A E R O S P A C E

SAFETY

UNITED STATES AIR FORCE

NOTHING TO PUT YOUR FINGER ON

SEE PAGE TEN

MAY 1964

WHAT IS... safe′ty?

(sāf′tĭ), *n.* **1.** Co
or hazard. **2.** Quality o
danger or harm; safeness.
oneself or others safe, esp.
protective device, as on a
6. *Amer. Football.* Any a
on, above, or behind the go
his own goal, provided the
line was given by the side d
made. **7.** *Baseball.* A sa
to ensure the safety of the
Of or pertaining to the safe
ployees, or the like, from a
engineers.

What is Safety? Ask a dozen people, you'll get a dozen different answers. Some people equate it with reliability. Others see it as a distinct and specific function, i.e., the safety office, the safety officer.

Some say that Safety is accident prevention, but this is a very broad and rather vague concept. Some think of it only in terms of prevention of death and injury to people. Others include equipment in their thinking.

Perhaps a few definitions will help. Safety is a guard at the crossing where children go to school. Safety is teaching your children not to play with matches. Safety is well conceived design so that a pilot in a moment of stress will not pull the wrong handle, or trip the wrong switch.

Safety is listening closely to information or instructions so that confusion as to what is expected will not ensue. Safety is knowledge of aircraft structural and operational limitations so that they will not be exceeded.

Safety is the little extra concern that assures that a cotter pin will not be omitted, that tires will be properly inflated so that one will not blow out on takeoff or landing.

Conversely Safety is NOT sending a crew off in freezing rain. Safety is NOT hiding something that may cause someone else to have an accident. Safety is NOT taking for granted what one must be absolutely sure of. Safety is NOT exceeding your own and your aircraft's limitations. Safety is NOT drinking before driving.

Safety is NOT directives, regulations, technical orders, checklists that are ignored or disregarded.

As we said, ask a dozen people the meaning of safety and you'll get a dozen different answers. If they all meant the same thing, only in different words, we wouldn't have such a problem. But Safety IS different things to different people. This can be dangerous, for example, if SAFETY to a safety officer means the hanging of posters on hangar walls, or a dull lecture to a restless captive audience at the safety meeting.

Safety can be all things to all people if it is a positive force. Actually isn't Safety something of a natural law that is ingrained in all of us from infancy on? It is reaction to hazard. It is self preservation. But is it survival of the fittest? If it is, then we had better back up and regroup. For safety must be of the concept that "I am my brother's keeper."

The mechanic following this concept takes the necessary time and care. The designer studies and restudies to make sure there will be no flaw in the placement of equipment, the strength of materials and the overall reliability of the system, even while staying within the parameters that seem to limit him.

Does not the commander who demands mission capability mean "with safety?" Without safety, in its broadest meaning, would there be any mission capability?

Perhaps after examining the word we can say that Safety is a state of mind—that it is an all encompassing word that includes all of the meanings that many minds can conceive. It is the individual performing his job to the limit of his capacity and without deviation from the principles the word Safety connotates.

This concept, believed in, acted upon and carried out by each individual will guarantee the achievement of the Air Force mission at the least cost in men, money, and material. ☆

RWH

FALLOUT

PERSONAL LOCATOR BEACONS

On page 26 of the December issue of AEROSPACE SAFETY, Major William R. Detrick mentioned that USAFE had purchased SARAH for use in their area.

It might be of interest to readers of AEROSPACE SAFETY that we here in the Pacific have found that voice transmissions on 243.0 mc by aircraft in the search area jam the SARAH receiver and greatly hinder scope interpretation. The more sensitive IT&T receivers used by NASA are effected to a lesser degree and we were able to recover one pilot in August 1963. His SARAH PLB was picked up while the aircraft was still 54 miles away and at an altitude of only 9000 feet. Other aircraft using another receiver were unable to get direction indications because of jamming.

Capt Donald L. Hagerman
Hq 5AF
APO 925, San Francisco, Calif

Air Force is slated to receive 28,000 personal locator beacons. These beacons will transmit on 243 mc. . . . more reason for everyone staying off Guard except in a bona fide emergency.

MISUSE OF GUARD

After hearing transmissions on Guard channel averaging every 50 seconds apart (only one genuine, valid call) I have finally decided to write somebody.

Is it any wonder pilots will fly around with Guard turned off?

Los Angeles ARTC maintains that an airplane on a clearance in their traffic area not in radio contact with the Center is reason enough to attempt contact on Guard. I don't think so. Neither do most of the other test pilots here at the United States Air Force Production Flight Test Facility at Palmdale.

What is your opinion?

George M. Andre
Pilot — Fighter Flying
Lockheed-California Co.

Our opinion is that ***any*** *non-emergency transmission on Guard is a potential hazard to flight safety. We have been, and are continuing, to explore means of minimizing such transmissions. FAA Liaison personnel here at DTIG, Facilities people, and project officers are among those involved. We suggest you continue to watch AEROSPACE SAFETY magazine for developments. Thanks for writing; if you or any other reader has suggestions, we're most interested.*

LEARNING THE HARD WAY

I had a frightening experience a few weeks ago that I should be ashamed to talk about, but considering my attitude before it happened, it might be worthwhile to mention it to you.

(continued on page 28)

AEROSPACE SAFETY

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VOLUME TWENTY NUMBER FIVE — USAF RECURRING PUBLICATION 62-1

TESTS SHOW T-BIRD PILOTS CAN PENETRATE AND LAND WITH . . .

Last July a story about a T-33 stuck on top of a cloud deck appeared in AEROSPACE SAFETY magazine. The bird's airspeed indicator was out, the fuel situation was critical and the cloud deck extended to within 500 feet of the ground. With the help of an alert team of controllers and led by the pilot of a commercial airliner, the T-Bird pilot made a safe descent and landing.

A few days after the magazine went out the editors received a call from Mr. Francis Gebby of Lockheed Aircraft Corporation who said he knew of a method of flying the T-Bird safely without the use of an airspeed indicator. He offered to come out to Norton and tell us all about it. A few days later Mr. Gebby and Mr. Wiliam Richards came to Norton to discuss the proposal. Then a trial flight was conducted at Norton and it was decided to ask the Aerospace Research Pilot School at Edwards to run some tests. It was accepted as a special project for the Stability and Control Curriculum of the Aerospace Research Pilot School. The results of those tests follow.

The flight test program was conducted with three T-33s at the Aerospace Research Pilot School, Edwards AFB, during December 1963 and consisted of six flights totaling nine hours and 30 minutes flying time.

The aircraft were flown with two 230 gallon tip tanks installed but without travel pods. The data obtained determined a flight technique that could be used to make instrument penetrations under actual IFR conditions with the airspeed indicator inoperative.

TEST RESULTS

In order to get a good cross section of opinion the tests were conducted by six pilots, Capt G. Bertelli, Italian AF; 1/Lt H. M. Van Den Biggelaar, Royal Netherlands AF; Capt A. G. Myers, III, Capt J. F. Stroface, Capt J. A. Morrison, Maj R. S. Buker, USAF. Fuel loads were between 100 gallons and 250 gallons to simulate normal fuel for arriving at destination. Three evaluations were made. The first two assumed that the airspeed indicator only was inoperative. VOR penetrations and ILS-GCA approaches were made to minimum altitudes in these two evaluations. The pilot remained under the instrument hood at all times and the airspeed indicator was covered with a piece of cardboard. The third evaluation assumed that all pressure flight instruments (airspeed, altimeter, and rate of climb) were inoperative and instrument descents were made to an altitude of 5000 feet above the ground.

The first test consisted of making a complete letdown from holding pattern to minimum altitude. The aircraft was trimmed to "hands off" flight during this test with no reference to number of trim bursts. It was found that by using a power setting of 85 per cent and trimming to hold a constant altitude of 20,000 feet the airspeed stabilized between 190-200 knots. This is the holding pattern airspeed as outlined in TO IT-33A-1 dated 1 May 1963. During turns three per cent RPM was added to maintain airspeed. The penetration was accomplished by reducing power to 65 per cent RPM, extending the speed brakes and placing the horizontal bar of the attitude indicator on the 60-degree bank index. The aircraft was trimmed to zero forces and the airspeed stabilized between 240-250 knots.

After penetration turn, as low station altitude was approached, the procedure departed from TO IT-33A-1 in that the speed brakes were left extended and RPM was advanced to 83 per cent and not changed until minimum altitude was reached. The aircraft was trimmed to hands off flight at low station altitude and the airspeed stabilized between 175-180 knots in straight and level flight. When low station was reached gear and 30-degree flaps (60 per cent) were lowered and low station altitude was maintained until interception of the ILS glide slope. The aircraft was then trimmed to full aft position. The airspeed continued to bleed off and finally stabilized between 135-140 knots throughout the approach. Forward pressure was required on the stick to maintain the ILS glide slope. The approach was continued to ILS minimum altitude where 100 per cent power was applied, gear and flaps retracted and a rate of climb of 2000 feet per minute established. The airspeed was above 200 knots and while the climb schedule was not optimum, the aircraft was in a safe flight condition.

Six VOR-ILS penetrations were performed on the Edwards AFB VOR-ILS (Figure 1) with airspeeds falling as listed above.

Radar approaches were also performed simulating an inoperative airspeed indicator. These were performed at George AFB (Figure 2).

On GCA downwind a power setting of 73 per cent RPM held the airspeed at 175-195 knots. The time spent on downwind leg was insufficient for the airspeed to stabilize. The airspeed variation was still acceptable. The gear was extended on base leg and power increased to 75 per cent RPM. The airspeed stabilized between 135-140 knots. Final approach was conducted similar to the ILS final approach with speed brakes extended, 30 degrees (60 per cent) flaps and 83 per cent RPM. This held the airspeed between 130-135 knots. Twelve successful approaches were made to GCA minimums.

Pilot skepticism at the start of the tests and fear that approaches would be "hairy" at best faded completely during the tests. All pilots were highly satisfied by the results of the tests and felt that practice approaches simulating an inoperative airspeed indicator should be introduced into the student pilot's flying curriculum and become a part of all instrument flight checks each year. The airspeed on final approach "felt" too high. This was caused by the requirement to hold forward pressure on the stick to maintain proper position on the glide slope. Actually, the airspeed was always fairly constant from 135-140 knots. Interest was expressed for trying this technique with other type aircraft.

The second method tested consisted of using the attitude indicator and altimeter and counting trim bursts from the UP edge of the green light or neutral longitudinal trim position. The test started at 20,000 feet, cruise configuration, and 80 per cent RPM. The aircraft was trimmed to the UP edge of the green light position. From this position, the trim button was actuated

Fig 1
Edwards AFB VOR-ILS Penetration and Approach

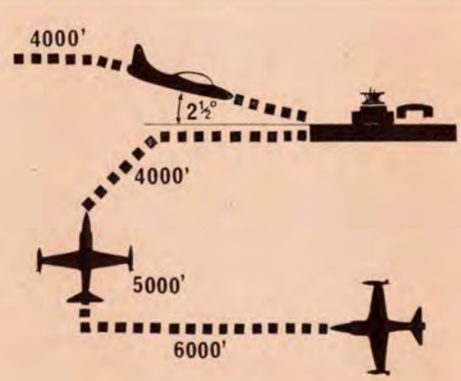


Fig 2
George AFB GCA Approach

in one-second bursts to zero stick force. This occurred after six bursts. It was noted that this was a much slower trim rate than most pilots use, so all pilots were requested to use their normal rate to trim to zero stick force. It was found that 10 normal bursts would produce the same effect as six one-second bursts. All pilots agreed very closely on the number of bursts to zero stick so that for the remainder of the tests the trim bursts were made at the normal pilot trim rate. (All future reference to trim bursts in this report will be considering normal trim rates.)

