover provide latest survival information.

Z-D *AND YOU*

We've heard a great deal during recent months about a program called Zero Defects. This is an effort to improve quality and reduce costs through the elimination of human error. Industry has applied the principles of Zero Defects and AFLC has a big Z-D program going for the Air Force.

The idea of reducing defects in workmanship or performance is, of course, dear to the heart of everybody in the safety business. If there were some way in which we could eliminate human errors on the production line, the flight line, in the cockpit or in the shops, think what this would mean in the preservation of lives and equipment. The monetary savings would certainly be spectacular and the capability of the Air Force to carry out its missions would be enhanced.

Several examples have come to my attention lately of work defects that caused accidents. An F-100 crashed because a bolt came out of the rudder control linkage. The bolt wasn't safetied. We've had this sort of thing before.

Debris left in aircraft components during routine maintenance and overhaul has done its dirty work. A fighter pilot recently could not keep the aircraft on the runway, it veered to the right. When the aircraft left the hard surface the gear collapsed. A small piece of safety wire had been left in the nose wheel steering mechanism during IRAN. This caused a spurious signal which the pilot could not overcome.

Last year the Air Force had 298 major aircraft accidents; 262 aircraft were destroyed. We lost four ballistic missiles, not to mention a lot of air launched missiles. There are a few of these we can't explain, but we're pretty sure of what happened in most cases. As the evidence is sifted during an accident investigation the area of uncertainty begins to narrow. Pretty soon cause factors begin to come into focus and finally a basic cause is proved. Too many of these accidents stem from human omission or commission. Eliminate these deficiencies and we can preserve lives and eliminate unnecessary aircraft and missile losses.

I see the Z-D program as a personal thing. Years ago we might have called it "pride of workmanship." I wish every person in the Air Force who has anything whatsoever to do with any of our weapon systems would adopt Z-D as a personal philosophy. If each of these people took stock of himself and pledged to provide defect-free work, the benefits would be tremendous. Why not give it a try?

Jay T. Robbins

JAY T. ROBBINS
Brigadier General, USAF
Director of Aerospace Safety

LOW DOWN CAT

By Captain R. C. Grazier, Aeronautical Systems Division

Adapted from a paper by Captain Grazier, and F. K. Atnip, Senior Group Engineer, The Boeing Co., presented to The Society of Expeimental Test Pilots.

The aircraft with the stabilizer missing is a B-52H test airplane after a CAT encounter ("Something's Missing," AEROSPACE SAFETY Magazine, April, 1964). The airplane was highly instrumented to measure the response of the airframe to turbulence at low-level—not to measure stability, tail off.

At Wagon Mound, New Mexico, the airplane had turned and begun its northbound course alongside and east of the Sangre de Cristo Mountains. The turbulence environment progressed from light to moderate and the pilot was forced to climb to a higher altitude. As the airplane passed through 14,000 feet, the air became very smooth. The airplane was accelerated to 350 knots, in preparation for the next test condition, and lunch was being contemplated by the crew. As the airplane passed adjacent to East Spanish Peak, located near Walsenburg, Colorado, a large discrete gust, of sufficient magnitude to fail the vertical tail, was encountered. From instrumentation on the airplane, the gust velocity was calculated to be on the order of 120 feet per second. The next questions were: "How frequently can we expect to encounter gusts of this magnitude? Why do low-level gusts differ in shape from classic gust models? What is the origin of such gusts? Can the weather systems and terrain effects associated with this phenomenon be identified?" To find out, a test project was set up.

The aircraft selected for the project was F-106A 56-0455. No doubt, there are several of you who have flown the 'ole girl.' It is my understanding that she has been in the loads-measuring racket since she was first put together by Convair. She looks like an ordinary F-106 from a distance, say a strong 7 iron; however, closer inspection will reveal that it's really an F-106 shell, housing a maze of instrumentation.

The instrumentation is basically a narrow band-frequency modulated tape system. The tape deck is fed information from a differential pressure gust probe mounted on the nose boom; Statham strain-gage-type accelerometers mounted on the nose, tail, and c.g., and a gyro-stabilized platform. All data were time correlated and supplemented by a voice track on the tape. We recorded time, position, weather, and all radio conver-

sations. An F-100 was selected to be flown by Boeing pilots to serve as a pace and chase as well as for photographic support.

OPERATIONS AND DATA COLLECTION

Aeronautical Systems Division collaborated with the Boeing Company to form a 14-man task force to set up a remote operation. The operation was established at Kirtland AFB, New Mexico, because of their F-106 support capability, tape readout facilities, airline shipping facilities (data tapes were returned to Boeing daily), and mainly because of its proximity to the test area. The area extended from Las Vegas, New Mexico, in the south, to Pueblo, Colorado, in the north, along the Sangre de Cristo Mountains. This geographical area was selected solely because it was where the B-52 had lost its fin. Specifically, the vertical fin had been lost adjacent to the East Spanish Peak near LaVeta Pass. There are perhaps many other locations even in the United States which would yield sharper turbulence. Two examples might be near Bishop, California, or in a thunderstorm anywhere. The Bishop area has experienced winds strong enough to lift a P-38 15,000 feet with both propellers feathered. Also, we have measured gust velocities greater than 300 ft/sec in the thunderstorms in Oklahoma. Wind velocity, however, constitutes only one ingredient in the recipe for destructive turbulence. The gust must also have a sharp profile to produce aircraft bending forces. The test results strongly verified the validity of our choice of the test location.

Our initial operational concept was to maintain our aircraft in a state of readiness and launch when, according to the weather observers, the atmospheric conditions were right for gusts. We found the gusts to be so unpredictable that we flew at least one mission each day, regardless of the turbulence reports or forecasts. We found the conditions necessary for extreme turbulence are much more complex than just a strong wind blowing over a mountain ridgeline. Mountain wave formations result from rare combinations of meteorological and topographical conditions. Two of the three times when we found evidence of such wave formations, we made quick refueling and instrumentation turnarounds; however, by the time we got back into the area, they had dissipated. So generally we flew twice a day, whether the conditions looked favorable or not; and, in retrospect, I believe this to be the wisest method of operation. The results were 59 data flights flown for a total of 89 hours, from 7 March to 28 April 1964.

When mountain waves form they contain a core of turbulence. There are also wave reflections extending to the tropopause, random low-level turbulence extends from the ridgeline downwind for 15 to 20 miles, and a mechanical type turbulence exists a few yards from the ridgelines. We found that ridgeline turbulence formed much more readily than the actual mountain wave. We had decided that our primary purpose was to get hit by the strongest, sharpest gust we could find. The project was therefore oriented to seeking out the core of turbulence, if we could find one, but more often than not, we had to settle for the mechanical turbulence. To accomplish this objective, we flew downwind from and adjacent to the sharpest ridgelines in the area. The original plan, as I mentioned, was to use an F-100 as an escort and pace support aircraft. Experience quickly revealed that the aircraft should work as a team, seeking out the turbulence and defining its boundaries. In fact, without the F-100, much of the mountain wave profile information would have been unattainable. Although we found more turbulence than we ever anticipated, we encountered only three mountain waves during the 89 hours of flying. Since our purpose was to measure the big bumps, we certainly couldn't afford to expend valuable data time flying in other than the most violent area; so, while we put the F-106 in the turbulence, the F-100 flew patterns to define the top, bottom, and relative intensity of the turbulence in the vicinity. I'd like to add here that the companionship of a friend while getting slammed around those rugged, wicked looking, sharp, snow-covered, desolate ridgelines provided a most pleasant peace of mind.

Dark line indicates route of B-52 which lost portion of tail in turbulence at "★". Bomber turned east and eventually landed safely at an alternate airfield. Box is area of CAT search by F-106-F-100 team.

AIRCRAFT CONTROL

Aircraft control consisted of the task of maintaining straight-and-level flight at as near a constant airspeed as possible. Three-hundred and fifty knots was chosen as a compromise between aircraft control and optimum instrument response. Gyro precession and the simplicity of small angles in data reduction made it desirable to have the aircraft straight-and-level when hit by the gusts. The difficulty of the task can be appreciated when you consider that we were trying to fly only a few yards from a twisting ridgeline, maintain straight-and-level flight as much as possible, and in turbulence which, at times, nearly surpassed control authority.

Project F-106 flies low in mountains during clear air turbulence search.

CAT INDICATIONS AND FINDINGS

Thunderstorms warn the pilot of the danger in many ways. But clear air turbulence (CAT) is like a ghost, you can only sometimes see the associated signs of its presence. The only dependable indication of clear air turbulence in our test area was snow blowing off the mountain tops and the ridgelines. It looked like a blowing tassel on a huge white cap. We always experienced turbulence flying adjacent to a ridgeline if the snow was blowing. Extreme turbulence was encountered if the snow was being lifted up through the trees on the downwind slope. Obviously, this indication of turbulence vanished with the snow. Generally, as the wind velocity increased, so did the mechanical ridgeline turbulence. The mountain waves did not present such a simple indication. We did on occasion observe the classic roll and lenticular clouds. However, on one mission, we encountered a severe core of turbulence without a cloud in sight.

Although we investigated and searched 200 miles of mountain range, the most violent turbulence was consistently found adjacent to the ridge where the B-52H lost its vertical stabilizer. Several distinct characteristics may be noted about this ridge:

- It's oriented perpendicular to the prevailing westerly winds.
- The ridgeline is composed of an unbroken series of peaks and saddle-backs extending for almost 20 miles at nearly constant altitude in excess of 13,000 feet.
- The topography of the western slope is an essentially flat desert floor, allowing the wind an unobstructed path for 50 miles.
- LaVeta Pass terminates the ridge on the north end and provides a channel for possible wind flow around the ridgeline.

Each characteristic seemed to be part of the ingredients necessary to produce aircraft-bending forces.

The rotors that we found were all located six to ten miles adjacent to and downwind of the ridgelines. The core of turbulence paralleled the ridgeline and appeared to be about 2000 feet in diameter. The top of the core was just below the ridgeline altitude where there was a sharp boundary of smooth air. The core seemed to dissipate where the ridge turned away from the perpendicular to the wind. The core also seemed to dissipate with higher wind velocities. Other ridgelines in the area looked sharp enough; however, daily investigation failed to reveal the formation of this core of turbulence. Obviously, severe turbulence is found only under very special conditions. It is evident that both wind direction and speed, as well as the orientation and particular characteristics of the topography, are extremely critical factors. Although there were several visual indications of turbulence, we found no parameter, visual or otherwise, which will guarantee a valid forecast of turbulence intensity.

GUST EFFECTS

The physiological effects of the gusts on the pilot were not recorded; the psychological effects were also not recorded, but I can assure you the experience will remain with us for some time. The aircraft was instrumented, we were not. The aircraft was stressed for the gusts, we were not—at least not too well. Human factors do, however, constitute a significant part of aircraft design and should always be considered. I don't intend to formulate any conclusions with respect to harness design. Also, my intention is not to predict what you might feel if you encounter the same turbulence in any other type air machine. I would, however, like to relate a few of the sensations and problems so that you can get a better picture of the effects.

In the spring of 1963, I served as project pilot of an instrumented F-100F for the National Severe Storms Project "Rough Rider." In that capacity, I penetrated 53 mature thunderstorms to collect meteorological data. Although we got slammed around quite a bit in the thunderstorms, the turbulence was never as rough as the clear air turbulence encountered during this project. When an aircraft is pounded by gusts, the pilot gets tossed around inside the cockpit. You can be strapped down only so tight and still retain the mobility required to function. Positive control of the body was sometimes extremely marginal. For instance, we found that if we held the throttle as in a normal flight position, the result was continual, unintentional, power changes. As a consequence, we had to position the throttles, brace ourselves as well as possible, hang onto the stick, and ride it out like a bucking bronc.

The problems can be divided into those resulting from lateral and those resulting from vertical gusts. A lateral gust striking the aircraft resulted in a rolling moment. The resultant bank and acceleration caused a lateral motion of the body, and our helmets would slam against the side of the canopy. The lateral gusts also flexed the vertical tail a bit. Most of the F-100 pilots adjusted the rear view mirror so that they didn't have to see the bending. They said that they just preferred not to watch it. The vertical gusts resulted in fatigue, a sore back, poor voice control, and an ejection hazard. We found it difficult, and sometimes impossible, to talk coherently when riding out the severe turbulence. The sharp, high G gusts did an excellent job of scrambling up syllables. On one occasion, my ejection handle was partly raised by a large negative gust. I completed the remainder of the project with the seat pin installed. It was impossible to tighten the lap belt enough. One time, one of the F-100 pilots was thrown up from the seat and came down with his seat cushion survival kit wedged against the stick. Additional negative gusts assisted him in working it back into place. The combined gust effect raised havoc with aircraft electronics. Compass systems, UHF radios, and TACAN sets were replaced regularly. One time, a radio specialist remarked, "it looks like someone stuck his foot through the amplifier." Power supply and other system failures had to be taken in stride; however, the illumination of a warning light is always distracting. Structurally, the aircraft remained sound. Visual inspections revealed only a few popped rivets at the base of the vertical fin.

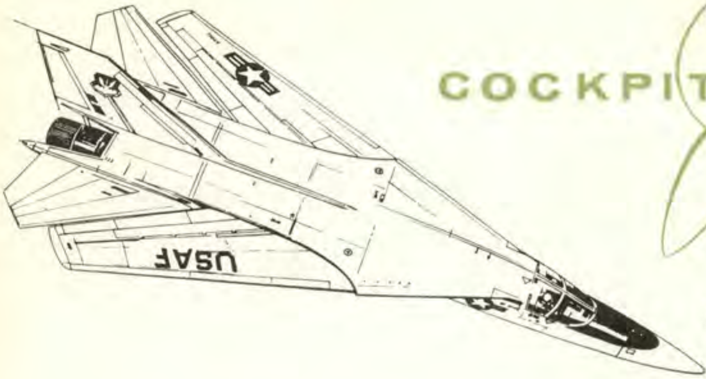
Naturally we did not encounter 100 feet per second gusts on all flights, but we did get hit by gusts over 100 feet per second several times. Quite often we flew in turbulence containing 40-80 feet per second gusts. Considering the airplane dynamics, this meant that we were getting slammed with sharp 2 to 4 G raps and quite a few of those 5 to 7 granddaddies. Maneuvering load factors of 3 or 4 G are quite common to a fighter pilot. The uncomfortable aspect of turbulence flying is in the fact that gusts start the body moving in one direction before jerking it in another. The load factor caused by one of the larger gusts transitioned sharply from -2 to more than +5 G. That adds up to a 7 G differential.

CONCLUDING REMARKS

We searched, found, and measured turbulence powerful enough to destroy aircraft. The season for severe turbulence was supposed to have been past; however, the quantity, shapes, and magnitudes of the gusts that we encountered during our brief, limited investigation were astounding. No one anticipated gust profiles that were so sharp edged, and certainly not gusts which would yield a rap of a 7 G differential.

Gust probe (left) mounted on nose boom of F-106 fed information to tape deck mounted in 455, project F-106A.

Before the program was two weeks old, the preliminary data had convinced engineers making studies of advanced low-level weapon systems that their design requirements would have to be more stringent if these aircraft were to survive a reasonable lifetime. Other engineers making studies on modifying present weapon systems to increase low-level capability also revised their modification criteria. Certainly, all Air Force design criteria will NOT be rewritten based on two months of turbulence investigation in one geographical area; however, it points out the need for much more knowledge of the low-level environment, and this program proved the feasibility of obtaining it. It will bring about improvements in the present state-of-the-art in flight gust measurements. Boeing is now designing and fabricating a new gust probe instrumentation system. Our project has prompted a proposal for a more detailed program which will allow us to construct an analytical model of the gust environment. Also, a request has been submitted to conduct physiological studies on the effects of extreme turbulence on the respiratory, cardiac, and neurological body functions. ☆



COCKPIT Design by DORA

By David V. Lewis, General Dynamics Fort Worth

As the jet fighter touched down, the pilot reached for the drag chute release handle. At least he thought he did. Instead, he pulled the emergency gear-up handle. He was fortunate to escape without serious injury, but an expensive aircraft was damaged.

Others have not been so fortunate. Records reveal a history of similar accidents and near-accidents for this type fighter. Reason: poorly placed controls for the emergency gear and drag chute. They were so arranged that it was easy for the pilot to make a mistake.

Poor cockpit arrangement—mostly inaccessible or easy-to-get-confused controls—has resulted in many mishaps in the past. Therefore, why not design the cockpit around the pilot rather than fit the pilot to the cockpit? In this way, engineers hope to discover and correct potential cockpit problem areas on the ground rather than in the more crucial flight environment.,

This approach was carried out on Uncle Sam's newest fighter, the sweep-wing F-111, now being tested at Fort Worth Division of General Dynamics.

The device used was DORA (Dynamic Operator Response Apparatus), a computerized, simulator-like device on which representative Tactical Air Command and Navy pilots "flew" hundreds of missions before the first production plane rolled off the line.

Each pilot flew a wide range of missions—high and low level, reconnaissance, ferry, attack, and so forth—in order to evoke the widest possible range of responses.

"In each series, we were careful to program identical flights for each pilot to insure statistically correct results," says Chet Zimmerman, GD/FW design group engineer, under whose supervision DORA was designed and constructed,.

Unlike an ordinary simulator, DORA is equipped with an elaborate tape-recording system which sets down every switch or lever actuation a pilot makes on the cockpit panel. From this wealth of data, analysis of human reactions contributed to the cockpit's design.

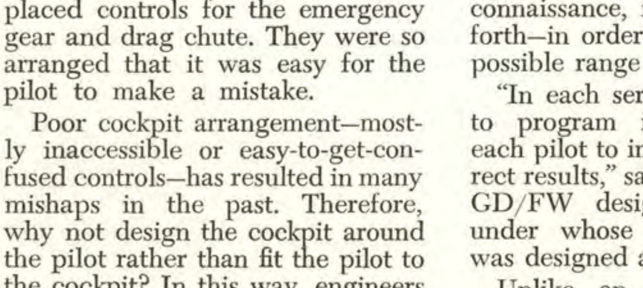
DORA uses a modified Link Mark I solid-state digital simulation computer. Major components include separate crew stations for the F-111A and F-111B, a motion system for the cockpits, a visual system, a recorder system and radar simulation equipment.

An ingenious eye-camera, which pinpoints a pilot's visual fixation at any given moment, is also part of DORA. The camera is synchronized with the recording to both stimulate the pilot and provide resulting pilot-action data.

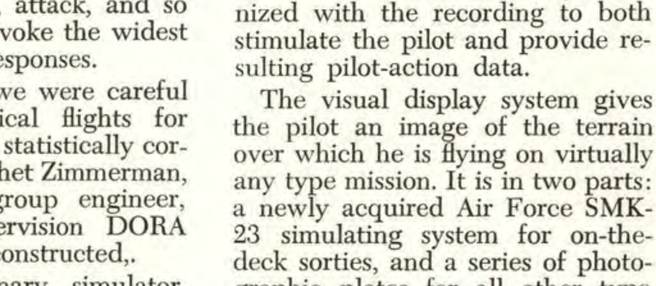
The visual display system gives the pilot an image of the terrain over which he is flying on virtually any type mission. It is in two parts: a newly acquired Air Force SMK-23 simulating system for on-the-deck sorties, and a series of photographic plates for all other type missions.

When plates must be switched to effect a rather sudden change in flight environment, the pilot simply flies through "haze" for about 30 seconds. Plates represent areas of varying size. The high-level photo-

GETTING READY. S. W. Nichols, design engineer, helps ready DORA for Navy "flights." Pictures of terrain over which pilot is flying are sent through box-like visual display system in front of cockpit.



LOW LEVEL. Television camera, left, transmits pictures of simulated low-level terrain depicted on foam-rubber strips 14 feet high which revolve mechanically.



graphic plate, for example, represents an area about 50 miles across. The lower-altitude plate covers only about five miles.

The amazingly realistic portrait of terrain that DORA crewmen see during on-the-deck missions below 500 feet is actually three strips of foam-rubber mountains, valleys and fields. Each strip, 14 feet high and four feet across, represents an area about 70 miles long and 10 miles wide. The strips revolve mechanically. As they do, a television camera, backed by banks of fluorescent lights, records the movement. After viewing one strip, the camera moves over on a track to the next strip. The result is a virtually uninterrupted low-level flight of considerable distance.

All pictures appear in black and white except those simulating Navy landings. Carrier landings include red and green color to simulate the Navy's "meat ball" system of telling the pilot whether he is above or below the desired glide slope.

The eye-camera is attached firmly to the pilot's helmet. It moves as the pilot's head moves and records his visual world on a hooked-in television setup.

Attached to the camera and extending down like an optical periscope is a metal tube with a small light at the bottom. This light is bounced off the eyeball and projected on to the instrument panel. Here it is picked up by the same head-mounted camera that picks up the overall scene.

Thus the television picture will display both the pilot's immediate area of vision, plus the reflected spot on which his eyeballs are fixed. As the pilot glances from one object to another in the scene, the eye marker jumps rather like an illuminated pointer, always indicating the area of immediate interest.

Geared to the programmed flight, the eye-camera can tell engineers whether the pilot was looking at the right place at the right time, especially at critical points in flight.

Data obtained from DORA are constantly being analyzed and should the data reveal a poor or marginal design, the error can be corrected at a relatively early stage in the airplane's development — long before Air Force and Navy pilots get behind the stick of a production plant. ☆

SEEN THROUGH A FOG BRIGHTLY

Reprinted from Flight Safety Focus

There have been several recent occurrences of accidents caused by loss of visual reference at a critical stage of an approach. These accidents have occurred to pilots whose experience, it might have been thought, would have safeguarded them from this particular hazard. The following report may make clearer the dangers of this situation:

"Before taking off on a night flight to an aerodrome some 50 minutes flying time away, the forecast visibility at destination was given as 1 to 2 n.m., reducing to 1600 yards. Fourteen miles from the aerodrome and at a height of 3000 feet the runway and approach lighting was as clear as crystal and belied the 'actual' then given as 'wind variable 4 knots, visibility 1000 yards.' Scattered patches of thin fog or possibly low stratus had been noticed during the last part of the flight and a 'smear' lay over the approach lights and the first 3000 feet of the runway lights in the landing direction 23. However, there was very little apparent difference between the intensities of the lights at either end of the runway and a visibility as low as 1000 yards seemed rather surprising.

"It was still more surprising when, on reaching the holding pattern a few minutes later, a Runway Visual Range (RVR) of 100 yards was given for runway 23, quickly followed by 50 yards. All the lights at the 23 end could still be clearly seen, the only danger signal, other than the reported RVR, being a slight diffusion of the lights which caused some reduction in the sharpness of individual lights as compared with those at the opposite end (05) of the runway. Air Traffic Control were most helpful and went to the 05 end to check conditions there, while we made an approach to 250 feet on 23 to see what it looked like. Throughout the approach and overshoot, all lights again appeared perfectly clear, despite the 50 yards RVR. ATC's report on the 05 end was that the visibility still remained at approximately 1000 yards along the first few thousand feet of runway. In view of the light wind and the relatively short run required for the twin-engined aircraft being flown, it was decided to land on 05. A visual approach was made and it was not until we were about 200 feet on the approach that the runway lights at the far end of the 10,000 foot runway began to disappear from view in the fog. In the last stages of the landing run, extended with ATC permission so that the full fog conditions could be experienced, all doubts about the reported RVR were dispelled when the visibility reached the stage at which it was only just possible to see one high intensity runway light ahead.

"This was a text book example of just how easy it would be to be misled by what can be seen from the air when there is a thin layer of fog about and a good illustration of why these conditions have led to accidents. Approach and runway lights were clearly visible at least down to 200 feet with only light diffusion as a warning—and yet there was an RVR of 50 yards." ☆

Safety In Combat

By Lt Col Frederick C. Blessé, Directorate of Aerospace Safety

Ever since the first air to ground gunnery and bombing range opened for business, the fighter pilot's major problem has been to estimate range and dive angle. Dive angles in excess of 50 degrees have proven to be hazardous and invariably take their toll of pilots during high angle bombing training.

Unfortunately, experience tells us that the steeper the dive angle the more accurate the bomb—providing the range at which the bomb is released is accurate. Countless training missions must be flown bombing a target with a circle of known dimensions before range estimation is even moderately accurate. The transition from training missions of this type to combat where no circle is available, terrain is irregular, weather uncertain, and flak bursts are apparent again gathers its toll of pilots too eager, too inexperienced, too distracted, or too determined.

Experience in three wars shows us conclusively that combat losses due to pilot error in judgment invariably approach and frequently exceed those resulting from enemy action.