The penetration was made by reducing power to 65 per cent RPM, extending speed brakes, trimming to the green light ON and placing the horizontal bar close to the 60-degree bank index and letting the airspeed stabilize at 240-250 knots. At the completion of the penetration turn, as low station altitude was approached, the speed brakes were left extended, RPM increased to 83 per cent, and nose up trim actuated for 10 bursts. The altimeter was used to maintain level flight and the airspeed bled off to 175-180 knots. At low station gear and 30-degree (60 per cent) flaps were extended, the aircraft was trimmed to full nose up and the airspeed bled off to 140 knots. At this time the ILS glide slope was intercepted and the descent started with the airspeed fluctuating between 135 and 140 knots. The approach was terminated at ILS minimums where missed approach procedures were initiated.

Radar approaches were also accomplished using this technique. The downwind leg in the cruise configuration required 73 per cent RPM and 14 bursts to hold airspeed at 175-185 knots; base leg with gear down required 75 per cent RPM and no trim change; final approach with speed brakes extended and 30 degrees (60 per cent) flaps down required full nose up trim to hold 120 knots straight and level and 135-140 knots on the final approach glide slope.

This second method showed no advantage over the first method since the altimeter was still relied on to confirm level flight. It had the disadvantages of requiring large stick forces when trimming to the green light on condition before the actual UP operation and also having the instrument cross-check deteriorate while searching for the green light position.

The third method tested was to determine whether or not a safe descent could be made with all the pressure flight instruments inoperative. In the event the static pressure system becomes inoperative, the altimeter and rate of climb will also be inoperative. This test started under VFR conditions on top (20,000 feet) with outside reference to the horizon. The aircraft was trimmed to a constant attitude at 85 per cent RPM. The airspeed stabilized at the aforementioned 200 knots. A hooded penetration was then made by reducing the power to 65 per cent RPM, extending speed brakes and placing the horizontal bar of the attitude indicator on the 60-degree bank index. The trim was returned to the green light position and descent started. The airspeed increased to 240-250 knots and stabilized. The descent was terminated at 5000 feet above the ground simulating the VFR conditions of breaking out of an overcast. Recovery to level flight was made by retracting the speed brakes and adding power to 80 per cent RPM. The aircraft was then flown under VFR conditions using outside reference for attitude. Two successful penetrations were made using this technique.

CONCLUSIONS

1. The test results indicate that adequate control of the T-33A aircraft can be maintained with an airspeed indicator inoperative under IFR conditions.

2. The test also indicated that descents could be made from 20,000 feet to 5000 feet under instrument conditions with both the airspeed indicator and altimeter inoperative.

3. During all phases of a VOR penetration and ILS or GCA approach the deviation from optimum airspeeds can be maintained well within safe margins.

4. The technique using the attitude indicator, altimeter and zero stick forces proved better than the method of trim bursts; however, either is adequate.

5. The technique requires "blind faith" using the power settings and trim techniques outlined in this report.

RECOMMENDATIONS

1. The first method outlined in this report using the attitude indicator and altimeter be added to instrument flying as an emergency method for making an instrument approach with the airspeed indicator inoperative.

2. The third method outlined in this report be added to instrument flying for making a letdown to ceilings higher than 5000 feet above the ground with the airspeed indicator and altimeter inoperative.

3. Penetrations and low approaches with the airspeed indicator inoperative be introduced in the student pilot training program and added as a requirement to maintain instrument proficiency.

4. If these procedures are adopted, pilots use their normal trim rate to count bursts when making a letdown with no airspeed indicator.

5. Tests be conducted on other types of aircraft for evaluation as a possible emergency method for making penetrations and approaches in these aircraft. ☆

Hydroplaning...

Fun or **Disaster?**

Lt Col Earl F. McKenny, Directorate of Aerospace Safety

ALTHOUGH WATERSKIING OR AQUAPLANING has been widely accepted as a sport and fun pastime, tests by the Air Force and National Aeronautics and Space Administration have proven it to be a potential hazard to aircraft operation. It has been known for a long time that hydroplaning keeps water skiers on top, and now it has been learned that the same phenomenon can keep airplanes from making contact with the runways under certain conditions.

The NASA film, "Hazards of Tire Hydroplaning to Aircraft Operations" explains the phenomenon, how and why it happens, and how best to minimize the adverse effects. This film, serial number L-775, can be borrowed or purchased through the NASA Langley Research Center, Langley Station, Hampton, Va.

USAF, independent of the NASA studies, substantiated many of the same conditions concerning hydroplaning. The Air Force project was primarily devoted to determining causes of B-58 brake ineffectiveness on wet runways and stemmed from a series of incidents and accidents. Replacement of the smooth dimple tread tire by a rib tread tire was one outcome of the B-58 tests.

To go back to the NASA report, it was found that as tire hydroplaning increases, the friction coefficient decreases until, under total hydroplaning conditions, aircraft wheels stop rotating. Tests confirmed that braking degrades on slightly wet runways because of lubrication effects between tire and runway. The same tests disclosed that braking decreased in deep fluid or slush. In this context, deep means from ⅛ of an inch to ¼ of an inch, depending on runway surface. It is under these "deep" conditions that tire hydroplaning becomes a serious problem.

After much testing with models, the NASA Langley Research Center began full scale testing at its landing loads track test facility. Here they ran a completely

Hydroplaning... continued

instrumented test carriage with full scale gears and wheels to over 100 knots. Runway conditions from dry to a two-inch fluid depth were used. Slush depths of ½ to 2 inches were also investigated. These tests proved that partial hydroplaning occurred at the lower speeds, total hydroplaning could occur at the higher speeds, wheel rotation would stop completely. (Actual test run films show wheel rotation stopping in both the NASA and B-58 tests.)

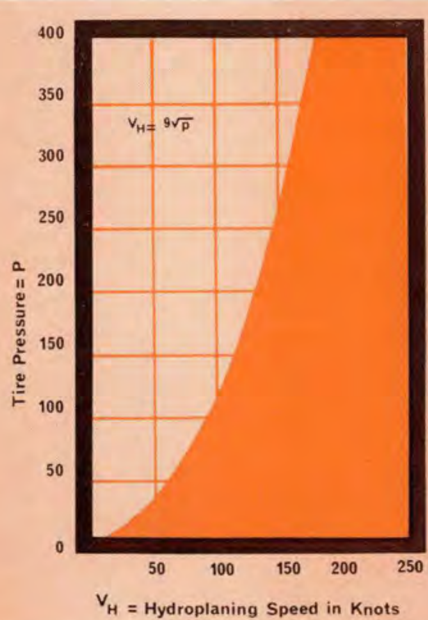
There is a fairly simplified explanation of the physical principles involved in wheel stoppage in total hydroplaning. Figure 1 shows a standing tire, with the only acting force the ground reaction caused by the weight or vertical load on the tire. On the rolling tire (Figure 2) the situation is becoming more complex as ground friction, tire deformation, and tire hysteresis enter the picture. When the tire is rolling freely at a fixed forward speed on a dry runway, a rolling resistance force acts on it in a direction opposite to the motion of the aircraft. This produces a moment on the tire in the accelerating or spin-up direction. This reaction must be opposed by an equal spin down moment which is produced by a shift of the vertical ground reaction ahead of the wheel axle centerline. In Figure 3 a deep fluid on the runway further complicates the picture. Additional drag on the tire is produced when the fluid is displaced from the tire path. Also, as the forward speed is increased (Figure 4) the spray pattern thrown up by the tire changes and the wedge of fluid penetrates the tire ground contact area producing a hydrodynamic lift force on the tire (a partial hydroplaning condition). As the forward speed continues to increase the spray pattern becomes flatter and the wedge of fluid penetrates farther into the ground contact area resulting in increased hydrodynamic lift on the tire. At some high forward speed (Figure 5) the hydrodynamic lift force becomes equal to the vertical load being supported by the tire. It is at this point that complete separation between the tire and the ground takes place and total hydroplaning occurs. Rotation stops under this condition because ground friction causing spin-up has been reduced and the predominating spin-down moment tends to stop wheel rotation. As the speed increases above total hydroplaning speed, there is further reduction in fluid drag forces as the tire rises up out of the fluid and rides along on the fluid surface.

As the hydroplaning tendency increases, aircraft directional control and braking effectiveness decrease.

In the NASA film the footprint area of a tire is shown during progressively faster runs. The wedge of fluid can be seen progressing farther into the ground contact area until, at total hydroplaning speed, there is no tire ground contact area showing. On an FAA artificial slush bed test with a Convair 880, when the aircraft entered the slush bed at 120 knots, with a crosswind of 9 knots, a yaw was induced that could not be corrected

POSSIBLE TIRE TOTAL HYDROPLANING SPEEDS

(Tire pressures based on representative takeoff gross weight servicing.)



Type Aircraft	Gross Weight	Nose Gear	Main Gear
T-33		80psi:80K	155psi:112K
T-39		75psi:78K	165psi:116K
F-100	40,000	185psi:122K	280psi:150K
F-104	24,000	199psi:128K	247psi:141K
F-105	52,000	140psi:107K	200psi:128K
F-106	40,000	140psi:107K	285psi:151K
F-4	50,000	150psi:110K	375psi:175K
KC-97	170,000	77psi:79K	182psi:121K
C-118	107,000	70psi:75K	105psi:92K
C-123	54,000	45psi:60K	65psi:73K
C-130	120,000	60psi:70K	79psi:80K
KC-135	280,000	130psi:103K	144psi:108K
B-47	180,000	180psi:121K	180psi:121K
B-52	400,000	202psi:128K	228psi:136K
B-57	55,000	146psi:109K	146psi:109K
B-58	160,000	160psi:114K	270psi:148K
U-3		30psi:49K	40psi:57K

by the pilot until exit from the slush bed. A definite loss of braking was also noticed during these tests.

Analysis of test results indicated, surprisingly, that changing the weight carried by the tires appeared to have little effect on the speed at which total hydroplaning occurred. As the weight on the tire changed, the footprint area changed but the ratio of weight-to-area remained constant. This ratio is essentially the tires' inflated pressure. The two major factors in tire hydroplaning were found to be the forward speed and the tire inflation pressure. During controlled tests with conditions of vertical loads and fluid depths remaining constant, it was found that hydroplaning occurred on a tire with a pressure of 25 pounds per square inch at about 45 knots, 50 pounds/square inch at about 63 knots, and 75 pounds/square inch at about 77 knots. This all led to development of a fairly simple formula based on classical hydrodynamic lift theory to quite accurately predict the total hydroplaning speeds. It is $V_H = 9\sqrt{p}$ where V_H = tire hydroplaning speed in knots and p = tire inflation pressure in pounds per square inch. The equation proved valid for smooth tires or for grooved tires where fluid depth exceeds tread groove depth.

Here are some practical applications. The average automobile will be susceptible to total hydroplaning at about 50 mph. The typical propeller-driven transport could encounter this condition at about 72 knots, the jet transport at about 100 knots and the jet bomber and century series aircraft at about 150 knots. These speeds are well within the normal takeoff and landing speed ranges for the respective aircraft. On page six is a list of several USAF aircraft and their tire hydroplaning speeds.

Tests have revealed that several factors affect the the hydroplaning speed of a tire. All factors, such as tire inflation pressure, runway fluid depth, runway surface character and tire tread pattern are variables that influence actual total hydroplaning speed. It should be remembered that partial hydroplaning can mean trouble and it occurs to varying degrees at speeds below that for total hydroplaning.

The adverse effects of tire hydroplaning can be minimized if certain facts are kept in mind.

- Crosswind takeoffs and landings on wet or flooded runways should be avoided.

- When landings on very wet runways must be made, use such techniques as minimum safe touchdown speed, early runway contact, early use of spoilers, wheel brakes or reverse thrust. (Use caution on use of wheel brakes or reverse thrust as directional control may become a problem.)

- Smooth or worn tires may tend to hydroplane with lesser fluid depths—with as little as 1/10 inch of water present. Ribbed tread tires may hydroplane in 2/10 to 3/10 inches of water. ☆

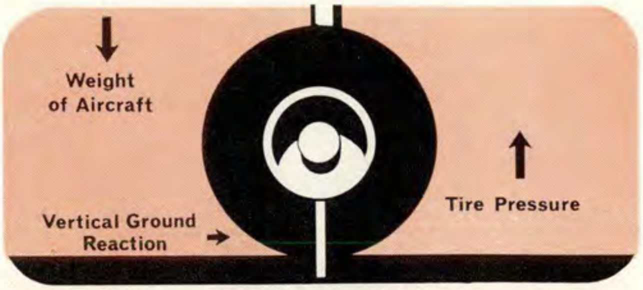


Fig. 1: Standing tire

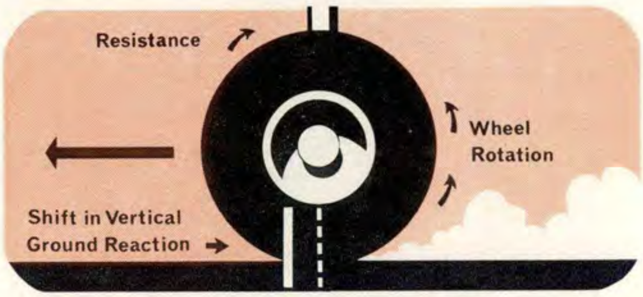


Fig. 2: Rolling tire, dry pavement

Fig. 3: Tire contact with deep fluid

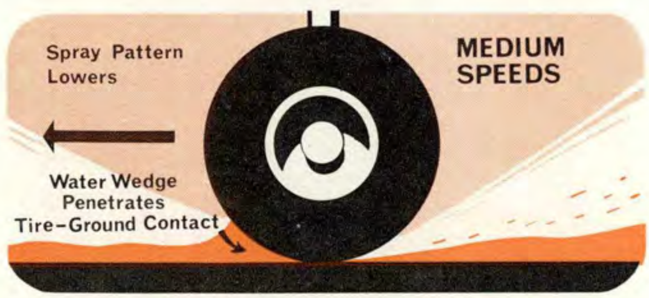


Fig. 4: Partial hydroplaning

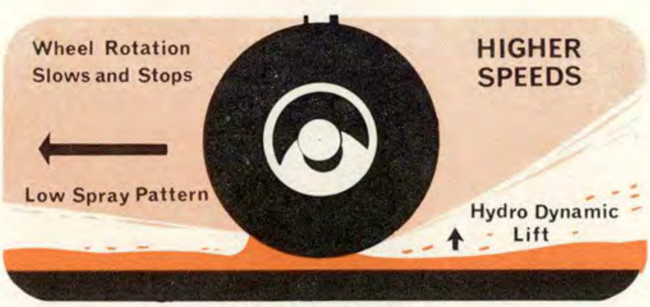


Fig. 5: Total hydroplaning

Lt Col Don H. L. Anderson, 4th Weather Wing, Scott AFB, Ill

How do you use your Weatherman?

"Never mind the lecture, Charlie, just sign the clearance—I'm in a hurry."

"But sir," replied Lt Charles, "there is a very active squall line crossing your flight path, your destination is questionable because of high, gusty surface winds, and the alternate you have indicated does not meet the requirements of 60-16!"

"Don't hand me that stuff, Charlie," said Captain Stallout, "I've got a good aircraft out there. I'll be over the top of your squall line and gusty winds won't bother me. If you insist I'll change the alternate."

The above conversation took place at Roughramp Air Force Base on a beautiful Friday afternoon in early spring. Captain Stallout was ready to take off on a ferry flight to deliver an airplane to a unit at Ellington AFB. It had taken him six full weeks to get this trip set up, numerous sessions with the Squadron Operations Officer, approximately $19.00 in long distance phone calls to "the sweetest thing in Houston," and now he was ready to go. His reservations were waiting at the Shamrock Hilton, and he was in no mood to listen to a lieutenant weather type who obviously was a confirmed pessimist and over-impressed with his duty title. Why this youngster had just graduated from school and was on his first assignment in Uncle Sammy's Air Force. How could he possibly appreciate the flying proficiency of the most senior captain in the squadron?

Lt Charles, fairly newly commissioned and a recently certified weather officer had graduated the preceding June from Texas A&M, having successfully completed the basic study course in meteorology. He looked around for his boss, Major Thermal, then remembered he was briefing the flying safety meeting on springtime flying conditions in the Southeastern U.S. "Boy, I wish this guy was attending that lecture," he said to himself.

"Well, Captain, just let me explain what is happening," Charles said, pointing to a surface weather chart.

"Now look, Lieutenant," snarled Stallout, "I can see the map and have probably looked at more weather maps in my career than you have. Just make some marks on the clearance and sign it. Nothing, but nothing, is going to keep me from making this flight—on schedule!"

"Yes, sir, Captain," said Charles, and made the necessary notations in Section D and signed the form. Stallout grabbed the clearance, signed it off, threw a copy in the general direction of the dispatch counter and tore out to his bird. He shattered all existing quick start records and was taxiing out to the active runway before the tower and Flight Control were aware of his proposed flight.

Some delay was experienced awaiting clearance, and it was because of the considerably diminished fuel load that he was able to get off the runway in a distance much shorter than computed. Climbout was uneventful. Everything was trimmed up, and Stallout was contemplating the vision a couple of hours hence at the Shamrock pool when he suddenly realized that he was not near high enough to transcend the wall of clouds ahead. Adding power, he began climbing and searching for a saddle.

Meanwhile, back at the Roughramp Weather Station, Lt Charles was reviewing the weather situation. A cold front had come booming out of the Great Plains the night before and was moving rapidly eastward. It extended from a deep low pressure cell in the vicinity of Sioux City southward into Mexico near Laredo. Along with this, a strong southeasterly flow for the past week had blanketed the entire area covered by Captain Stallout's flight path with warm, moist, unstable air. Temperature across the front was averaging about 40 degrees. The front itself was moving about 35 knots and was just now approaching the Houston area. Ahead of the front an intense squall line was now showing up at 350 miles range on the weather radar scope at Roughramp. The fact that it showed up at that distance confirmed previous radar reports that tops extended to above 65,000 feet. Although no hail had been reported by ground stations, it would be a good assumption that heavy hail would exist in some storm cells above 10,000 feet. Turbulence would also be a factor to be considered. Judging from pilot reports when the squall line was only partially developed, there should be severe with occasional areas of extreme turbulence in the squall lines.

"Well Lieutenant," said Charles, musing to himself, "there will probably be saddles between the main thunderstorm cells which won't run above 20,000 to 25,000 feet. The captain can probably maintain VFR on top by going through these saddles. I guess he'll be able to maintain clearance at 35,000 feet; however, I wonder if he'll encounter hail and turbulence in the clear air. Guess I should have insisted on briefing him. Should have said something about the winds too."

The southern jet stream was most intense just 75 to 100 miles north of Stallout's course. He should experience a 50 knot headwind for the first third of his route, and an average of 70 knots for the balance. Max winds would be about 90 knots.

At 35,000 feet, and 300 miles west, Captain Stallout, after 25 minutes of searching, found a saddle between two large anvils. As he began to penetrate, he said to himself, "That meterological neophyte back at old Roughramp air patch sure has a thing or two to learn about weather. He was trying to scare me. Smooth as glass and on top of—whoops, little rough in here. Man those are big, big build ups, they must go up to. . . ." Ping-rattle-woosh! "Hey, that's hail! What the devil, I'm in clear air! Oh-oh, the right engine doesn't sound right—like it wasn't made to be an ice crusher. Best shut her down. Zing! What the devil was that? How come it's so quiet all of a sudden? Oh-oh! Radio's gone. Now how am I supposed to get some help? Well, things ain't so bad. Ellington should be straight ahead, just beyond the next line of build ups. That must be that front the youngster was babbling about. Well, it doesn't look near as bad as what I've been through. I'll just use radio failure procedures and have her on the ground in short order. Yessir, got it made, and I'm right on schedule, even young Windy couldn't slow me up. Windy! Yessir, I'll have to remember that and christen him with a nickname when I get back. Come to think of it, didn't he say something about winds at Ellington? Can't ask anyone with no radios; guess I'd better see what he put on the clearance. Gad! I hope he was kidding! 320 at 30 knots with gusts to 45! Why didn't that clown tell me that was 30 degrees off the runway direction? Can't go back to my alternate, cause I'd have to cross that squall line again. Well, Hotrock, put her down. Aren't you the senior captain in the squadron? Sure you can do it. No sweat. Not too slow now, easy does it. Wheels down, in the green, just a bit of flaps and touch down just over the threshold lights. Steady now. Kill that drift. That's it. Now! Perfect, right on the money. Using up more runway than I thought with this wind. Oh no!"

Captain Stallout spent the rest of the day and most of the evening in discussions with the Base Commander, Operations, Maintenance and Flying Safety types. At midnight the desk clerk at the Shamrock Hilton cancelled the reservations wondering what happened to the joker that sent two telegrams and a registered letter for the reservations.

Two weeks later, the findings of the Aircraft Accident Investigation Board read, in part:

"Primary cause of the accident was the failure of the operator to properly plan his flight and to take into account weather information available to him prior to departure.

"A contributing cause was the failure of the weather officer to properly brief the pilot in accordance with Air Weather Service Regulation 55-23."

Lieutenant Charles in his testimony stated:

"My forecast was fully compatible

With the squall line and front, bilateral.

I made not a sound, kept my head in the ground,

What day does the board meet, collateral?"

Captain Stallout, when queried as to his opinion as to the findings of the board stated:

"My pilot technique though phenomenal,

Was not up to the weather, abominable.

Flight planning I skipped, the airframe I ripped,

And now I have pains, abdominal." ☆

The daughter of the maintenance technician had a cold. Her parents didn't get much sleep. Her father decided to fix his own breakfast; his wife was sleeping so soundly at 0530. He had to hunt things; finally settled for coffee, cold cereal and toast, and left the house late.

The mission was scheduled for an 0800 takeoff. He hurried his preflight.

The armament technician was on time, but had to stand around until the maintenance technician finished. He frequently rubbed his hands and stomped his feet. When he saw the coffee wagon pull in by the shops he went over. Later, he saw the maintenance technician having coffee on the other side of the wagon and asked if he were through on the plane. He was.

Fire control circuitry checked. He flipped the checklist, but performed most of the items from memory, being a little pressed for time. He had to be finished by 0730.

Lt Morgan couldn't believe it at first. He had a leak in his oxygen mask. The PE guy was out for coffee. Got to make a decision. The leak didn't seem too bad. The cockpit was pressurized. Besides, it's not often that pressurization fails. Just saw a film though—a pilot's got about seven seconds in sudden decompression to 45,000.

At briefing yesterday the Old Man had congratulated everyone—hadn't been a mission delay all month. Hate to be the first. "Nuts," Morgan said to himself. "Take it."