A fire control system is being tested that could revolutionize all this. This system employs laser radar for ranging against ground targets. From a pilot's standpoint it works like this:

1. Put the pipper on the target.
2. Press the weapons release button.
3. Begin pull out.

Sounds too simple? Certainly it does. That's the beauty of it. Putting the pipper on the target is your way of identifying the target to your sight. When you hit the release button, you have told your system, "Drop the weapon on that target when we get to the right range and pull up angle." As the aircraft reaches the precise point in space that will allow the weapon to hit the target, the weapon releases. The system is capable of high or low angle delivery—nuclear or conventional, bomb or rocket (or guns). A laser radar should offer good performance at angles below five degrees as a result of its extremely narrow beam, whereas the returns of a conventional radio-frequency radar might be swamped by noise at angles of only 10 or 15 degrees. Regardless of angle of approach to the target, pilot procedures remain the same. The only limitation is that, by design, the attack system is suitable for weapons delivery under visual conditions only, when performance of the laser radar would not be subject to degradation due to foul weather.

The safety implications of such a system are tremendous. The number of training missions could be reduced because weapons delivery methods could be standardized. Training and combat missions would be identical, reducing losses of new pilots in the combat area. Combat effectiveness, because of overall accuracy in delivery, would be increased, reducing the number of combat missions necessary to destroy a target. Combat losses would decrease because pilots could employ tactics and procedures which reduce exposure to enemy gunfire.

Here's a device worthy of a little prayer from the wife of every fighter pilot in the business. The system is in being, tests are scheduled—we in Safety hold our breath and hope it works as designed. ☆

THE IPIS APPROACH

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

Q **Define a TACAN "Gate".**

A A TACAN "Gate" is the final approach fix on the TACAN approach. It is a compulsory reporting point and is also used as a fix for transition to radar or ILS. Level-off from the penetration should be accomplished to place the aircraft over the TACAN "Gate" at the published altitude and at the appropriate airspeed. If an approach is going to be made from the Gate, the final aircraft configuration should be accomplished at or prior to arrival at the gate. Weather conditions will determine the configuration and airspeed to use on final approach. Check your flight manual for this information.

Q **Suppose an approach procedure has a restriction stating ". . . complete penetration turn at 3000 feet within 25 NM." Final approach fix altitude is 2000 feet. When may you descend to 2000?** *(Captain Robert J. Chepolis, 3510 FTS, Randolph AFB, Texas.)*

A Unless otherwise stated on the FLIP terminal chart, you may descend to the final approach fix altitude when you are established on the inbound course.

Your obstruction clearance will be 1000 feet, five NM either side of the inbound course, until you reach the final approach area. This area starts 10 NM prior to the final approach fix and provides a 500-foot obstruction clearance. It is 4.34 NM either side of course at 10 NM and narrows to 1.25 NM at the final approach fix (VOR). JAFM-55-9 is the reference for this criteria.

Q **Should the holding pattern sketch, depicted on a FLIP, Terminal, High Altitude chart, be used?** *(Captain Robert D. Poff, Det 27, USAF Air Station, MAAG, APO 205, New York, N. Y.)*

A The RT and LT sectors of the sketch may be used to determine the direction of turn to enter the holding pattern. However, the use of the teardrop entry procedure in the TD Sector is not required. The teardrop entry may be used at the discretion of the pilot. For the current holding pattern entry procedures, refer to FLIP, PLANNING, SECTION II.

POINT TO PONDER

We saw last month what a jet enroute penetration is and what is involved in the clearance that you receive. The purpose of this procedure is to move the aircraft from an enroute altitude to the final approach course without using all the maneuvers depicted on the FLIP Terminal, High Altitude Charts. Normally, you will be given a clearance limit, an altitude, and a vector to either the final approach course or GCA final.

Make certain in your own mind what facility you are expected to use for an approach if you lose two-way radio communication. The controller will normally give you this information by stating a clearance limit fix or by telling you what the radar vectors are accomplishing. An example of the latter would be radar vectors to the ILS final approach course. In either case, if you are uncertain, ask the controller or tell him what facility you will use if you lose contact. After receiving this information, what are you expected to do if you lose two-way radio communication?

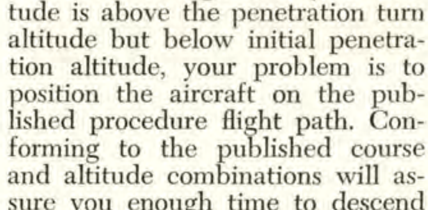
First, check the FLIP Terminal, High Altitude Chart, which depicts the penetration procedure for your assigned clearance limit. Check the minimum safe altitude and descend to your assigned altitude or the minimum safe altitude, whichever is higher. (Refer FLIP, Planning, Section II, Jet Enroute Penetration.)

Second, proceed via the route specified in the clearance, or if none was specified, proceed directly to the assigned clearance limit and execute the published approach procedure.

FLIP, Planning, Section II does not elaborate on how you should perform the published procedure. We feel that the following technique should help you get safely on the ground without using up too much time or airspace.

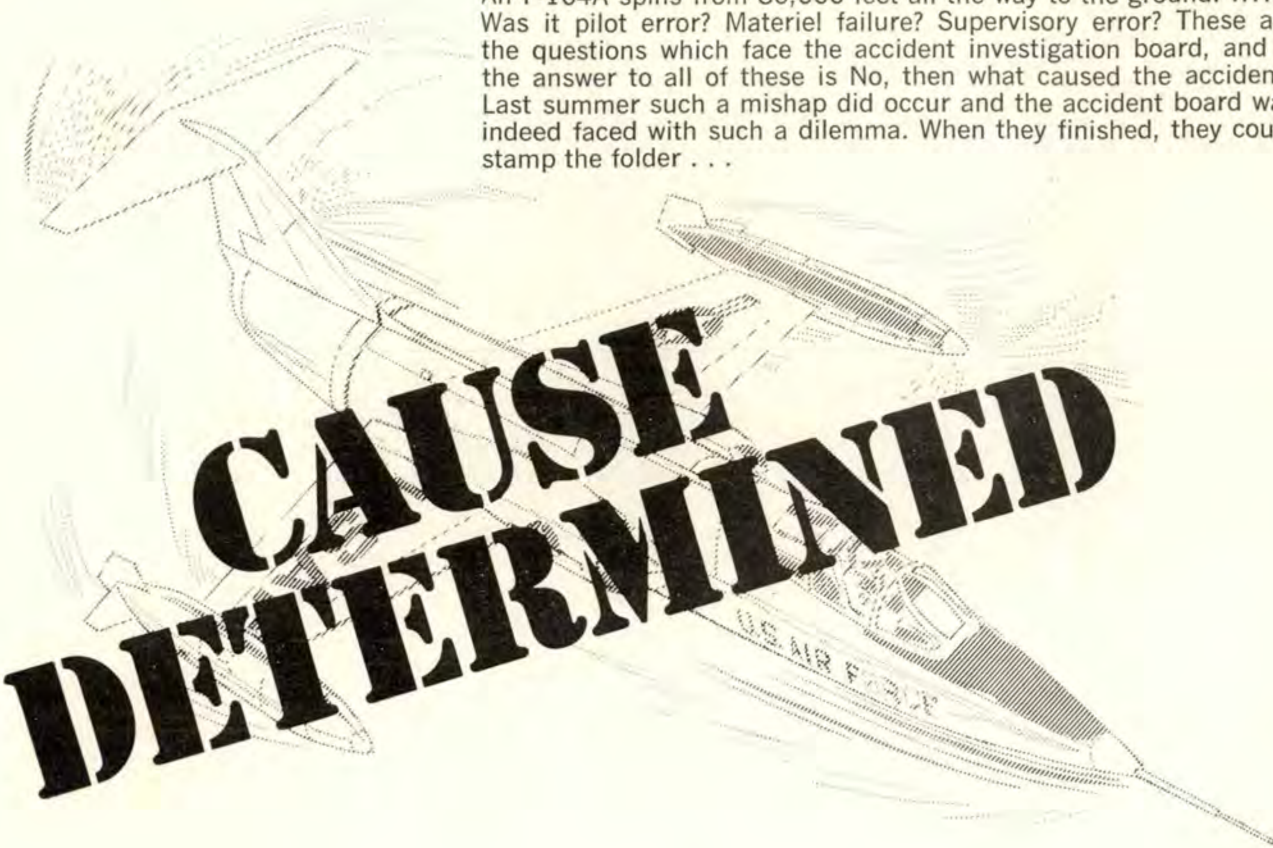
If your clearance limit is a VOR or ADF facility, maintain the assigned altitude or minimum safe, whichever is higher. If your altitude is above the penetration turn altitude but below initial penetration altitude, your problem is to position the aircraft on the published procedure flight path. Conforming to the published course and altitude combinations will assure you enough time to descend and accomplish pre-landing checks before arriving at the low station. How do you intercept the flight path?

SAC recommends a technique that seems to work well. This technique is to fly outbound on the penetration course at your altitude 15 seconds for each 1000 feet the aircraft is below the initial penetration altitude and then complete the penetration procedure. You might consider the adaptability of this technique to your aircraft and mission.



Next month, we'll consider techniques to use when you are below penetration turn altitude or using TACAN. ☆

An F-104A spins from 80,000 feet all the way to the ground. WHY? Was it pilot error? Materiel failure? Supervisory error? These are the questions which face the accident investigation board, and if the answer to all of these is No, then what caused the accident? Last summer such a mishap did occur and the accident board was indeed faced with such a dilemma. When they finished, they could stamp the folder . . .



CAUSE DETERMINED

A student of the Aerospace Research Pilot School at Edwards Air Force Base was performing a scheduled, properly planned, and properly executed zoom maneuver as a part of the prescribed curriculum. The maneuver was performed within the profile limitations as outlined in the applicable technical order. This zoom maneuver was the fifth zoom mission performed by this pilot and was to take him to an altitude of nearly 90,000 feet.

The entire mission up to the peak of the zoom was normal. The afterburner blew out at about 62,000 feet, the engine was shut down and the UHF radio was turned off at 75,000 feet. The maximum altitude attained was 83,000 feet MSL. Near the top, the pilot noted feeling one stick kick which he thought to be from the Automatic Pitch Control system of the F-104. He immediately applied full forward stick. The nose of the aircraft started downward normally; however, as the nose fell through, the aircraft also yawed to the left approximately 135 degrees. The motion stopped momentarily with the nose somewhere between level and 45 degrees nose down. The nose of the aircraft then yawed right as the nose rose to the horizon. This right yaw at a level pitch attitude developed into a flat spin which continued to the ground.

The pilot applied all the proper spin recovery techniques with no apparent affect on the spin or pitch attitude. Attempts to restart the engine, recover by using the drag chute, etc., all failed. The pilot successfully ejected at about 4000 feet above the ground.

At the Air Force Flight Test Center there were, fortunately, many facilities available to measure and analyze this flight. For instance, from the radar plot of the zoom, the flight conditions at the top of the zoom were calculated to be 83,000 feet of altitude, 220 knots true airspeed, 48 knots indicated airspeed, and a q of eight pounds per square foot. Now q, the dynamic pressure, is very important to this analysis where:

$$q = \frac{1}{2} pv^2$$

and p = the density of the air

v = the true velocity

q can be thought of as measured by the airspeed indicator; low indicated airspeed means low q.

The intricate technical details of this flight will not be discussed here, but let us defer to the ways in which the questions of what happened and why were determined. The combination of equipment and engineering talent, both available at the Flight Test Center, and the germ of an idea coming from the investigating board brought forth the answer. The board wondered what takes place at low q at high altitude, and, in particular, what are the forces on the airplane? Aerodynamic forces as a function of the dynamic pressure, q, are obviously far less influential than at normal flight conditions. If inertial forces are predominant in this flight regime then what are they? And what are their relative effects?