The armament tech held up a circled right thumb and forefinger when he saw the pilot and the maintenance tech approaching. He got out of the cockpit, ducked under the wing of 326 and began looking for 337. Had to check it next. He looked at his watch, and moved faster.

One of those days; everyone just a little behind.

The officer in Mobile Control checked his watch—0757. Again he looked at the three fighters in run-

NOTHING TO PUT YOUR

up. He punched his mike button. "Blue Leader, you say Blue Four is coming out?"

"Rog . . . Blue Four, how ya' doin'?"

"Blue Lead, Blue Four, on my way."

The fourth fighter, 326, took the turn from the ramp to the taxiway. Even in Mobile Control the sound of the jet blast was noticeable as the pilot poured on catch-up power.

Time 0759. Blue Lead released his brakes and, followed by his wing man, rolled onto the active.

An armament man ran to the side of Blue Four, worked rapidly on

FINGER ON

the right pylon, ran around to the left side, ducked under the wing, then raced away.

"Ready, Blue Four?"

The edge of the metal visor on the white hard hat in the cockpit of Blue Four glinted in the sun as Lt Morgan turned to see that armament was clear.

"Blue Four, Roger."

"Line up . . . Tower, Blue Lead, rolling."

"Roger, Blue Lead, wind zero three zero, eight knots. Cleared for takeoff."

No delay!

The mission was routine. Blue Four's missile hung fire, but that happened now and then. All that was required was a routine report and a systems checkout. A solenoid was found to be sticking. Could have had some bearing, but probably not. Besides, things like that can crop up anytime. Records check showed no discrepancies on the preflight. The solenoid was changed.

Lt Morgan left his mask with the PE man. It would be repaired or replaced by the next mission.

The maintenance tech pulled a routine post flight on 326. Nothing . . . oh, he found a plugged drain hole in the right wing. He cleaned it, using a piece of wire. A little stream of water ran out. He could take a panel off, but, no sweat. It would dry out before the next day's mission. He looked at his watch—1020. He'd better call and see how the baby was getting along. His wife would surely be up by now.

He went over to the line shack to make the call.

"Hi, Bill, how's it going?" One of the fellows who had been on two weeks leave asked the question.

He waved. "Nothin' doin', strictly routine," he replied.

"Heard your bird had a missile fail to launch."

"Yeah, happens every now and then. They'll get 'em perfected someday."

"Let's go for coffee."

"Can't, baby's got the bug, hafta call my wife."

Over in squadron operations the scheduling officer put black check marks after all the morning missions. The Board really looked good this month.

In the training section the training officer took a black grease pencil and drew a neat X in a square on the line with the name, LT MORGAN.

At 0120, Lt Rohr aborted with 374, two minutes after the backup had been called out of commission for a tire change.

Quickly—what's available? How about 326? Where's . . . oh, that's right—he left to take his daughter to the dispensary. How about the 781?

Take 326!

The switch was made in minutes. Armament hung the rockets in record time.

Close, but they made it. On time!

The afternoon report on 326 was a lot more complicated than a 781 entry and two squares filled. It was eventually made on a 711. It required two weeks and the full time effort of an accident board. Their only real clue was the statement of the pilot. Upon entering the range, and shortly after arming, the bird had pitched up and rolled hard right. Nothing Rohr had tried was effective. He'd called Lead and had tried everything Lead had suggested. And, at 10,000, following Lead's order, he had punched out.

There wasn't enough left of 326 to give the investigators a clue. They'd called in an electronics expert from the Directorate of Safety and skilled company investigators had come down. Nothing.

Lt Morgan said he'd had no discrepancies on the morning flight. He'd had a hung missile, but other than that, strictly routine. Trying to be helpful, he remembered that he'd discovered his mask was leaking slightly, but of course that hadn't affected the mission. He let them assume he had not discovered the leak prior to takeoff.

The maintenance technician couldn't add much. He remembered the moisture when he'd opened the wing drain, but didn't mention it. After all, like Lt Morgan had said, there hadn't been any control problems on the morning mission.

Armament didn't add much either. They'd hurried to make the switch in aircraft, but were confident nothing had been overlooked.

Since the accident one little difference had become a habit of the maintenance technician. He made it a rule to get up earlier—no matter what—and to leave the house on time. "Of course not," he had replied when his wife asked if they were blaming him at all because 326 had crashed. "But I'm going to be sure I have time to check every thing carefully."

Driving out to the base the morning after the investigation had been wrapped up, he kept mulling it over. Like that electronics specialist had said, "Any number of things could have caused it. Probably some small item somebody overlooked . . . nothing you could put your finger on." ☆

PITCH LOCKED OPERATION

Most flight crews of the C-130 are thoroughly familiar with all aspects of the Hamilton Standard propeller/Allison T-56 engine combination. To test this knowledge, here are two simple questions that just might win you a couple of beers at the club.

QUESTION 1: **Suppose the T-56 engine is driving the propellor in flight at 100 per cent RPM and the blade angle locks in this condition. In shutting down the engine, decoupling is experienced and blade angle does not change. If airspeed and altitude are held constant, what will happen to the RPM of the propeller?**

(a) The RPM will not change. ☐
(b) The RPM will increase. ☐
(c) The RPM will decrease. ☐

QUESTION 2: **Considering a free-wheeling propeller (decoupled in the gear box) and a fixed blade angle (locked pitch) in which of the following flight conditions will the propeller windmill at the greater RPM?**

(a) 150 KIAS at Sea Level. ☐
(b) 150 KIAS at 25,000 feet. ☐
(c) The same RPM under both conditions. ☐

Adapted from a MATS Flyer article by Jack G. Gilley, Lockheed-Georgia Company

If you selected answer (c) for question 1 and answer (b) for question 2, you are qualified to write the next article on propellers. If you selected any other answer for either question—read on!

There have been at least two incidents involving the Hamilton Standard 54H60 propeller in which serious overspeeding occurred after an attempt had been made to feather the propeller from what was apparently a pitch locked condition.

The first such occurrence was experienced during a test program on another type of aircraft which had a slightly different prop control arrangement from the C-130. Misrigging of the power lever combined with a switch failure in the pitch lock block out feature of the propeller resulted in high internal leakage and inability to pitch lock. Oscillograph records showed the normal increase in blade angle after initiation of feathering, however the feathering oil reserve was quickly depleted because of leakage. Subsequently, centrifugal twisting moment drove the blades toward the low pitch stop with an attendant decoupling and overspeed. The magnitude of the overspeed was significantly increased because of the pitch lock system being electrically disabled.

The second incident involved a C-130B which experienced a pitch lock in flight. This was the result of improper assembly of the propeller governor causing a gasket to blow in the control oil system. During flight the overspeed was not significant and the power level was retarded to maintain RPM within limits. As letdown was started at destination, RPM decayed with power reduction and a decision was made to feather. When the condition lever was placed to feather (the low oil quantity light was extinguished) things got extremely interesting as the engine decoupled and the tachometer pegged out.

In both of these instances the flight crew had been confronted with a propeller malfunction resulting in pitch lock and had experienced overspeeds of 140 per cent to 160 per cent RPM when they attempted to feather by following the existing handbook instructions. In one case the causes are well documented; however, in the case of the C-130 the exact sequence of events is not known because of the lack of recording instrumentation. Regardless, the propeller must have decreased pitch in order for the overspeed to have occurred.

Now for the answer to question number 1. It was obvious that something had happened to the pitch lock assembly which allowed down pitching of the blade angle (movement toward flat pitch). When the blade angle of a driven propeller does not change and airspeed and altitude remain constant, decoupling of the propeller will *always* result in a decrease in sustained RPM.

For example, in cruise flight at a specific gross weight and altitude, 200 knots calibrated airspeed will require 1425 HP per engine and a propeller blade angle of 53 degrees will govern the engine at 100 per cent (1021 prop rpm). At this same blade angle a windmilling, decoupled propeller will rotate at 82 per cent (840 rpm) at the same altitude and airspeed.

Study of the propeller pitch lock mechanism indicated that under certain conditions of low oil supply and/or internal leakage at RPM below the pitch settings, pressure surges could develop which would unlock the pitch lock mechanism and allow down pitch during an attempted feather. This was substantiated by dynamic tests on a whirl rig at the Hamilton Standard factory.

Other incidents besides those noted indicate that an overspeed can also occur if feathering is attempted with the propeller pitch locked and driving the engine at negative torque and on the fuel topping governor. If the propeller is incapable of driving the blade angle toward feather (no NTS) the added shaft torque resulting from shutting off the fuel can cause the propeller and engine to decouple. The pitch locked propeller will then overspeed with no change in blade angle.

With this knowledge, the changes to existing procedures were coordinated with all concerned and the Safety Supplements were issued. Essentially, continued operation of the pitch locked engine is recommended, using the engine fuel topping governor to control the RPM of the propeller maintaining a high blade angle to assure minimum drag, until a suitable landing area is reached. Then, follow Dash One "Engine Shutdown With Pitch Locked Propeller" procedure. This procedure is designed to prevent serious overspeed or excessive drag.

It was recognized that while in the cases reported the overspeed did not seriously overstress the propeller, the situation did nothing to improve the condition of the crew's nerves. Also, sustained overspeed could cause failure of the engine gear box and associated hardware. Just as serious was the drag which was created by the windmilling prop and the potential effect on range.

Now for question 2 and its relation to the WARNING note in the handbook in the paragraph on "Engine Shutdown with Pitch Locked Propeller." The reduction of airspeed to the lowest practical speed is extremely important if overspeed occurs during shutdown.

The resultant windmilling speed is almost a direct function of *true* airspeed, *not indicated*. The windmilling speed of a propeller with a 40 degree blade angle is a mere 820 rpm at sea level at an indicated air speed of 170 knots, increasing to 1220 rpm at 175 KIAS at 25,000 feet and reaching approximately 1450 rpm, or over 140 per cent at 35,000 feet and 175 KIAS. However, if a true airspeed of 175 knots is maintained at each altitude, the windmilling speed will be very close to 820 in each case.

Considering this data, it is obvious that at high altitude cruise conditions the true airspeed will normally be high enough to cause serious overspeeds if blade angle down pitch is experienced. If shutdown of a pitch locked propeller is dictated by other conditions a reduction in airspeed is certainly in order. If an overspeed does occur, immediate slow-down will reduce the overspeed. A slow descent to a lower altitude will allow continued flight at a more comfortable indicated airspeed.

For the C-130 operator the problem boils down to four distinct phases.

(1) Recognition of pitch lock when it occurs and elimination of those factors (synchronizing and synchrophasing) which may be causing the condition.

(2) Acceptance of the fact that sustained overspeeding to fuel governor setting is a good indication that the propeller control can no longer increase blade angle: therefore cannot be relied upon to feather the propeller, and may even unlock the pitch lock and allow down pitching when feathering is selected.

(3) Operation of the engine to maintain RPM above the pitch lock setting until a suitable landing area is reached. In other words, use the engine fuel governor to control the RPM of the sick prop until shutdown is dictated.

(4) When the landing area is reached, or shutdown is mandatory, follow the "Engine Shutdown With Pitch Locked Propeller" instructions in the handbook. Keep the true airspeed down during descent and, if overspeed occurs, remember that the best condition is *low and slow*.

The loss of feathering capability through malfunctions in the hydro-mechanical control system is not a peculiarity of only the Hamilton Standard 54H60 propeller. The problem is known to exist on other electro-hydromatic propellers on both turboprop and reciprocating engines. The decoupling feature of the T56 engine installation merely adds some new factors. Continued operation in pitch lock instead of immediate feathering is just one more new principle to learn and follow. ☆

Lt George E. M. Kelly, 30th Infantry, on 10 May 1911, became the first military officer to be killed while piloting a heavier-than-air craft. Unfortunately, his fate has been shared by others in the history of flight. This is the chronicle of . . .

THE FIRST ELEVEN

By Norman E. Borden, Jr., Wapping, Conn.

Fifty and more years ago, the causes of the first serious aircraft accidents experienced by the Army's new Aviation Section of the Signal Corps bore an amazing similarity to the reasons for accidents today. A careful look at the first 11 fatal crashes in Army flying shows that, though the earliest accidents were different because the airplanes were different, the circumstances which led to disaster were not. The most common factor, pilot error, was often augmented by the failure of flying personnel to understand or allow for the operational limitations and the deficiencies of the equipment they flew. Those early airplanes were often structurally weak or aerodynamically poor because they had, of necessity, been designed by the trial and error method.

To Wilbur and Orville Wright should go the credit for instituting a safety of flight program whose general principles are carried on in the USAF by the Director of Aerospace Safety today. And like many more modern flying safety measures, the first aircraft modification to make flying less dangerous was made as the direct result of a catastrophic accident. Then, as now, men learned to fly more safely because they were able to profit from the mistakes they made.

Wright Model B, rear view, at North Island, 1913

■ On 10 February 1908, the Wright brothers were awarded a contract to build and deliver the world's first military airplane—the two-seat, twin-propeller, single-engine Wright pusher-biplane which later became Army Airplane Nr 1. The machine was taken to Ft. Myer, Virginia, late in Ausust. By early September, Orville Wright was astonishing the world with public demonstration flights preliminary to the formal Army acceptance trials which were to begin on 17 September. Late in the afternoon of the 17th, Orville took off from the launching track that had been erected on the Ft. Myer drill field. As passenger, he carried a member of the Special Aeronautical Board appointed to conduct the trials, 1st Lieutenant Thomas E. Selfridge of the Field Artillery.

Orville circled the field for three or four minutes at an altitude of approximately 150 feet. His airspeed was about 40 miles an hour. On the fifth time around, part of one of the propeller blades was seen to fly away from the airplane and fall to the ground. At about the same time, Orville was heard to shut the engine down. Then he started a gliding approach to the field. While still 75 feet in the air, the airplane fell into a spin. It was completely wrecked when it crashed after less than a turn.

Structural failure was blamed for the accident. Subsequent investigation revealed that Orville Wright first heard what he believed to be a light tapping in the vicinity of the right propeller, which was the one on his side of the airplane. A crack had developed in one of the hand-carved wood propeller blades, flattening the blade and setting up a severe vibration. This, in turn, lossened one of the wires supporting a steel tube which housed the propeller shaft. The unsupported shaft permitted the rotating propeller blade to swing around and cut the stay-wire to the vertical fin and rudder on the right side of the aircraft. Orville killed the engine at the first sign of trouble, but could not prevent a spin when con-

Wreck of the Army's first Wright airplane. Orville Wright, who was piloting, survived. Passenger, Lt. Thomas E. Selfridge, was the first man in the world to be killed in a plane.

trol of the rudder was lost. In the crash, Orville's skull was fractured and his left leg broken. The 26-year-old Selfridge, who was killed instantly, became the first man in the world to lose his life in an airplane accident. Selfridge Air Force Base is named in his memory.

After Orville recovered, the airplane was rebuilt and the design modified to prevent the brace wires from ever being able to foul the propeller again. The acceptance tests were resumed at Ft. Myer in July 1909 and the recommendation of the Special Aeronautical Board that the Army airplane be accepted were approved by the Chief Signal Officer of the Army on 2 August. The machine, which was later numbered S.C. (for Signal Corps) 1, reposes today in the National Air Museum at the Smithsonian Institution.

March 1910 found America's infant air force flying from the mounted drill ground at Ft. Sam Houston, Texas. Here, the Army's only pilot then on flying duty, 1st Lieutenant Benjamin D. Foulois, and a handful of enlisted men conducted a series of flight tests and experiments with S.C. 1, all by themselves, for nearly a year. On 12 March 1910, only about a week after he had made his first solo while teaching himself to fly, Foulois was almost thrown from his seat on top of the lower wing when the ship encountered turbulent air as Foulois was coming in to land. After this narrow escape, he had the saddler of a Field Artillery battery install a leather strap on the pilot's seat to be used as a safety belt. From this moment on, Foulois saw to it that safety belts were standard equipment for all U.S. Army aircraft. But, for some unexplained reason, it was not for another three years that the U.S. Navy made the use of safety belts in airplanes mandatory. This came only after Ensign W. D. Billingsley, Naval Aviator Nr 9, fell 1600 feet to his death in the water near Annapolis when he was thrown from a Wright hydroplane on 20 June 1913.

■ Late in March 1911, Lieutenant Foulois of Ft. Sam Houston was joined by three more pilots, Lieutenants Paul W. Beck, George E. M. Kelly, and John Walker, all of whom had just been taught to fly by Glenn Curtiss at North Island, near San Diego. New aircraft had also arrived. S.C. 1 was retired on 4 May 1911 after it had been replaced by a single-seat Curtiss training biplane, S.C. 2 and a new Wright Model B, S.C. 3.

The morning of 10 May, Lieutenants Foulois, Beck, Kelly and Walker and Wright Company pilot Frank Coffyn breakfasted together at about 0500. It was their custom to fly early in the morning to take advantage of the relatively calm air at that time of day. At 0610 Kelly took off for a practice flight in the Curtiss trainer, S.C. 2. He crashed while trying to land on the mounted drill ground, 10 minutes later.

Kelly's landing was an exceptionally hard one. When the front landing wheel of the ship's tricycle gear struck the ground, the shock broke the seat supporting fork, which was a main structural member of the landing gear. The broken front ends of the fork stuck in the earth. This broke a bamboo outrigger which supported the horizontal elevator at the front of the airplane. Kelly applied power and was soon airborne again. In an effort to avoid a row of tents along the edge of the drill ground, he made a sharp turn while still very low. The weakened airplane dove straight for the ground, hitting left wing first. Kelly was thrown from his seat when his safety belt snapped. He hit the ground 20 feet away, breaking his neck. When he died a few hours afterwards, he became the first American military aviator to lose his life while piloting an aircraft. Kelly Air Force Base is named for him.

Lt. Frank M. Kennedy in the Curtiss trainer, S.C. 2, at College Park in 1911, after the aircraft had been rebuilt following Lt. Kelly's fatal crash at Ft. Sam Houston. Later, this same airplane killed Lt. Joseph D. Park in Calif. Lt. Kennedy, himself, crashed in a similar plane.

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After the crash, the knife blade-type switch under the pilot's seat that was used to short out the ignition and kill the engine was found in the open position, indicating that Kelly had not tried to shut down his engine. As a result of this accident and upon Lieutenant Beck's recommendation in a letter to Glenn Curtiss, the hand switch for stopping the engine was moved to a more convenient location and the seat supporting fork was redesigned to make it stronger.

Judged by modern standards, the early airplanes were frail little craft. Yet, for all the fun poked at them, they were surprisingly well constructed. In the factories of the Wright Company, the Curtiss Aeroplane Company and the Burgess Company and Curtis, the wings and other parts were skillfully built by woodworkers, seamstresses and metalsmiths who prided themselves on the quality of their workmanship. But, when the pioneer aircraft crashed, as they often did, they did not come to an end in a pile of twisted metal, nor did they explode into many pieces, or burn, as planes sometimes do today. Instead, they simply folded up. And when the ships were repaired or rebuilt, they were frequently put back together in accordance with the whim of some pilot or mechanic and the dictates of whatever material happened to be most readily available. Even in the factories, there was no exact standard of construction. Therefore, no two airplanes were precisely alike and each had its own individual peculiarities.

■ After Kelly's death, the Signal Corps flew for over a year without another fatality. Then, on 11 June 1912, civilian pilot A. L. Welsh of the Wright Company with Lieutenant Leighton Hazelhurst as passenger crashed during an acceptance demonstration flight of a new Wright Model C scout plane at the Army's flying school at College Park, Maryland. Both were killed instantly. During WWI, Hazelhurst Field near Mineola, Long Island, was named in memory of Lieutenant Hazelhurst.

■ Rockwell Field, for many years an Air Corps supply depot on North Island in San Diego Bay, was named for Lieutenant Lewis C. Rockwell. About three months after Welsh and Hazelhurst had been killed at College Park, Rockwell completed his pilot training at the same facility. On 28 September, he took off shortly after 1600 hours in a Wright B, S.C. 4, to take the required flight test for the rating of Military Aviator. The ship's crew chief, Corporal Frank S. Scott, went along as passenger. After circling the field a few times at about 500 feet, Rockwell descended in a glide at a reduced throttle setting until he reached about 100 feet. On approaching the hangar line, he appeared to open his throttle. The engine responded with a roar, whereupon the aircraft dove to the ground. The crash killed Corporal Scott and so seriously injured Lieutenant Rockwell that he died three hours later at Walter Reed Hospital.

Rockwell's accident can be charged to his inexperience—he did not allow for a treacherous characteristic of the early Wright biplanes. The engines of these ships were mounted just a little off center, on top of the lower wing. The pilot and passenger or student sat on the wing beside it. But the propellers were mounted at about the center of the right and left wing bays. Thus, the center of thrust of the propellers was a number of inches above the aircraft's center of gravity. When the airplane was in a glide at a near stall condition, the nose of the machine had a tendency to pitch-down sharply when full power was applied suddenly. Because the horizontal elevator was mounted relatively close behind the wings and was therefore rather ineffective at very low airspeed, the early Wright B and C airplanes, possessed a built-in booby trap for the unwary pilot, one of whom was Rockwell.

■ When winter weather late in 1912 necessitated that the school at College Park be closed, Signal Corps aviation activities were divided into two sections. One was moved to Augusta, Georgia, and the other went to the field that Glenn Curtiss was operating at North Island in California. On the afternoon of 8 April 1913, an instructor at North Island, Lieutenant Lewis H. Brereton, took a new student, Lieutenant Rex Chandler, on a training flight in a Curtiss flying boat, S.C. 15. They had been practicing takeoffs from San Diego Bay for about an hour and a half when the aircraft lost altitude during a right turn close to the water. The lower wing on the inside of the turn touched the water and the flying boat cartwheeled near the place where the Point Loma ferry was crossing the bay. The ferry boat cap-

Orville Wright demonstrated the first airplane for the Army at Ft. Myer, Va. The Plane crashed during acceptance trials.

tain saw one of the victims floating in the water and picked him up. It was Lieutenant Brereton who was badly bruised but otherwise not injured. He asked for aid for the man he said was pinned under the airplane wreckage. When the ferry reached Lieutenant Chandler, they found him dead.

■ Also at North Island, a month later on 9 May 1913, Lieutenant Joseph P. Park took off at 1720 for Ascot Park, near Los Angeles, flying the rebuilt Curtiss S.C. 2 biplane in which Lieutenant Kelly had been killed at Ft. Sam Houston. When he had covered 108 miles of the flight after two hours and 40 minutes flying, Park encountered a heavy mist and lost his bearings. He landed near a school at Olive, California, just north of Santa Ana, to orient himself. A few minutes after taking off at Olive, Park hit a tree on a hilltop with one of his wings. The aircraft crumpled into a heap of bamboo, wire and fabric, killing Lieutenant Park.