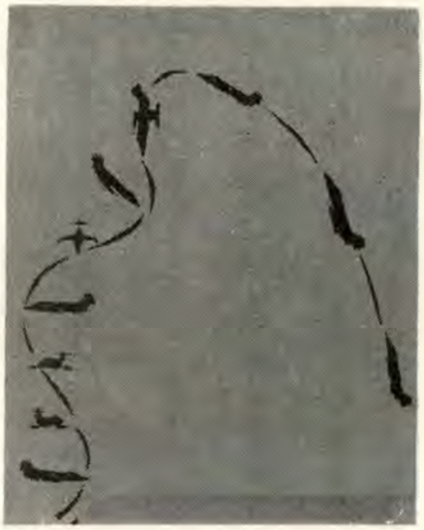
Analysis did reveal the inertial forces to be predominant; but because of the low velocity at the

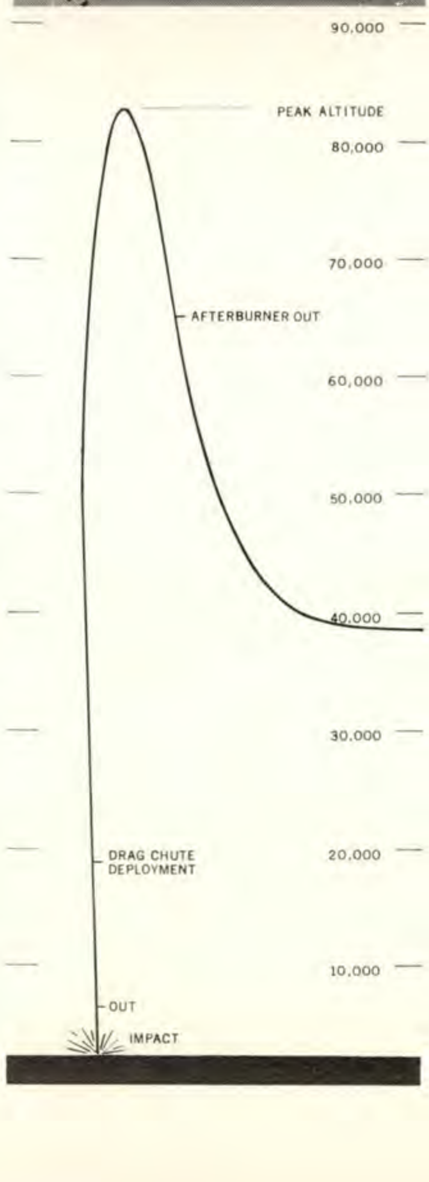
By Col James H. Polve, Director, Flight Test Engineering
Air Force Flight Test Center, Edwards AFB, Calif.

peak of the zoom, the effects of the inertial forces with regard to the ballistic trajectory could be considered minor compared with the inertial forces caused by the large rotating engine. Thus, the idea of the gyroscopic effects of the engine materialized.

As a result of the flight test program being conducted at Edwards on the NF-104, there was available an analog simulation of this airplane which was quickly adapted to the F-104A. The method of attack was to first reproduce the known flight path on the simulator to give motion in the vertical plane only. The flight path, as determined through the radar plot, was matched on the simulator based upon the known initial conditions such as Mach number, altitude, pull-up acceleration, pitch attitude, etc. This matching coupled with the characteristic performance and stability parameters of the F-104A gave representative simulation. The simulator responded in exactly the same manner as did the actual airplane and gave the same flight path up to the point where the airplane went into its uncontrollable maneuver.

Another analog simulation to give rotational motion about all three axes as well as vertical and sideward motion was then programmed to the same conditions existing at this point in the flight path. The results of this study showed that it was possible to get the same uncontrollable maneuver experienced by the actual airplane under these conditions. The studies showed that at low airspeed, or low q, the engine RPM caused the airplane to behave initially just like any other gyroscope, because even at the relatively low RPM of 50 or 60 per cent, the engine was still turning over at 4000 rpm or more. As is well known, any movement of such a gyro causes precession 90 degrees to the direction of motion. For instance, in this case a negative pitch rate caused by a rapid push over or forward stick action caused the airplane to yaw left. This left yaw was induced from the gyro-





scopic action of the revolving engine. The yaw, in turn, created a rather fast left roll caused by dihedral effects. The inertial forces and the aerodynamic forces coupled in the form of a yaw-roll maneuver to place the aircraft at an excessively high angle of attack. Simultaneously, this disturbance triggered an inherently unstable mode in the F-104A to induce a divergent lateral-directional oscillation. The resulting spin may have been initially just one cycle of this oscillation, but with the aircraft oscillating directionally and at a high angle of attack longitudinally the spin was virtually inevitable.

A seeming paradox was uncovered in this analysis. The gyroscopic effects of the engine led to the initial oscillatory spin, and as the engine RPM decayed to a low value, essentially zero, this spin evolved into a flat spin. The normal F-104 oscillatory spin depended on high engine RPM and the consequent gyroscopic effects for its oscillating motion. This motion of the nose oscillating above and below the horizon created the favorable environment necessary for recovery using the prescribed techniques. No known recovery of an F-104 has ever been made from a flat spin. Thus, the inertial forces that caused the entry into the spin would have aided in recovery if they could have been preserved by maintaining high engine RPM.

The investigation showed that the factors contributing to the cause of this accident were none of the ordinary factors for which we normally look. The analog computer proved that this accident resulted from the airplane being flown in a hazardous flight regime, a regime of low dynamic pressure, where the inertial forces of the engine predominated over those forces in control of the pilot to cause an uncontrollable maneuver resulting in a flat spin from which recovery could not be affected. ☆

IFR--the Hypnotic Shield

By Capt David E. Craig, Air Force Special Weapons Center
Kirtland Air Force Base, New Mexico

The New Jersey coastline slips rapidly underneath; you are fascinated by the hazy New York skyline and the massive fleet of fishing boats moving out to sea. The public address system crackles: "This is your Aircraft Commander speaking. Welcome aboard Flight . . . We are now passing 5000 feet, climbing to cruising altitude of 31,000. We are on an IFR clearance via airways to . . . The weather en-route is excellent with only a few scattered clouds forecast. If any members of the crew may be of assistance, please feel free to call upon us. Relax and enjoy your flight."

The steady voice of the Aircraft Commander reassures you, but you question yourself: Why an IFR clearance if the weather's so good? You are handed a cup of coffee and retire to your newspaper. Suddenly your tranquillity is broken—

A flash of light snaps your eyes to the cabin window in time to glimpse an airplane crossing your path close—*too close*! As you stare, in shock, at the window, a little man appears on the window sill and yells: "Your crew is hypnotized!" You grab for him to wring the truth from him, but in vain—he's gone!

You pinch yourself and it hurts. You're dead sure you saw the other airplane as big as life; but that little man's proclamation—incredible as he was!

Impossible? Improbable? No, crew hypnosis is possible and highly probable!

Want a quick lesson in hypnosis? According to Webster, to hypnotize is: ". . . to entrance or overcome by suggestion." Just talk a flight crew into filing a low altitude IFR clearance through VFR conditions and you're well on your way to becoming a master of the art. The clincher occurs just before takeoff: "ATC CLEARS . . ." The inherent danger in practicing this art is that, once cast, the trance is practically unbreakable so long as the IFR clearance remains in effect.

How does the trance affect the performance of the crew? Psychologically, a spherical shield surrounds the aircraft protecting it from *all* potential external dangers; therefore, attention is concentrated *inside* the cockpit rather than *outside*. Precise radio navigation and associated log keeping, so essential to actual IFR operation, occupy much of the crew's time—even in instances where familiar routes could be accurately flown via pilotage. In general, the crew tends to perform their duties in the exact same manner and extent that they would be expected to—if they were flying in actual IFR conditions!

This situation is not a case of misinterpretation or ignorance of regulations—merely a false feeling of security initiated by "ATC CLEARS" and reinforced by the thought that VFR traffic maintain their own separation and the knowledge that radar controllers are usually very helpful in giving "VFR traffic advisories."

A typical traffic advisory is: ". . . unidentified target at nine o'clock, five miles, southbound, slow moving, altitude unknown." Does such a statement remove the trance? No, this is merely another type of suggestion which, while it does cause attention to be shifted outside momentarily, causes the visual scan to be concentrated in the nine o'clock direction. If the target is not immediately sighted, the assumption follows that the target is above or below and presents no threat. But, could the controller have *meant* three o'clock direction? Competent as controllers are, it has happened!

Another shocking suggestion which has the appearance of being a genuine trance breaker is: ". . . make climb VFR from 7000 to 9000 feet—I have traffic southbound on V-16 at 8000 estimating . . ." This is the one which makes a small hole in the shield temporarily; the eyeballs cage outside on the twelve o'clock high position and will remain so until the target is sighted; or, until well past 8000 feet. Meanwhile, all other sectors are disregarded in favor of looking for an aircraft which presents no real threat in the first place; if such threat did exist, a radar vector off airways would probably have been issued.

What, then, are the real trance breakers? ". . . be extremely alert; I have numerous unidentified targets along your flight path." These are the magic, seldom spoken, words which can jar a crew back to reality. They forcibly remind the crew that they're on their own with respect to other (VFR) traffic. The other possibility is a crew-initiated cancellation of IFR clearance; however, this method is not generally as effective because of subconscious reliance on continued radar traffic advisories.

The purpose of this article is not to discourage operation on an IFR clearance at any time; however, it is intended to vividly show what can (and does) happen when we allow our subconscious to be deluded by such things as: "ATC clears . . . ," "traffic advisories will be issued," "other (VFR) traffic is responsible for maintaining their own clearance," etc. True, the most severe examples have been used to emphasize the results; radar controllers *usually* do keep aircraft well advised on other conflicting traffic, other (VFR) crews *usually* do look out, and IFR crews *usually* are not influenced to the degree depicted herein.

What can we, as pilots and crew members, do to enhance our safety (as well as that of others) when regulations or conditions require flight through VFR conditions while on an IFR clearance? Obviously, prevention of the hypnotic trance is preferable. Although not completely preventable, complacency can be avoided by self-initiated reminders, before flight, that an IFR clearance only "guarantees" clearance from other IFR traffic which, in low altitude VFR conditions, may be as few as one aircraft in twenty. To combat the inevitable partial trance, we must issue our own trance breaker immediately after takeoff: "BE EXTREMELY ALERT . . ."

In conclusion, when flying in VFR conditions, the added task of navigating in accordance with an IFR clearance does not alter the fact that we are still VFR and responsible for maintaining our own separation by looking out the windows. ☆

Controllers Cited

Three saves and the successful guiding of 20 aircraft to safe landings during an emergency earned the 1936 Communications Squadron at Lajes, Azores, high praise from Air Force Secretary Eugene Zuckert.

During the afternoon of Oct. 7, Lajes was experiencing a light drizzle with broken clouds when the RAPCON arrival controller received a call from a Navy jet. The pilot explained that his aircraft and three others from the USS Roosevelt were dangerously low on fuel and must land at Lajes. Adverse weather prevented them from returning to the carrier.

After making preparations for handling these aircraft, the center was alerted to receive 16 more diverted from the carrier.

The weather was fluctuating—one-quarter to one mile visibility under a 200-400 foot ceiling. All aircraft were requesting straight-in approaches with power cut to minimum to conserve fuel.

Because of the weather and position of tower on high ground, tower personnel could not see the runway. Aircraft could not fly holding patterns because of low fuel state. Radar frequencies were saturated from the start. Nevertheless, within minutes additional controllers reported and talk-downs began. The first 11 aircraft—all stating emergencies because of fuel shortage—were recovered in about 15 minutes. ☆

Office of Information, Hq AFCS

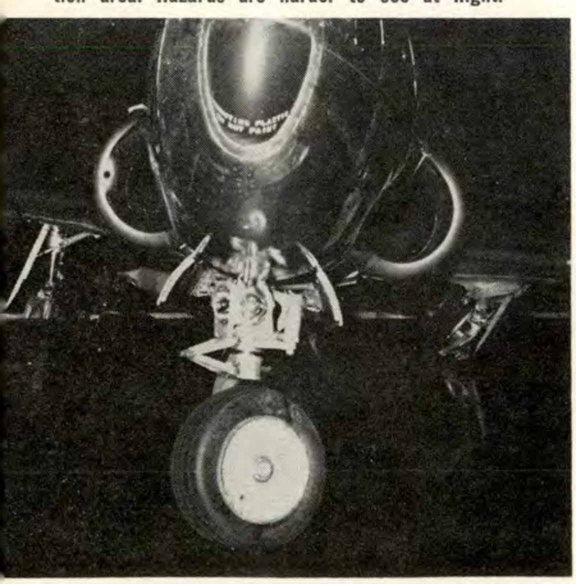
TAXI ACCIDENTS

No brakes . . . assistant crew chief failed to turn on the hydraulic switch.

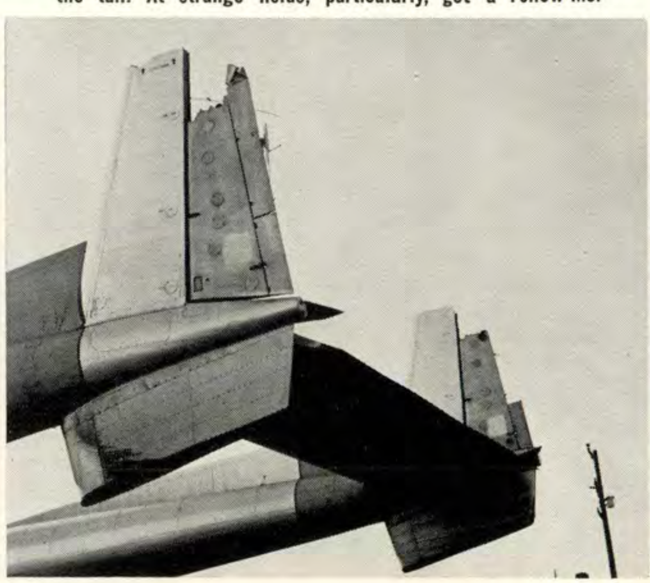
There's an old axiom that go
"There's no excuse for a taxi ac
show that since 1958 the Air Fo
than 15 taxi collision accidents/
1964 was the worst year with r
reduce this rate? Possibly, if:

- All personnel authorized
verify that starting units are pr
- Crewmembers would ad
list procedures and question an
time limits that are unrealistic.

Pilot error. Taxied into open ditch in construction area. Hazards are harder to see at night.



He made it between the poles, but see what a wire did to the tail. At strange fields, particularly, get a Follow-Me.



Pilot failed to assure safe c
fellow who planted the tree.

A T-29 after collision with a starting unit.

Approximate position of power cart and tug prior to accident.

Starting unit correctly positioned.

es something like this: cident." Still, statistics rce has averaged more incidents per year. And nore than 20. Can't we

to start engines would roperly positioned.

here to proper check- y passenger/cargo stop

• Wheel chocks were used during engine starts, even during through flight starts.

• Pilots and copilots would make pressure checks, and look outside while taxiing.

• All pilots would adhere to AFR 60-11, which requires wingwalkers within 25 feet and tugs within 10 feet of obstacles.

• More care were exercised when taxiing at strange airfields, particularly non-Air Force airfields.

• Operations personnel would brief departing transients on hazards.

• Hazards were NOTAMed.

learance. And it's useless to blame the

No wingwalker as required by regs. While taxiing between rows of parked aircraft, pilot collided with parked refueling truck.

Civilian operator attempted to taxi Air Force transport without wingwalker.

THE TIME IS NOW

By Maj William R. Detrick, Aviation Physiologist, Asst for Medical Services, DTIG

H-hour is now! You, Captain Average A. Crewman, USAF, have just been forced to abandon your disabled aircraft. Although you were sure it couldn't happen to you, it just did. That fire warning light was for real this time and the bird was unusable for further transportation. You pulled the ejection trigger or dropped through the escape hatch. This is no dry run or training exercise. It is a very stark, startling fact—THE TIME IS NOW!

Will your escape be successful? Will you live to fly again? Or will you perish in a watery grave? Will you throw away your life because of carelessness or forgetfulness? Or will it be "lack of training" or perhaps just lousy equipment? Standby one on this channel and let's spend a few minutes coffee break time to think about this.

Since 1950, the Air Force has averaged 331 bailouts and ejections per year, 85 per cent of which have been successful. Hold one, though. Our definition of success means that you not only ejected safely but descended to the ground and were rescued or picked up alive. If you die during the parachute descent or survival phase, it's an unsuccessful ejection. The improvement of the ejection system and parachute has been the subject of previous articles in AEROSPACE SAFETY, therefore, what happens after the parachute descent will be our subject. Most of our survival fatalities *could have been prevented*.

Our definition of a *survival situation* includes *all* water situations and those on land where the individual is not picked up in one hour. By this definition, from 1958 through 1963 there were 697 persons who fell into the survival category. Almost a third of these are still missing, all but one over water. A majority of these were probably not survival cases, but the mere fact that they are missing means we cannot assume this. Of the individuals who were recovered, 10 per cent had suffered fatal injuries. As would be anticipated, most of the fatalities occurred following water landings. Land accidents, although involving few fatalities, did involve a large number of injuries. More than half of those who survived were injured.

Half of the persons involved in water landings were rescued in one hour or less, most within the first 20 minutes. If an individual can cope with the first few minutes following a water landing, the probability of survival and eventual rescue is greatly enhanced. During the six years only 41 individuals were not rescued within 24 hours. Rescue or recovery time of these individuals ranged from 24 to 72 hours for those rescued alive and to over five months for recovery of the fatally injured. Twelve of the 41 died, 10 suffered major injuries, and 19 minor or no injuries.

The information that an individual has been involved in an aircraft accident triggers a vast program of search and rescue activity. Rescue efforts are greatly aided if the downed airman can make his whereabouts known. During the six-year period, 506 methods of attracting attention were listed. Light signals in various forms (flares, fires, and flashlights) played a prominent part. The flare, particularly on water, was the single most useful signaling device available. Survival radios contributed very little to the overall locating function. This was due not only to faulty radios but to widespread lack of knowledge regarding their use.

Now that you have some of the big picture, let's take a look at some of the attention-getting survival situations over the past several years. Most of you have already read about the B-52 crewman who was apparently without serious injury after bailout into bitter winter weather. Even though he had been through several survival schools, he walked away from his survival equipment and perished of exposure. He had the equipment and had been trained in its use, but DIDN'T use it correctly and died. Another crewmember in the same accident did everything he had been trained to do and is a shining example for survival schools for years to come.

A jet fighter pilot was forced to eject over the north Atlantic last year. Even though he had not worn his exposure suit for this flight, he lived for over 14 hours in cold water, about three times longer than he was supposed to last. He died during the pick-up operation. Rescue crews are still wondering why he made no attempt to use one of the two mirrors or other signaling devices he was carrying with him. Another second guess, had he been wearing his poopy suit, he undoubtedly would have been in much better shape to help himself during the long ordeal and rescue attempt.

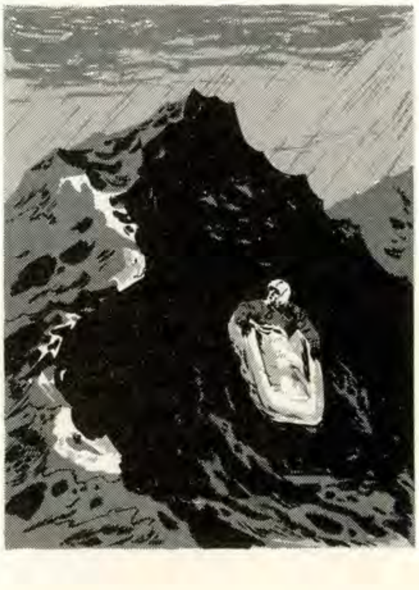
Another jet fighter pilot ejected into the relatively warm waters of the Gulf of Mexico, several months back, and survived for 40 hours before pick-up with only an under arm life preserver for company. He reports that he was forced to jettison his chute harness just after entering the water, thereby losing all of his survival goodies. Any one of the signaling devices in that kit would have worked, since rescue planes flew over and ships came near many times before his actual rescue. According to his account, that pocket flare kit lying at home on his dresser really would have come in handy. His physical stamina and "will to live" helped him survive the long ordeal before an almost miraculous pick-up.

The Air Force is well aware of equipment problems. Some of the things being purchased to help in this area are:

- The URT-21 personal locator beacon, an automatic beacon that will be packed in your parachute pack to broadcast an emergency signal on Guard channel upon parachute deployment.
- The SDU-5/E marker distress light, a pocket sized strobe beacon which will be strapped to your harness for emergency signal, particularly at night.
- The pocket flare gun, a pen gun type flare easily carried in one of your flight suit pockets.
- The CWU-10/P and CWU-12/P anti-exposure suits; both models are attempts to give you more comfortable equipment and better protection.
- The URC-10 survival radio, a transistorized, waterproof version of the transceiver type.
- Improved MK-13 Model O day-night flares for carrying in the survival kit.

All these devices have been a long time in coming and will appear, in part, through the efforts of an extremely important body—the USAF Personal Equipment Advisory Group (PEAG). The PEAG is made up of representatives from each operational command, the research and development agencies, logistic people—including each depot responsible for personal equipment items — and various staff agencies in Headquarters USAF with responsibilities in this area. In addition, friends from the Army, Navy, NASA, and Canada attend. Nearly everyone has a representative in his major command headquarters who is a member of this group. Suggestions and requests for changes or new equipment should be funneled through this individual.

Now, it only seems reasonable to expect you, Captain Average Crewmember, to do something to help yourself. As the Boy Scouts tell us, "BE PREPARED." First of all, you should know your equipment and how to use it. "But," you say, "I've already been through the required survival lectures and have seen all the latest films." That ain't enough, friend. You must *know* what's in that kit. Each item should be examined, sniffed, handled, explored and used until you can do it with your eyes shut. (Do you know by feel which end of the flare is the night end?) Second, you must have the equipment along and in good shape to protect you, should you need it. The pen gun flare on his dresser didn't help that pilot in the water. I know the exposure suit is uncomfortable but so is the parachute and the oxygen mask and helmet—all equally important life saving devices.



In the Hell's Canyon accident several years ago, passengers and crew of a transport that left a sunny southern base were forced to bail out into the frigid snow of mountainous Utah. Half of them died needlessly because they were in summer clothing without proper survival equipment. You don't need to wait on a regulation or directive to tell you what to wear or carry while flying. Common sense should do it.

Let me suggest some items that might come in handy in an emergency, in addition to cold weather and water survival (flotation) gear. A signal mirror can be easily carried in your flight suit pocket and is an excellent signaling device, IF you know how to use it. A pack or two of waterproof matches, very easily carried. A reliable but small flashlight makes a good signaling device. How about a police whistle? Better than yelling! There are many other gadgets that might be in the "nice to have" category, but don't get carried away! Remember, you want to stay alive and to help others rescue you, not set up housekeeping for a month. It's not a matter of keeping comfortable but staying alive.

Seems to me I've read several times on these pages the remark that we are professionals and should act like professionals. I believe this cliche applies here. I don't mean we should stop griping about unsatisfactory equipment; intelligent gripes give us an indication of what is wrong and how to correct faults. I do mean we should know our equipment and how to use it. The best equipment is no better than the individual operating it or using it. And last of all, we should exercise enough self-discipline to make sure we are carrying the proper equipment for the terrain over which we are flying. Remember, should you have to eject, survival becomes very real and it *is* happening to *you*.

The TIME IS NOW! ☆

DON'T PUT OFF UNTIL TOMORROW

By Lt Col A. C. Eggleston, Directorate of Aerospace Safety

Safety surveys and missile incident and accident reports reveal an excessive number of delayed and repeat discrepancies which have caused or could cause catastrophic failure. An extensive review of similar weapon systems and units indicates there is a wide variance in the number of delayed discrepancies per complex and organization. Ground rules also differ in each organization as to the method of reporting delayed discrepancies; e.g., one organization identified in excess of 15 components requiring corrosion control on separate AFTO Form 209 entries.

Now let's get down to the source and causes for the excessive number of delayed discrepancies. Missiles can be launched on a tactical mission with one or two redundant systems inoperative. Knowing this and the requirements by higher headquarters for maximum alert posture, personnel at squadron level are prone to live with delayed discrepancies rather than explain down-time required for unscheduled maintenance.

Planning and scheduling must be accomplished well in advance of all multiple maintenance tasks to insure that specialists are not attempting to perform at the same time tasks that require different configurations of systems in work. Only qualified personnel who understand the relationship of these tasks should be assigned in plans and scheduling. Too often during field visits, lack of good, sound, logical planning has been observed.

What happens when a missile specialist drives 35-75 miles to accomplish a work order and finds he has forgotten his tools or replacement part or has the wrong tech data? He reports to the complex chief that he is unable to accomplish his work order; it is then reported to job control for rescheduling. Any of us who are familiar with this situation can visualize the shouting and earth shaking which evolves from this forgetful act. These time delays and errors will be eliminated only through careful planning, coordination and last minute prebriefing by the specialist's supervisor.

Another time consuming delay results from inadequate troubleshooting. A specialist determines that a replacement part is required. After hours, possibly days, this item is delivered to the supply point and scheduled for installation. Now another specialist discovers that he is able to make an adjustment to correct the reported malfunction. According to their job training standards, both specialists were equally qualified. Our area of prime concern is: Will the supervisor be informed of this occurrence and will he do anything to improve trouble shooting techniques and reduce needless expenditure of valuable manhours? The cited examples are typical throughout our missile units and, to a degree, affect reliability and contribute to accidents.