■ The next fatal accident occurred two months after this at Texas City, Texas, when Lieutenant Loren Call lost control of his ship while making a turn at 200 feet over the flying field. The Accident Investigation Board suspected some sort of structural failure of the Wright C biplane. The date was 8 July 1913.

■ At North Island, 4 September 1913, Lieutenant Moss L. Love took off early in the morning from San Diego Bay for a practice flight in a Burgess-Wright hydroplane, S.C. 18. After climbing to 2000 feet, he started a wide, gliding turn. When Love opened his throttle at 300 feet the machine nosed almost straight down. When the hydroplane hit the water in a vertical dive, Love was killed. The Accident Board found all of the hydroplane's controls intact, which led to the conclusion that Love had fallen victim to the same aircraft design characteristic which had killed Lieutenant Rockwell.

There were two more accidents before 1913 drew to a close. On 13 November, Lieutenant Perry C. Rich, flying a Wright Model C, S.C. 12, was killed in the Philippines. While flying solo, he circled the ships anchored in Manila Bay, then cut his throttle and started a glide over the water. Witnesses said that once Rich commenced his glide, he was never heard to reopen his throttle. Although the glide was normal at first, it grew steeper and steeper, finally ending as a perpendicular dive. The left wing of the aircraft hit the water first. When the engine was torn from its mount, it hit Rich on the head, causing his death. Cause: undetermined.

■ There seems but little doubt that the tricky rotational characteristic of Wright-type aircraft under certain conditions was responsible for the death in a Wright biplane of Lieutenant Eric L. Ellington, for whom Ellington Air Force Base is named, and his student, Lieutenant Hugh M. Kelly. The morning of 24 November at North Island, Ellington took off to give Kelly some practice landings. After a short flight, the aircraft was observed to be making what appeared to be a normal gliding approach for a landing. When Ellington and Kelly were still about 75 feet in the air, the engine was heard to respond to a full application of power. The aircraft then dove straight to the ground, killing both the instructor and his student.

In December 1913, the Aeronautical Division of the Signal Corps issued a statement summarizing the achievements of Army aviation up to that time. Since 1908, the War Department had purchased a total of 28 aircraft. One had been given to the Smithsonian Institution and nine had been destroyed by accidents. The remaining 18 were in the Philippines, Hawaii, Texas and San Diego. Of the 40-some men who had received flight training, ten, or approximately 25 per cent, had been killed in crashes, and a disheartening number of those who survived had requested to be relieved from aviation duty.

■ On 9 February 1914, there was another fatal accident at North Island. Earlier, on 18 December the year before, Lieutenant Henry B. Post had set a new Army altitude record when he reached 10,600 feet. On the morning of 9 Februrary, he tried to better this in a Wright C, S.C. 10. His barograph later showed that he reached 12,120 feet, setting a new American record for both military and civil aircraft. After Post had gone as high as he could, he must have decided to return and land as quickly as possible. Those watching saw him diving very fast. The right wing of his aircraft collasped in flight when he was 600 feet over the water of San Diego Bay. The airplane fell into the bay at 1040 hours. Post was dead when a civilian instructor at North Island, Francis Wildman, reached the scene of the crash in a flying boat.

The structural failure which caused the death of Post was the eighth in a series of accidents involving Curtiss and Wright-type pusher biplanes. These had started with Rockwell's accident in September 1912 and included the disastrous flights of Brereton, Park, Call, Love, Rich, Ellington, and now Post. Oscar Brindley, who had formerly been chief instructor at the Wright flying school at Dayton and was then a civilian instructor at North Island, reported that he considered all the aircraft at North Island to be in bad condition. Brindley suggested that they be rebuilt. The Accident Board which investigated Post's accident recommended on 23 February 1914 that all the Wright and Curtiss pusher biplanes at the station be condemned as they were no longer safe to fly.

It was decided to rebuild all of the older Army airplanes, including the Burgess-Wrights. But the Wright and Curtiss pushers would be flown only after they were overhauled and modified to make them safer until new equipment could be procured. This arrived late that summer in the form of the new Curtiss JN-1, forerunner of the famous JN-4 "Curtiss Jenny." By the end of 1914, 11 JN-1s had been received, these being the first relatively modern type tractor biplanes with protected cockpits and a reasonably complete set of cockpit instruments to be used by the Signal Corps. The passing of the open-seat pushers marked the end of the pioneering era of flying in the United States Army. But those who lost their lives during the 1908-early 1914 period did not die in vain, for their experiences have served through the years to help others avoid the pitfalls into which they had fallen. ☆

Airplanes and hangars at the U.S. Signal Corps flying school, College Park, Maryland, 1911.

DECLARE WAR!

Maj Clifford J. Galliot
Directorate of Aerospace Safety

"TRAFFIC ACCIDENTS can be greatly reduced. But there are no shortcuts, no quick or simple cures. Slogans, gimmicks, and drives yield no lasting benefits."

The above is a quote from the Highway Safety Action Program developed by the President's Committee for Traffic Safety. It pinpoints in a few words what the Air Force should have realized a long time ago. However, during 1963, a total of 442 Air Force military personnel lost their lives in automobile accidents. These appalling facts are proof positive that Air Force efforts in this area have not been effective; that these efforts may have been too passive and not sufficiently positive.

NEW LOOK NEEDED

The need for a new look at Air Force-wide efforts to prevent automobile accidents is clearly evident. Since the inception of ground safety in the Air Force, too much reliance has been placed on slogans, gimmicks, drives, and other such shortcuts. The "soft sell" boys have tried their way, and the results have been safety programs based mostly on safety gimmicks, persuasion, and reward. Military discipline frequently has been subjugated as an accident prevention measure, and disciplinary action considered by many as incompatible with the safety effort.

We have listened to the disciples of Heinrich, the "Father of Industrial Safety," and patterned our safety efforts along civilian/industrial lines. This concept, although successful for its intended non-military purpose, failed to take into consideration the basic Air Force safety problem: That traffic accidents are largely identified with our younger personnel.

In failing to recognize this problem, we also fail to discharge basic "parental" responsibilities for the young people in our care. Busy commanders have permitted safety technicians to preempt their safety responsibilities, and the technicians could only respond with more safety gimmicks, persuasion, and bigger trophies. Seemingly we have forgotten that we are a military organization with technical control over our personnel 24 hours a day, every day in the week.

The results have been just about what could have been expected. Safety gimmicks, persuasion, and offers of bigger awards have been successful to a degree. We have succeeded in reducing our motor vehicle accidents and resulting fatalities a part of the way. The bulk of the problem remains, and these accidents continue to take a heavy toll.

Vehicle accidents in the Air Force can be further reduced. An opinion to the contrary, based on the false premise that inherent hazards on the highways make it necessary to accept these accidents is a fallacy, pure and simple.

MILITARY APPROACH

A hard-nosed military approach to this problem is needed. It is now time to organize our vehicle accident prevention efforts along military concepts, tailored to meet military needs, and conducted by military commanders. It is now time to take the actions that can and must be taken if we are to reduce these accidents. Every individual on a base must be made to realize that failure to conform to good driving practices will not be condoned; that personnel with repeated traffic violations, or those involved in accidents, will invite the personal attention of the commander.

Obviously, the key man to take these actions is the commander. A commander can generate a great deal of interest in safe driving by making the following announcement at his next staff meeting:

"Gentlemen: At 1400 hours, Friday afternoon, two weeks hence, I will hold a meeting in the base theater. Attending this meeting will be all military personnel who have been responsible for an automobile accident or have received a citation for a moving traffic violation during the past 12 months. The Security and Law Enforcement Officer and the Ground Safety Officer will work together on this. They will screen the ground accident reports and AF Forms 1313, 'Driver Record,' and identify the personnel who will attend. Unit commanders will be given a list of the selected personnel and will personally escort their people to the meeting. No exceptions will be made unless the individual is in the hospital. On Friday afternoon, three months from the first meeting, and every three months thereafter until further notice, I will hold similar meetings. All military personnel involved in automobile accidents or receiving moving traffic citations during any intervening three-month period will attend the next meeting. Personnel required to attend more than one of these meetings will be considered repeaters and will be identified for further action. The commander of any repeaters, accompanied by the individuals concerned, will report to me at 1000 hours the Saturday morning following the meeting. The unit commander will be prepared to tell me, in the presence of each repeater, what specific action he has taken or will take in regard to the individual's poor driving performance.

. . . on traffic accidents

"The Information Officer will give maximum publicity to this program in the base newspaper. Any questions?"

POINTS FOR CONSIDERATION

We are confident that the unit commanders can take it from there. It would be presumptuous to tell them what to say at the meetings or what action to take against the repeaters. There are, however, a number of points that are offered for consideration:

- The ultimate success of this program depends on the effectiveness of the commander's actions.
- For maximum effectiveness, the program should be conducted for at least one year or as long as accidents and traffic violations make it necessary for personnel to attend the meetings.
- Firm and positive implementation of the requirements of AFR 125-14, "Motor Vehicle Traffic Supervision," is indispensable to the success of this program. The driving performance of each individual must be fully reflected on the AF Forms 1313, "Driver Record." This means that every accident, every citation, and every action that has a bearing on the individual's ability to safely operate a motor vehicle must be entered on his record.

Obviously, the man on the red-hot seat during the tenure of this program will be the unit commander. It is he who will have to take disciplinary or administrative action against the repeaters, and it is he who will have to meet the commander face to face on those fateful Saturday mornings. That is the way it should be. When the heat gets too intense—who knows? Some unit commanders may find a way to share the hot seat with first-line supervisors and other NCOs, and that's all to the good.

At this point, a couple of areas should be clarified. Nothing in the foregoing is planned to downgrade the value of our safety promotional programs. These programs have proved their value, and are a necessary part of a balanced effort. Nor should every man who has an accident be immediately drummed out of the service. Disciplinary actions should be on a selected basis and directed at the more hardened offenders. It is our belief, however, that a more positive approach to the traffic accident problem is a must if we are to reduce our fatalities. Many commanders have taken disciplinary action in support of their safety efforts and have achieved excellent results. We believe that others can.

A final thought. The usual hue and cry can be expected from some quarters that "you can't do this." These are the same people who, all along, have come up with thousands of reasons why effective action cannot be taken against flagrant traffic violators. But this is hogwash and poppycock. It takes a different kind of leadership than that to stop these accidents, and the Air Force has those leaders at every level of command. Our long and successful history has proved it.

During war and peace we have found solutions to even more perplexing problems. This is another kind of WAR. Let's win it. ☆

HOUSEKEEPING IN THE SPACE AGE

Lt Col M. E. Hollis, Directorate of Aerospace Safety

In almost every area, technology meets the basic requirements of the space age. However, housekeeping procedures have not advanced much beyond the horse and buggy age. To prove this point, all you have to do is to observe the cleaning of a HGM-16F (Atlas) silo after a major spill of hydraulic fluid, diesel fuel oil, or lubricating oil. The use of rags, soap and water or a cleaning solvent (trichlorethylene), and lots of elbow grease is the approved cleaning procedure.

In most cases, horse and buggy age housekeeping procedures were adequate until the advent of liquid-fueled ballistic missiles, such as the HGM-16F (Atlas). The Atlas F, for example, is housed in a silo during standby alert. An eight-level crib structure with grated flooring covering approximately 180 degrees of the 360-degree circumference of the silo, is located between the missile enclosure area and the silo walls. Consequently, dirt, debris, water, oil, and fuel from upper levels will fall or drain to lower levels if not promptly removed.