Repeat discrepancies, like delayed discrepancies, are of prime importance and must be corrected in the interest of accident prevention. Too often the area defined as primary cause of an accident reveals a history of repeat malfunctions within a relatively short period of time. On any critical system, only our most highly skilled personnel should be used. Then if there is any doubt of complete corrective action, don't hesitate to ask for depot assistance through T. O. 00-25-107 channels.

Supervisory personnel should review all repeat and extended delayed discrepancies as though they were accident investigation board members reviewing these writeups to determine the primary cause of an accident. If, during this review, you find potential killers, be sure that positive corrective action is taken to eliminate any element of doubt. ☆

Aeromed Squadron Accident Free

If all the accident free flying hours compiled by the 12th Aeromedical Transport Squadron were put together in sustained flying for one plane, that plane would be in the air continuously for eleven and one-half years.

Early this year, the squadron, based at McGuire Air Force Base, N.J., passed the 100,000 accident-free flying hour mark. In reaching this goal, the squadron flew 24 million miles, or the equivalent of nearly 1000 times around the earth.

With four C-131 Samaritans assigned, the McGuire squadron, part of the 1405th Aeromedical Transport Wing, is responsible for the transportation of Department of Defense patients to specialized medical facilities throughout the Eastern part of the United States. Other detachments of the 12th AMTS are located at Andrews AFB, Md., and Maxwell AFB, Ala.

Under the direction of Headquarters MATS, the 1405th, with three other squadrons like the 12th, operates the domestic aeromedical transport system servicing the entire nation.,

An aeromedical aircrew is a unique team trained to operate an airborne hospital ward. The aircraft commander is responsible for the safe and efficient operation of the aircraft and crew. He is assisted by a copilot and flight engineer and a medical crew consisting of a flight nurse and two aeromedical technicians. The latter three are responsible for the health and welfare of the patients being carried. This combined effort of flight crew and medical crew insure the operational success and the medical integrity of the mission.

"In a small organization such as ours, the accumulation of 100,000 accident-free flying hours must necessarily occur over a long period of time; and credit must be given hundreds of people now departed, who contributed to this noteworthy achievement," said Lt Col Harold H. Imhoff as he congratulated the 12th's pilots and flight mechanics, nurses and medical technicians, maintenance and support personnel, past and present.

Maj Charles C. Yoos, who, with the exception of a tour in Korea and one in Alaska, has been with the squadron since 1949, recalls when he first joined the squadron as a second lieutenant. "We were located at Westover Air Force Base, Mass., and were known as the 1732d Air Transport Squadron. We flew the C-47 Gooney Birds until 1954 when we gained the C-131's, which we presently have in operation.

"I think the thing that has been most impressive to me has been the advancement of the aeromedical transport system to the well controlled, professional approach which we have today.

"It's been very gratifying throughout the years, and continues to be today, to be able to transport patients and have the feeling that in some way you have contributed to their welfare, or have helped save a life."

There are interesting sidelights to the background of the flight crew that actually flew the one hundred thousandth hour. The aircraft commander of the flight, Capt Donald H. Hutchinson, is the first Viet Nam returnee in the squadron to be upgraded to aircraft commander. First Lt. John W. Clar, the flight's copilot, is the youngest member of the squadron. Major Yoos, who has served more years in the squadron than anyone else, was the flight examiner. ☆

Office of Information
1405 Aeromedical Transport Wing
Scott AFB, Ill.

Members of the crew that flew the 12th Aeromedical Transport Squadron's 100,000th accident-free flying hour pose in front of their C-131 "Samaritan" at McGuire AFB, N.J. They are from left, standing, SSgt John T. Lowe, medical technician; SMSgt Joel L. Blanton, chief of maintenance; 1/Lt John W. Clark, copilot; Capt Avis R. Hildebrand, flight nurse; A1C Robert W. Stevens, flight engineer; Capt Donald H. Hutchinson, aircraft commander; Maj Charles C. Yoos, flight examiner; and A2C Leroy L. Branch, medical technician. Kneeling are A2C Gary R. Fenn, left, and SSgt Lyman H. Look, both aircraft mechanics.

HEADIN' HOME

By a USC-FSO Student

The cloudless sky indicated that this was going to be another hot day, just like yesterday. We were going off alert in about half an hour. After briefing and changeover, we would have nothing to do except pack our bags, put the forecast wind on our flight plan, and wait for 0600 tomorrow for our flight home. This had been a long alert tour. Our replacement crew was two days late arriving, so we were really keyed up to be on our way.

Briefing seemed like it would never end but one thing caught our attention: The briefing officer said we would taxi our own aircraft off the line and our replacement crew would put theirs on. Since this was not the normal procedure, we began to pay attention to the briefing.

After turning over the classified material to the other crew, we climbed aboard our bird, started the engines and taxied over to the downloading area.

As we were shutting down the engines, the Reflex Commander climbed aboard and asked if we thought we could make a 1000 hours takeoff. It would take at least that long for the ground crew to download the bird, which included offloading at least 4000 pounds of fuel. Furthermore we weren't packed and didn't have the latest winds on our flight plan. I told him I just couldn't see how we could make it. He told us to go pack our bags while he found a crew to preflight our aircraft and a crew to complete our flight plan and file it for us. That way we should be able to make it.

Excited that we were going home a day early, we headed for the alert facilities. We were back at the bird in 45 minutes but things there weren't going too well. The ground crew hadn't downloaded the bomb bay yet and then it would take another 30 minutes to remove the fuel. Our hopes of going home vanished like water down a drain.

As we stood there talking about our hard luck, the operations officer drove up and wanted to know how we were doing and whether we were going to make our takeoff time. When I told him that it was impossible, he told us to keep doing what we could while he called Hqs to see if they would adjust the takeoff to 1200. "Do you think you can make that time good?"

We all agreed that we could if it didn't take the ground crew too long to download the bird.

About 15 minutes later the operations officer returned and told us that Hqs had extended our takeoff time to 1200 but if we weren't off the ground by then we would be canceled for the day. Our hopes went back up as this gave us over two hours to make it.

The copilot had the operations officer drive him to base weather so he could get the forecast temperature for 1200 in order to compute new takeoff data. I stayed at the aircraft so I could hustle up the downloading.

The next thing I knew, the team chief walked over and told me the hoist was broken and it would take about an hour and a half to get it fixed and finish with the downloading. That would leave about 30 minutes before takeoff, not enough time to download the fuel and make the takeoff time good.

When the copilot arrived back at the aircraft, he said that we would have to download 6000 pounds of fuel instead of the planned 4000 pounds. This presented another problem: not only would it take

longer to download us but we would have 2000 pounds less fuel at destination. Our flight plan called for us to arrive there with 20,000 pounds and now we would have only 18,000 pounds—the minimum required by regulations. If our flight plan wasn't right on the money we would have to divert to another base.

At 1135 the ground crew finished downloading the bomb bay, but we still had the 6000 pounds of fuel to get rid of. We talked it over and decided to try to make our takeoff time good by burning the 6000 pounds when we reached the end of the runway, plus what would be left of the 2700 pounds that was computed to be used for engine start and taxi.

At the end of the runway we had used only 1700 pounds of fuel so we were now 7000 pounds over planned with three minutes to go before takeoff. A decision had to be made. Should we go over weight or cancel and taxi back in to the ramp? I didn't want to make the decision by myself. A quick conference and we agreed to take the chance and GO.

Now the stage was set for an accident: too much fuel, erroneous takeoff data due to weight, inadequate flight planning and get-homeitis.

At brake release we were 6500 pounds over the weight that was used to compute our takeoff distance and speeds. If all engines operated normally, we should be able to make it, even if we were 6500 pounds heavy. Our speeds would be off the computed, but we would subtract a couple of knots for S-1 speed and add a couple for liftoff and that should be close. Beside we all wanted to get home today.

The navigator made the countdown for brake release, "5-4-3-2-1, GO." The heavy bird started rolling, with black smoke pouring from its six engines. Engines checked good, all gages were GO.

The copilot called the 70 knot check; I checked the engines again and told the navigator to add another second to his timing for the S-1 check. When the navigator called S-1 time, I made a quick check of the engines and airspeed. Everything was good except that the airspeed was about two knots low; but we had expected that so we were going. All that was left to do now was to get the bird into the air before we ran out of runway.

Everything looked good until we were indicating between 135 and 140 knots. Then it seemed that the bird quit accelerating. We were using up the remaining runway fast now. I began to wonder, "Are we going to make it? Are we going to get home tonight?" In fact, I began to wonder if we would ever get home and, if so, just how. Would it be several months later, with parts of us missing? Or would it be in the well known "pine box." So many thoughts were going through my mind that I didn't notice that we had started picking up speed again. All I could see was the end of the runway coming fast. When the aircraft did get flying speed, we had used all of the runway and some of the overrun—a total distance of 11,500 feet against computed distance of 9100 feet.

No, there was no accident this time, just a severe case of the shakes and a promise to myself that I would never again let the desire to get home overrule common sense and good judgment. ☆

FUN... Can Be Hazardous!

Sports are for fun. When you indulge in sports and recreation this is your objective. It's your own spare time, and whether you will participate in a sports activity is, first of all, dependent upon your analysis of the question, "Will I have fun?"

Whether or not you will participate is dependent, to lesser extent, upon another consideration, "Can I afford it?" Skiing may be attractive, but the cost in transportation and equipment may rule out this sport.

Other considerations might be, "How strenuous is it?" "Will my friends be participating?" "What else can I do?"

Highly unlikely will be the consideration "How dangerous is it?"

After all, accidents happen to other guys. Naturally, if you figured you would be injured you wouldn't participate. You aren't completely crazy—you aren't going bull riding or entering the Indianapolis 500. You are only going skiing. But Mister, think of those three guys in your squadron who are hobbling around in casts; they didn't figure on breaking legs on the ski slopes.

Okay, it's your spare time and you'll spend it as you choose. Agreed. No one wants to curb your fun and we know you are going to ski, or whatever it is you've decided on, despite broken legs or broken necks. All we want is a few minutes of your time—not to cut into your fun, but to enhance it with a few tips on sports hazards.

We didn't select skiing at random. More accidents occur on ski slopes than in any other single area. But you are stationed in Florida and the only skiing you do is on water. Very well. Your probability of having an accident is cut nearly two-thirds. However, if you are a water skier, you probably do some swimming. Now, your chance of injury is virtually eliminated, but this is the greatest single cause of death among all sports activities. Two years ago, 30 airmen drowned, but none were killed on the ski slopes. But you say all you are going to do is ride around in the boat? You've only bettered your chances by about half. The year that 30 fatalities occurred from swimming, sixteen airmen lost their lives in boating accidents.

Golf is comparatively safe from accidents, but not everyone cares for the monotony of pull-cart hiking broken intermittently by moments of frustrating exercise.

Knowing that people are going to play around (fact, not assumption), our only aim in this article is to offer a few suggestions that may help *you* enjoy yourself by avoiding injury.

Here's where your hazards lie:

Most accidents occur in off-duty, unsupervised team sports. One-third more accidents stem from team sports than individual off-duty sports activities. Off-duty sports accidents exceed on-duty sports accidents on the order of more than 15 to 1.

Repetitive patterns have developed. Unsupervised off-duty water sports activities such as swimming, boating, water skiing, diving and fishing are deadly. In 1964, for example, water sports accounted for 55 of the total 114 sports-recreation fatalities.

In off-duty team sports activities softball and baseball are the perennial leading accident makers, followed closely by touch and tackle football, and basketball. This big three combination accounts for about half of all sports accidents. In individual activities, handling firearms while hunting or in target and skeet shooting takes a consistent toll in dead and injured.

If you have a non-fatal sports activity accident — and you are average—you can expect to be laid up for 10 days. (Incidentally, this costs the Air Force an average of 30 bucks a day.) Total per annum cost exceeds four million dollars! Sports and recreation accidents are second only to private vehicle operation in causing injury and death.

Painful as it may be, the knowledge that sports-recreation injuries cost the Air Force $12,000 per day is not nearly as impressive to you as your broken leg would be. So let's go further with suggestions that may help you from breaking it.