Diesel engines, fuel and oil tanks, and hydraulically operated equipment are located on Level 6 and above in the HGM-16F silo. LOX transfer and storage equipment are located on Levels 7 and 8. Spills and leaks of hydrocarbon fluids, if not promptly contained and removed from the silo crib structure and equipment, will penetrate lower levels and contaminate the LOX system. Hydrocarbon contamination of a LOX system can result in a catastrophe.

Everyone in the missile business today recognizes good housekeeping as an essential ingredient of accident-free operations. Unfortunately, the need for space age housekeeping procedures was not recognized until many missile systems were operational. Although this need has been recognized for some time, little or no progress has been achieved in solving the problem.

One reason for the lack of progress in the state of the art (cleaning) is that the problem seems to generate more emotion than sound, logical, scientific thought. Everyone seems to be looking for a perfect solution to the problem. They want a cleaning agent that is nontoxic, noncorrosive, LOX-compatible inexpensive, and one that requires little or no equipment and manpower. This is as it should be. However, we should not expect to achieve the ideal in one big leap forward. A more realistic approach would be to progress step by step toward our ultimate goal. This is the way we progressed from the Wright brothers' airplane to the space age!

A portable steam cleaner, for example, meets all the requirements of a perfect cleaning method with one exception—steam increases corrosion problems; consequently, some people violently oppose its use. However, present cleaning procedures (soap and water) probably cause more corrosion than does steam. The use of more effective cleaning agents is opposed because they are either toxic, corrosive, or not LOX-compatible. It should be noted that although soap is not Lox-compatible, it is used; trichlorethylene is toxic, yet it is an acceptable cleaning agent.

Someone has to look at all these arguments objectively and make a decision. In the case of the portable steam cleaner, the criteria should be: (1) Does its use increase the probability of an accident? (2) Are the added corrosive effects of steam a more serious problem than hydrocarbon contamination? If the answer to both questions is "No," it seems that this system should be adopted until a better method is found.

In proposing the use of a new cleaning agent that is toxic, corrosive, or not LOX-compatible, consider the following: (1) Does it increase the probability of an accident? (2) Is it more corrosive than accepted cleaning agents? (3) Is it more toxic than accepted cleaning agents? (4) Does it increase chances of hydrocarbon contamination of the LOX system? (It should be noted here that when a LOX-compatible cleaning agent removes, absorbs, and mixes with a hydrocarbon substance, it is at that moment *not* LOX-compatible.)

If the answers to the above questions are "NO," and the agent is a more efficient cleaner and/or requires less time and manpower, propose its use. New cleaning agents, equipment, or procedures, must in all cases be submitted to the proper agencies for testing and approval in accordance with existing directives prior to use by field activities.

The responsibility and procedures for testing and adopting new cleaning materials are clearly outlined in TO 43A1-1-1. MOAMA is charged with the responsibility for insuring that cleaning materials and processes meet the requirements of the Air Force mission. Personnel must be encouraged to be watchful for new cleaning material, equipment, and processes which will improve our ability to get the job done. Proposed new procedures and cleaning agents should then be forwarded to MOAMA, through the AMA for the particular commodity involved. Read TO 42A1-1-1 for details.

Each advance will help reduce accident potentials and assist in achieving our goal of a zero accident rate. ☆

MISSILANEA

PASA-JELL—Recently a corrosion control team was cleaning a portion of the outer skin of a Titan (LGM-25C). The procedure called for cleaning compound Pasa-Jell, Stock Nr 6850 L500507-4660, to be brushed on the surface to be cleaned, and then agitated with aluminum wool for 10 minutes. During the agitation procedure, the wool started to spark. Flame was extinguished immediately with no damage or injuries.

Local tests and tests conducted by The Martin Company, Denver, produced similar results in that Pasa-Jell is not compatible with steel wool or aluminum wool. Under laboratory conditions at Denver, steel wool, when saturated with Pasa-Jell, started to smoke and emit sparks almost immediately. It took the aluminum wool about five minutes to react.

There are four types of Pasa-Jell, namely, 101, 102, 103 and 104. Each is designed for a job on different metals. If you are to use Pasa-Jell, make certain that you are using the proper type for the equipment involved.

The Air Force Ballistics System Division is correcting technical orders concerning the proper use of Pasa-Jell. Commanders, maintenance officers and safety officers whose organizations use Pasa-Jell in conjunction with corrosion control activities should take a close look at their procedures and equipment to insure that no hazards are present due to its use. All corrosion control personnel should be briefed on the dangers involved.

Lt Col Driskill B. Horton
Directorate of Aerospace Safety

FUEL RULES—Here are some basic safety pointers that apply to RP-1, as well as other liquid fuels:

- In the event of a fuel spill, wash all affected clothing and skin surfaces thoroughly with large amounts of water. Change clothes as soon as possible and request medical assistance.
- Insure that all spills on floors, roadways or the silo cap area are promptly cleaned up. Where possible, washing with large amounts of water is the best and quickest method.
- Increase ventilation to reduce vapor concentration and provide personnel with self-contained breathing equipment during cleaning operations.
- Insure that all ignition sources, such as smoking, are not permitted where fuel vapors may be present.
- Keep all fuels and oxidizers well separated.

Maj L. G. Miller
Directorate of Aerospace Safety

FALCON LOADING—Preloading inspection had been performed on all launcher rails and all indexing feelers were pushed forward to retract the hold-back pins and umbilical plugs. In loading rail Nr 4, some binding was encountered after front launcher hooks were on the rail and beyond the indexing followers. The hooks on both sides of the rail were inspected and found to be properly engaged on the rail. The missile was then backed off the rail until launcher hooks reached the indexing feelers. Missile binding increased. The missile was moved forward approximately three inches to clear the indexing feelers so that they could be pushed forward and insure the retraction of the hold-back pin. The release knob was pulled; however, no forward movement of the indexing feelers could be obtained. The indexing feelers were raised to clear the launcher hooks and the missile was removed from the rail.

A close inspection of Nr 4 launcher rail revealed the hold-back pin was partially extended when the missile was started on the rail. The mechanism that extends or retracts the hold-back pin was binding and the indexing feelers would only go forward if struck sharply several times after the release knob was pulled.

The damaged missile fuselage had to be shipped to the depot and the Nr 4 launcher rail to the aircraft company for repair.

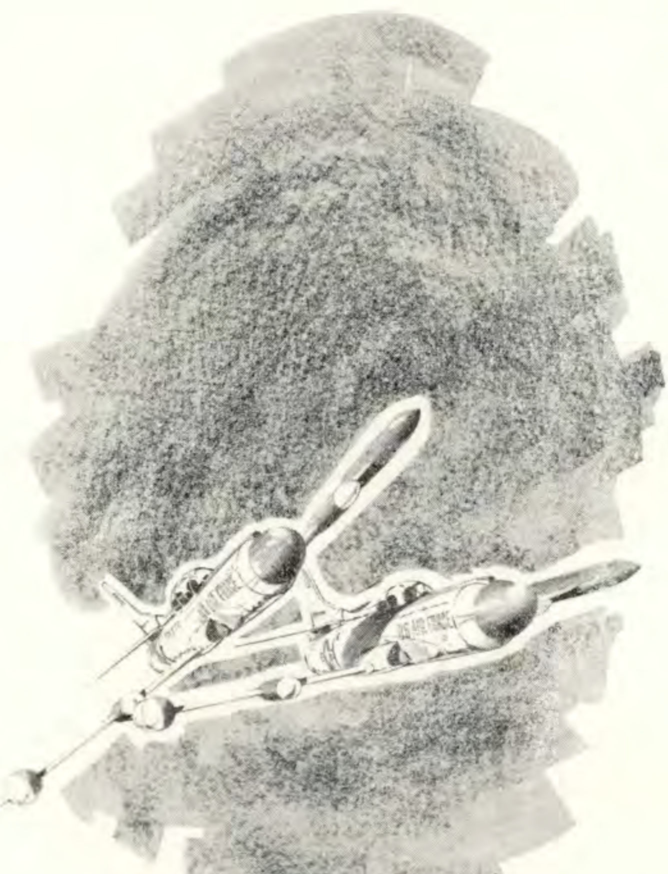
PREVENTION—Thorough preloading inspection of all launcher rails to insure that hold-back pins are fully retracted can prevent this type of missile damage. ☆

Lt Col Loren S. Tyler
Directorate of Aerospace Safety

As long as there are aircraft to fly and men to fly them there remains the frightening potential of midair collision. While all pilots share the dread of such an occurrence, the military pilot is unique in that not only must he contend with the possibility of collision with a strange aircraft, but also on occasion he flies formation with the attendant risk of colliding with a wingman.

Following are two articles written by students at the Flying Safety Officers' Course at the University of Southern California. One deals with a near miss that probably would have resulted in catastrophe had a collision occurred, the other with a collision that took place between two aircraft in formation. The authors have a number of suggestions for prevention of midair collisions. AEROSPACE SAFETY recommends careful reading of both articles.

KEEP YOUR DISTANCE



GET TUNED

Captain Russell D. Greenberg

Have you ever been involved in a midair collision? If not, may I tell you about the one I had? Perhaps my misfortune will serve as a warning to others.

You have heard the old cliche, "A midair will spoil your whole day." Believe me, it will. Only in my case it happened at the worst time—night.

Picture, if you will, an Air Defense Command alert hangar. It is early evening and everyone has just finished the evening meal. The crews are gathering around the alert commander to receive the night mission briefing. Weather, good as gold. Mission, instrument practice approach at a nearby civilian field. Flight of two—the wingman acting as observer. Radar observers, understandably, observe the scenery and everything else going on.

After the general briefing, I got together with my wingman to discuss in detail the flight we were about to make. We mutually agreed that I would lead and make two or three approaches. Then he would make the last approaches.

By the time we were preflighted it was dark. It was one of those crisp fall evenings that make flying a pleasure—even at night.

I could see my wingman was about ready for start. He was a good pilot. His RO was a good observer. They were a good crew. We were a good flight. Ignorance was bliss.

We were flying an old reliable F-94C. It was stable. It was a "goin' Jesse," one of ADC's top interceptors for that time. It was rugged. These qualities were about to be proven again.

Now for the circus, I took off first (naturally, I was the leader) and made a left turn out of traffic. My wingman was to follow and join up after takeoff. I remained at low altitude since the civilian field was only 40 miles away.

"I've lost you in the turn," the radio crackled. This surprised me somewhat so I called my heading and gave him an afterburner light. He should be able to see that.

"Do you have a Tally Ho?" I barked with a bit of impatience.

"Negative," was the reply.

I came inboard on the throttle to save fuel. If he hadn't seen six to eight feet of flame he wasn't about to find me.

"I'll make a three-sixty and pick you up in the turn," was my next action.

This I did and with great luck. I found him easily and joined up.

"Joined up," was my call.

"Roger," he replied.

After a few minutes I crossed over to the left wing and called him to let him know what I had done. He acknowledged.

I then decided it was time for me to lead again (since, after all, I was the leader) and told him to drop back and I would assume the lead. He acknowledged.

At this time we were in a right turn around the city. The field was on the other side. I began mentally figuring out the best way to get reversed on the ILS and begin my practice approaches.

I checked the wingman and he was dropping back in the normal manner. I added a little power and told my RO that I was going on the clocks.

We continued our turn for about another 90 degrees and were about to roll wings level when my RO yelled, "HEADS UP."

Instinctively I looked to my right and banked left. As I did so I saw nothing but airplane belly and rivets. The rivets were so close I could see them in minute detail. My navigation lights were lighting up his aircraft.