- Limit sports activities to your physical capabilities. Everybody can't be a rodeo rider.
- Proper pre-game warm-up is mandatory. To plunge right in may be more impressive, but the shock could kill you.
- Don't neglect your physical condition. Get your flight surgeon's advice.
- Don't play when you are ill. Relaxation is a better cold cure than recreation.
- If injured, see the flight surgeon before continuing play. It's better to be able to limp a little than to lie in traction.
- When tired, rest. Weariness is a warning—heed it!
- Examine the playing area for holes, wires, loose rocks and other hazards before the game. Be sure your equipment is in good condition and that you use the proper equipment. A golf cap is no substitute for a football helmet.
- Don't roughhouse or engage in horseplay. Being sorry never makes a broken arm mend faster.
- Establish safe ground rules to apply when hazards cannot be eliminated. Examples: a fly ball into the bleachers is out of play; throwing a bat is an automatic out; no one on the rink without skates, and all bowlers must wear bowling shoes.

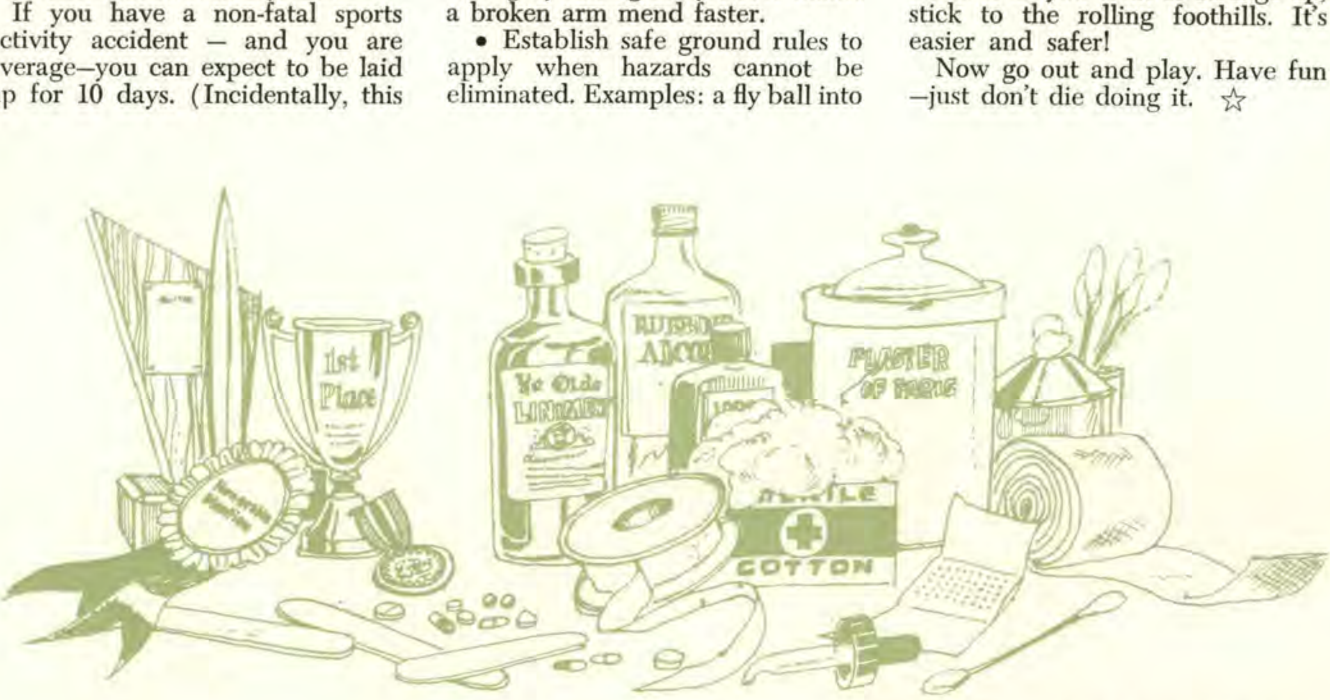
"Hazardous Sports" deserve special mention. This category is set aside for those sports that have a high hazard history. Included are tobogganing, water skiing, mountain climbing, stock car racing and diving. Before you succumb to an enthusiastic buddy's sales pitch and step out the door of a Stinson at 3000 feet, check with your base safety office. At best, parachuting is a hazardous sport that requires superior equipment, training and procedures to insure safety.

Drag strips, dirt track and stock car racing are gaining in popularity. You may be another Dan Gurney, but how about your competitors? Have they had to pass driver certification procedures? Do the cars have to meet specified standards? Are safety regulations enforced and is the track equipped with adequate guard rails? Is the activity carefully supervised? Again, check with your local safety office.

Water skiing takes a high toll. The average man days lost per accident is almost double the overall average for sports accidents. Believe it or not, there are accidents on record in which the skiers involved didn't know how to swim.

Mountain climbing requires skill, know-how and specialized equipment. If all you want to do is go up, stick to the rolling foothills. It's easier and safer!

Now go out and play. Have fun —just don't die doing it. ☆



Missilanea

T. O. CURRENCY—During removal from storage, two AGM-12 wings were found to be damaged. Investigation revealed the damage probably occurred during packaging. The unit stated that no established packaging procedures exist in available technical orders.

Quality Control Sections take note: Packaging procedures were included in T.O. 21M-AGM12-101, dated 14 August 1963, which had been published over a year prior to the incident.

Are your files up to date?

Captain R. A. Boese
Directorate of Aerospace Safety

LET'S REPLACE "MURPHY'S LAW"—Throughout the life cycle of a weapon system, tech data are continuously developed, evaluated, supplemented, revised and up-dated to increase their effectiveness. Cases do exist where tech data, general in nature, leave implementation details to the user. Perhaps in the minds of the writer and the approving authorities, the steps were clear and seemed so basic that anyone could follow them. Perhaps, also, they overlooked a facet of the operation where "Murphy's Law" could be employed. (Unfortunately, Murphy's Bonehead Law is so well known that definition is not required.)

Supervisory, quality control, and skilled technical personnel must be relied upon to be the first to locate any possible area in which the "Bonehead Law" can be exercised and to insure that corrective supplementary procedures are available. Each member of a "two-man" team bears the responsibility to be alert to the fact that his buddy may have a tendency toward the "Murphy" concept.

A recent mishap illustrates the point. Tech data require checking a specific fuse and relay for operational condition for a particular security system fault. Apparently, it was assumed that power would be turned off before the fuse was removed, or if a condition existed precluding power shutdown, a standard insulated fuse puller would be employed. A dedicated student of "Murphy's Law" (together with a sympathetic buddy) was equipped with the "all-purpose" screw driver and proceeded to pry out the fuse in question. The result was inevitable. A fine metal bridge connecting the missile ground to a substantial positive electrical potential, initiated the unexpected—the firing of installed ordnance! The subsequent damage was serious and costly—it could have been catastrophic!

The results of the incident are under study and fixes will be developed to prevent the recurrence of this, as well as any other, malpractice that can be envisioned by careful study and analysis of the mishap. Tech data and weapon systems continue to prove that they are not infallible and avid proponents of "Murphy's Law" continue to locate the loop holes.

Why can't we start a new law? Like a "Kelly's" or "Casey's" Law, where technicians, supervisors, and other alert personnel out-do the proponents of Murphy's Law by getting the defense mechanism in print as tech data or operating instructions before "Murphy's friends" can discover their opportunity. It would be a great day if this new law became as widely known and followed as "Murphy's!" You know, gentlemen, no one gets paid extra for exercising Murphy's Law—far from it! But, if the new law were exercised in its initial phase on an AF Form 1000, called "Suggestion," someone could receive extra dollars in addition to the gratifying knowledge that he has provided a real benefit to his unit, and to the entire United States Air Force!

Lt Col Randall S. Kane
Directorate of Aerospace Safety

OUCH! MY PROBE IS BENT!—The OIC of Job Control made the decision to have a B-52G, with two mated AGM-28's, moved into a nose dock to keep the missiles out of inclement weather. As the aircraft started into the dock, the tail walker moved forward to the right front side of the tug to assure clearance between the tug and the dock's concrete wall. The left and right wing walkers were located forward of the wingtips to observe clearance between wingtips and dock doors and the NCOIC was located near the left front side of the tug to observe tow team members and general aircraft clearance.

The observer on the right side of the tug saw the pitot probe of the number two missile approaching dangerously close to the concrete walk, became excited, took the whistle from his mouth and yelled for the NCOIC to stop aircraft movement instead of blowing the whistle for an emergency stop. The NCOIC gave the driver the command to stop; however, the delay in giving the command permitted the pitot probe of the number two missile to strike the concrete wall. The probe and probe adapter were damaged.

Strictly a case of personnel error. The dock design would not permit a B-52 mated with two Hound Dogs to be towed far enough inside to permit closing the doors. In addition, the towing team did not utilize the signals established for the operation.

Major E. D. Jenkins
Directorate of Aerospace Safety

DOUBLE YOUR PROFICIENCY FLYING TIME....

By Col Robert D. Curtis
3615 Pilot Training Wing
Craig Air Force Base, Ala

If you're a CRT type pilot, I've got something for you. If not, this may be worth a few moments of your time anyway; I promise to be brief.

Over the past several years the Air Force CRT program has undergone several revisions which have reduced proficiency flying time. I'm one of those guys who like to fly, and my desire to fly has been strong enough through the years to prompt me to occupy a seat in an aircraft as often and as long as current policy has permitted. Each time the screw of further restriction turned, I squirmed. When the "big picture" pressures forced a limitation to 100 hours a year, I became concerned. When we were "permitted" to log copilot time in two-place training aircraft, it usually became very inconvenient for me to find another qualified pilot to go along. But finally, when policy required two rated pilots to occupy the driver seats and both were required to log pilot or copilot time, I was trapped for sure. How could I maintain a high level of pilot proficiency on a diet of 50 hours first pilot time per year? At first it seemed unlikely; certainly it was necessary to spend these few hours cautiously, doling them out through the months and making each flight as efficient in training value as was reasonably possible. Then my crafty mind produced the solution I'm passing on to you now.

Most CRT time is logged on out-and-back cross-country flights. Like any good guy, I split the front and back seat time with my fellow CRT'er. But, and here's the gimmick, when I occupied the rear seat, I flew hooded instrument time. As soon as the wheels went up, my cheery voice was heard through the intercom, "OK, I've got it." Later, often much later, when the GCA operator notified us that we were passing GCA minimums or the altimeter provided the same message on an ILS or VOR low approach, "OK, you've got it." The other guy, unaware that he'd been victimized and probably unwittingly thinking he'd been doing the piloting, courteously swapped seats and sat quietly while I flew the next leg from the front seat. Net result: just about 100 hours of proficiency flying time for each year's worth of CRT time. Ingenious?

Let's look more closely at the by-products of all that "bag" time. Flying proficiency carries along in good solid shape with 40 or 50 hours of hood time per year and, as an incidental bonus, instrument checks are a breeze. Ah, but you'll say, "Straight and level cross-country flying doesn't provide much useful practice." I'm ready for you; it can. It's going to be work, but here's how you do it. First, consider perfection as your goal. Work toward freezing the altimeter *exactly* on your assigned altitude. Lock onto and hold, to the degree, the correct heading. In other words, exercise hard and continuously the technique of rapid instrument cross check. Second, deliberately make it tough for yourself. Take over the radio calls. Do any fumbling with computer or inflight publications that is necessary. Dig out and study the let-down plates. Meanwhile, continue trying to control the aircraft precisely. Third, stick it out. If the flight is two hours and thirty minutes, spend two plus 25 under the hood driving. And fourth, take the trouble to convince those Air Traffic Control and RAPCON guys that you should be allowed a low approach.

What are you going to get out of all this? You'll maintain a high level of proficiency; you may even improve. You'll increase your ability to fly accurately when your attention is split by the outside demands of traffic control and flight planning. You'll develop endurance so that a long flight will not leave you exhausted at the time when the final approach requires your very best accuracy. Finally, knowing human nature, the other guy is likely not to be as conscientious (or as sneaky) as you; you'll double your proficiency flying time.

Come to think of it, 40 or 50 hours of hood time each year would probably make you a better pilot whether you're restricted to CRT flying or not! ☆

Aerobits

PE SHOPS, ATTENTION! — Here's what the message from a southern base had to say:

During normal repack and inspection of personnel parachutes, seven aneroids on the auto-release type F-1B were discovered leaking. This would have degraded the capability of the release to function at the preset altitude. Inspection of all parachutes on base disclosed 22 more malfunctioning aneroids. Recommend other units inspect for this discrepancy.

To which we add, AMEN.

A LITTLE DAB CAN UNDO YA . . . . Wasn't too long ago that a little dab of paint caused a tail hook to bounce allowing a fighter to miss a barrier cable. Now a dab of paint appears to be the culprit in a hard chopper landing. Seems the pilots were making a normal approach until about ten feet off, the pitch stick was being raised to increase collective when, after about one inch of travel, it jammed. Deceleration forces were sufficient to cause the rotor blades to flex and strike the tail rotor drive shaft. After considerable investigation, most probable cause was attributed to a dab of paint —this was the first time the chopper had been flown after a complete repaint job. It was thought that a thin paint residue that apparently had collected on the collective pitch control during repainting had worked down to concentrate on the phenolic blocks of the friction lock. This in turn apparently caused a momentary snubbing action, restricting movement of the collective pitch control stick.

T-39 FUEL VARIATIONS. Two transient T-39's were presumed to have been serviced with full fuel loads. However, during pilot ground checks both aircraft fuselage tanks indicated 500 pounds short. They were topped off with 96 gallons of fuel. Investigation disclosed that each aircraft had been refueled by the same servicing unit and that the fueling unit was operating normally. It was considered most probable that the fuel was delivered at a pressure high enough to create a back pressure in the fuel manifold, causing a stoppage of flow and indicating closure of the fuel level control valves. This probably occurred when all but the one tank had closed normally. The command concerned has directed that fuel quantity gages be checked to verify the amount of fuel prior to signing off Block E, Part II, AFTO Form 781. A power on check of fuel quantity gages to insure full fuel servicing is also recommended before flight. A check with North American discloses a fuel imbalance that can be experienced in this bird, provided all conditions are as follows: Fuel tanks in both wings are not full, the aircraft is not level, the cross feed valve is open and an O-ring in the cross feed manifold is unseated. Fuel can drain from the high tank to the low tank at a fairly slow rate and if the aircraft is left long enough (overnight) fuel weight will be heavy on one side. Reading of the fuel gages will disclose this condition.

WHAT'S SFA? "Air Force Jet 35212 departing FL 200 and Podunk VOR at 05."

"Roger, 35212, call penetration turn, expect GCA this frequency."

"Air Force Jet 35212, Podunk GCA, turn further right to 310, you are 11 miles on final approach, etc."

The transmissions you just read are typical of those received at many ZI and most overseas bases today. What's so significant? SFA—that's what! What's SFA? — Single Frequency Approach — that's what!

The Single Frequency Approach system as discussed in paragraph IV-B of FLIP Planning Section II, Flight Planning Document, has been implemented at many ZI bases and nearly all overseas bases. In your review of the Flight Planning Document information, you will note that this service enables single-piloted jet aircraft to remain on the same air traffic control frequency from beginning of penetration through landing touchdown. SFA enhances flight safety by minimizing cockpit distractions which could induce spatial disorientation. When the SFA note is shown in the enroute supplement communication data on a given airfield, no frequency change is normally required during arrivals, except when pilots are conducting "enroute penetration." There will be one frequency change when control is transferred from the Air Route Traffic Control Center to the terminal air traffic control facility.

TEN FEET LOW. The scar on the hillside was ten feet below the crest. Investigators looked at it, examined the pieces left after impact, reviewed events that led up to the scar and finally concluded that they could not determine the cause of this accident.

But they recommended that all pilots be briefed on it.

Termination of this pilot's career was marked with a brilliant flash made by 12,000 pounds of exploding JP-4. And, until a late change, he wasn't even on the mission. The three pilots in the flight had all been scheduled on separate missions; but weather, shortage of in-commission aircraft and other problems had thrown them together that morning. In fact, No 3 was added to the mission after Lead and the No 2 man had left for their aircraft. However, he caught up with them and received mission and weather briefing from Lead.

But this is a little ahead of the story. A slight slip somewhere along the line resulted in a nine being changed to a six in the mission symbol. For this reason the wing commander, when he approved the mission, approved a different mission—one for which weather was better.

Takeoff and climbout were routine. No 3 had a 10-degree discrepancy on his heading indicator, but fast slaving took care of this and subsequent heading checks were O.K.

The mission was high-low-high and ground radar had the flight under surveillance during the high portion. Radar plot showed the flight six miles off when Lead reported turning over a fix. He was navigating by airborne radar as his only navaid. Shortly after the turn Lead called pulling power back and a descent to low level was started. Lead transmitted the local area altimeter. Radar plots showed the flight to be approximately 16 miles from the desired letdown point at this time. Ground radar contact was lost during the descent. After letdown to the initial low altitude the flight leader flew an additional minute, then made a turn and let down to a lower altitude. This altitude was reportedly held for six minutes and another turn made. During flight on this leg Lead and No 2 both caught occasional glimpses of the ground through the clouds.

Letdown was continued for the next leg. At this time period of the mission, Lead did not recognize the return on his radar scope and decided to abandon the low level portion of the mission. He called pushing up the power and starting to climb. Immediately after this call No 2 reported seeing a flash which came from the No 3 position. He described the flash as a bright, narrow horizontal streak which appeared in his peripheral vision, extended just a little forward of his position and then immediately disappeared. The flash was accompanied by a shock

Aerobits

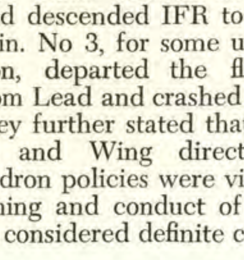
wave and muffled bang. Lead was unable to contact No 3 and turned in a right, climbing orbit over the vicinity of the flash. He switched to Guard, began squawking emergency. Position was fixed by ground radar and shortly thereafter the flight departed for home.

Investigators reported that Lead failed to comply with existing directives requiring use of all available navaids. They attributed the probable cause of off course track to failure of Lead to apply the effect of existing winds at altitude and during letdown. Timing errors were suspected as well. Other possibilities were enumerated in the report.

In summary, the board opinioned that the flight leader made serious navigational errors and descended IFR to just above the terrain. No 3, for some undetermined reason, departed the flight, turned away from Lead and crashed into the hillside. They further stated that 60-16, Command and Wing directives, Wing and Squadron policies were violated in the planning and conduct of this mission and are considered definite cause factors.

F-4C BLC MALFUNCTION—On the third touch and go landing, after an hour and 30 minutes of flight, the BLC malfunction light illuminated as the flaps were retracted to the full UP position. The pilot immediately throttled back, lowered flaps to the full DOWN position and landed without further incident. Maximum time with BLC light and flaps UP was five seconds or less.

Investigation showed heat damage to the flap trailing edge, and four one-half inch rips in the forward edge of the flap where it had jammed into the wing top surface rather than under the wing surface. An actuating rod connecting the flap to the bell crank had broken. ☆



FALLOUT continued

it the HSI and they gave it to us. We like it and think everyone ought to have one. But as long as we are stuck with radials, wouldn't it be nice if the thing had a tail on the needle?

Lt Col Norman H. Frisbie
Maj Robert F. Pugh
Capt John D. Musgrove
Capt. William R. Seal
836 Air Div (TAC)
MacDill AFB, Florida

RADIALS??

I have just read Colonel Fussell's letter in the January issue of AEROSPACE SAFETY. I'm all for someone who wants to tell a pilot to steer in the direction in which he should be headed, rather than to use the reciprocal of the direction he would be headed in, if he were headed the other way.

By all means, let's do away with radials! More power to the Colonel.

Lt Col H.H.D. Heiberg, Jr
7205 Leesville Blvd
Springfield, Va.

GUARD CHATTER?

About your attempts to reduce non-emergency radio traffic on 243.0 mc: recently I overheard a century series jet pilot carrying out a practice intercept and using 243.0 as a control frequency because he had lost his primary frequency. He carried out the intercept that he was involved in and then asked for another. In all, he used Guard for 20 minutes with constant chatter, rarely identifying himself and using pretty horrible radio procedure.

Later I telephoned the control station and talked with the Operations Officer. He readily admitted that his unit had used Guard and that there was no emergency. In fact, the jet with the radio failure was one of a flight of five in excellent weather. Throughout our conversation, I got the impression that he thought nothing was wrong with using Guard as a communications backup.

I was over 200 miles away at low altitude and heard the aircraft clearly. It is a fortunate thing that no aircraft experienced a real emergency throughout this 20-minute period in an area of over 132,000 square miles.

It's bad enough that pilots use Guard for non-emergency transmissions, but for a controller to condone it for 20 minutes is unheard of. Naturally, my CO filed a violation with the FCC.

Lt Henry C. Rayburn, USCG
USCG Air Station
Traverse City, Michigan

WELL DONE

MAJOR CHARLES A. GABRIEL MAJOR SCOTT G. SMITH

1001ST AIR BASE WING, ANDREWS AFB, WASHINGTON, D.C.

Majors Gabriel and Smith accomplished an outstanding feat of airmanship by working as a team to successfully execute a flameout landing with two landing gear only partially extended.

The flight in a T-33A was one leg of a proficiency cross - country. Takeoff was made at Little Rock AFB with Biggs AFB as the destination. The flight at 39,000 was uneventful, until an explosion occurred in the aft section one hour and thirty minutes after takeoff. The pilots, with the help of radar determined Carswell AFB, 35 miles away to be the nearest suitable facility and headed there. The weather was clear with unlimited visibility, and all electrical equipment except for radios was turned off. Major Gabriel and Major Smith arrived over the field at 25,000 and attempted to lower the gear using the normal system. The gear did not indicate down and locked so the emergency system was used, but to no avail. At 20,000 feet the radio failed. Use of the left rudder pedal after the explosion produced no results, and the pilots applied left rudder by pulling out on the right rudder pedal. Continued use of the emergency hydraulic pump failed to produce a safe indication. A forced landing was made on the runway, but the left main gear and the nose gear collapsed shortly thereafter, and the plane skidded off the runway where it came to a halt after turning 90 degrees. The pilots evacuated the aircraft with no further incident.

Major Gabriel and Major Smith handled this emergency situation in an outstanding manner and in so doing, limited damage to the aircraft. WELL DONE! ☆

SUCCESS STORY

"The ejection sequence went according to the book. I pulled the visor down on my helmet and cinched the chin strap. I put the aircraft in a wings level climbing attitude, airspeed 200 knots, and lifted both ejection handles. The canopy left the aircraft. Although the windblast was quite noisy, I felt no sensation of force in the cockpit. I assumed the ejection position and squeezed both triggers. The upward force of the seat was not extreme but the windblast and deceleration were quite violent. I had the sensation of tumbling forward at a great rate, but my wingman later stated that I made only one rotation backward before separating from the seat. The deceleration must cause this feeling. The man-seat separator worked as advertised and I felt it pushing me from the seat. I had connected the zero lanyard at the TACAN initial approach fix, resulting in the chute deploying immediately. The chute opened cleanly and I found myself, uninjured, floating down to the Pacific.

"During the descent, I inflated the underarm preservers, actuated the seat kit, opening the life raft, took off my oxygen mask and flying gloves, threw them away, and opened the safeties on the parachute quick releases. The descent was very peaceful and it seemed to take a long time to come down (ejection altitude 3000 feet). Before I hit the water, a flight of four aircraft appeared and started to circle my position. Their presence, along with my wingman capping, assured me of a quick rescue.

"As I hit the water, I released the left riser and spilled the chute before it could drag me. The second release was easy to operate and the chute drifted away. I closed the quick releases, got into the raft, and pulled up the survival package, fishing out the URT-21 beacon and a few flares. My CWU-10/P exposure suit leaked a little around the fly zipper but, although the water was only 45 degrees, I remained warm and comfortable until my pickup. I normally wear a set of thermal waffle weave underwear under the nylon suit liner. I believe that a man, uninjured, and clothed like I was could last a night at sea in his raft in the winter here. The gloves supplied with the suit were unsatisfactory, being practically impossible to get on with their tight wrist seals. I would recommend fitting them much looser or removing the seals altogether.

"The H-43 arrived on the scene about 20 minutes later, tracking in on my URT-21 signal. When I saw them coming, I lit one of the red smoke flares and they flew directly toward me. They lowered an aluminum basket rather than the usual horse collar and I needed only to roll into it from the raft. The winch operator signaled to cut loose the raft and survival kit, which I did, and hoisted me in. Twenty-five minutes later, I was standing on the ramp at my home base.

"Comment: I broke the antenna on my URT-21 while getting into the rescue basket. It is made of soft aluminum and is easily bent. I can see how a pilot could easily do this in a rough sea." ☆ *(This was the first known successful emergency use of the new URT-21 Personal Locator Beacon—Ed.)*

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