There was a sickening thud, bump and quiver of man and machine. We had collided.

I immediately rolled wings level and started climbing for altitude and ideas. The RO was asking a few pertinent questions like, "Will we make it?" "How does it feel?" and "Are we getting out?" I had to hand it to those brave souls in the back seat. I was too busy to answer.

I had good control despite a few missing parts on the right side and a bent wing.

My wingman was having trouble also. The collision had flipped him on his back and as I rocked my wings on the pull up I looked for him to see how he was doing. He was just rolling wings level and recovering at a much lower altitude.

"Are you OK?"

"Roger, I think so. It's yawing quite a bit but I think it's OK."

We limped back home and after much experimentation landed without too much difficulty.

Airplanes—rugged. Pilots—severely shaken. Radar observers—silent.

What had gone wrong? At the time I felt that I should have stayed in bed.

Let's back up a little and go over the facts. We had briefed the mission. But how thoroughly had we briefed? He lost sight of me on the turn out of traffic. Was it really necessary to fill all the squares in one flight? Did I really need a chase airplane?

I had called that I was joined up, crossing over, and taking the lead. All calls were acknowledged.

These are all facts brought out in the investigation. But, as the board brought out also, why were we flying around together both on the gages?

With experience comes wisdom. Looking back I believe the problem originated in communication — or rather the lack of it.

As an illustration, take either a novice pilot or a person with no experience in flying and listening to an airborne radio. Let him listen to a radio transmission or a recording of transmissions. Ask him what they said and chances are he could not understand a thing that was said in the conversation.

Now, take the same individual and let him listen to many recordings or airport tower transmissions over a period of landing or departing aircraft. Eventually he will project himself into the scene or situation so that he can tell exactly what is going on. He will "get tuned" to the situation. He will get into the act himself and even if some of the transmissions are slightly garbled, he will know what is next and be able to decipher more readily what was said.

What does this have to do with preventing a midair collision? The same way many other midair collisions could have been prevented. By getting tuned. By projecting one's self into the situation. By adapting oneself to the situation.

It takes practice and concentration. It can be attained through standardization. It can be attained through good, concise briefings. Briefings on even the most routine missions. It can be attained by knowing what's going on overall. Project yourself ahead of the mission.

All this is dependent on one main point. When you project yourself into the mission it means leaving all the abstract thoughts in the locker. Forget about the office. Forget about small problems at the bar or at home. Get Tuned.

Come down to the airplane with only one thing in mind—*FLYING.*

EYES OUTSIDE

Major W. R. Riley

A few months ago I experienced what I prefer to call a "near catastrophe." The occasion was my arrival at the Travis terminal in a C-135 with a full load of passengers. The flight had been direct from Yokota, Japan, to Travis. We approached Travis in the middle of the afternoon, with clear weather and excellent visibility.

We arrived over the Travis TVOR at 20,000 feet, under radar monitor, and were cleared for penetration. Following station passage I established a descent of 4000 feet per minute at 250 knots. The copilot, engineer and myself were cleaning up the remaining items on the descent checklist. As we passed through 14,000 feet the copilot happened to catch a startling sight out of his side window. He immediately yelled, "There's an airplane!" I looked out the window, and fear tied my stomach in knots as I simultaneously jammed the throt-

tles forward and pulled the airplane into a climbing turn, passing across the top of the other aircraft at an estimated 200-300 feet. We had been descending directly into a Constellation approaching from our three o'clock position. The Connie continued on its way without altering flight path; the pilots obviously had never seen us. After collecting our wits, we asked Travis RAPCON if they had painted the Connie on radar; they assured us they had not. Had my copilot not *happened* to glance out of his side window at that precise instant, we assuredly would have scattered 81 passengers and crew from our airplane, plus an unknown number from the Connie, across the brown California hills. And the Air Force would have had a catastrophe to investigate.

We have had two other near collisions in our squadron in recent months. Both were under conditions similar to my experience; descent in terminal areas, on IFR clearance under radar monitor, and in excellent visibility conditions. In both cases the collision was avoided because a crewmember saw the other aircraft in sufficient time to take evasive action.

Since the first occasion on which two airplanes flew in the same airspace at the same time, pilots have had the problem of avoiding other aircraft. Ernest K. Gann in his book "Fate Is The Hunter" tells how he, flying as a brand-new captain on a DC-2, missed another airplane by 50 feet on a night flight to New York. In more recent years some of our worst air disasters have resulted from midair collisions.

Three recent ones happened under conditions of good visibility. The collision of an F-100 and an airliner over Las Vegas occurred in broad daylight, as did the collision of two airliners over the Grand Canyon. The collision of a MATS C-118 and a Navy aircraft over Long Beach occurred at night. These disasters could have been avoided if, in each case, one of the pilots had seen the other aircraft in sufficient time for evasion.

The moral is obvious. Radar, although a valuable aid, has many limitations, and cannot under VFR conditions guarantee positive traffic separation. Light aircraft frequently do not appear on radar screens. Radar controllers are not required to report VFR traffic; they may do so if not otherwise occupied. Area positive control is an aid for high altitude jet traffic, but is of little comfort to lower altitude traffic and to jet traffic upon descent into the lower altitudes in terminal areas.

The only positive way to avoid other aircraft in conditions of good visibility remains, as it has since the first aircraft flew, the use of 20/20 vision. The hoary saying, "see and be seen" is of even more importance in today's increasingly crowded airspace and fast, sophisticated aircraft than it was in the day of the Curtiss Jenny. Until such time as a device for positive aircraft avoidance is manufactured, the pilot who does not maintain a good outside scan is quite likely to be a dead pilot.

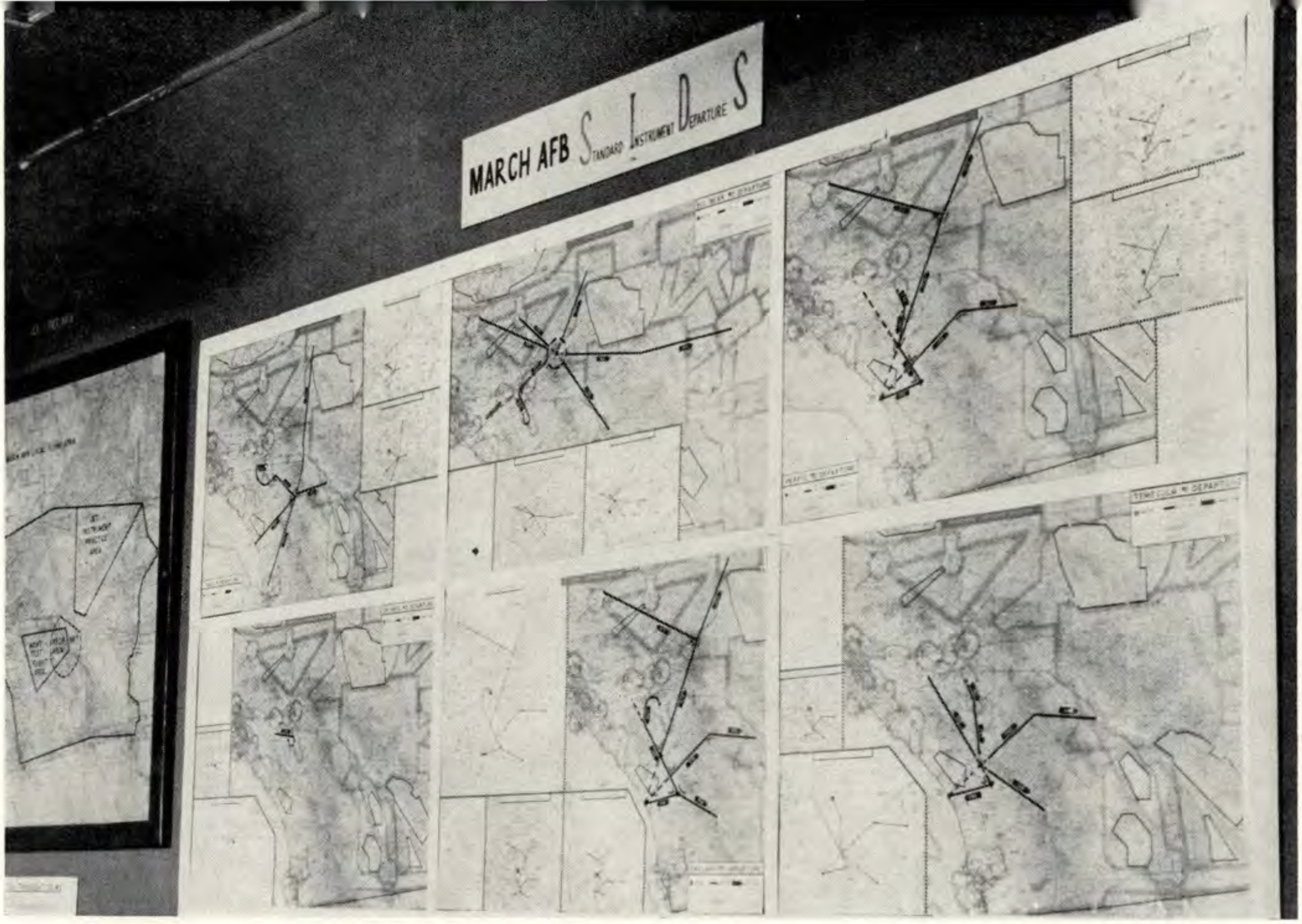
Commanders and supervisors must make every effort to allow the pilot to maintain a good outside watch. Pilots should not be required to accomplish long checklists in terminal areas. Cockpit duties during approaches and in crowded areas should be kept to the absolute minimum required to fly the aircraft. If operational necessity requires "head in the cockpit" occupation during these phases of flight, then the operational requirements should be changed. It will be much easier to do this than to attempt to explain away another military-airliner catastrophe.

Immediate steps must be taken to improve the near-collision reporting system. From my experience in talking to pilots, I estimate that three out of every four near-collisions are not reported. There are several reasons for this state of affairs, but the primary reasons are natural pilot reluctance and lack of education in the necessity for prompt and accurate reporting.

Military reporting procedures have been changed so often and disseminated so poorly that the average pilot does not know how to report a near-collision. Quick and accurate reporting is absolutely essential if the FAA and the military are going to keep abreast of hazardous or potentially hazardous airspace areas. But quick and accurate reporting will not become a fact until all pilots, civil and military, are given some sort of protection and are educated as to the necessity for reporting.

Finally, we in the safety business are responsible for teaching pilots that in order to survive they must "keep their heads out." We share the responsibility for convincing our pilots that each near-collision report may prevent a future disaster. We are responsible for continuing the fight for increased cockpit visibility in new aircraft. And we have the duty of keeping our commanders informed of hazardous traffic areas in our respective operations.

What endeavor could be more worthwhile? For midair collisions are among the most senseless of all aircraft accidents. And they are almost invariably fatal. ☆



Sid Display

AIDS PILOTS

Maj Richard K. Buckland
22 Bomb Wg, March AFB, Calif

A NEW FLIGHT PLANNING AID in the March AFB flight planning room has become the center of attention at Base Operations here, and has been the cause of numerous favorable comments from members of 15th AF Staff, Flying Safety Officers, and pilots in general, particularly transients.

The Base Operations Officer at March was constantly aware that the combination of mountainous terrain, weather conditions and high density air traffic in the March AFB area could pose a difficult and sometimes confusing problem for the transient pilot when preparing a flight plan. Almost daily, pilots were observed struggling with charts, plotters, computers, and dividers to interpret the Standard Instrument Departures (SIDs) and fit them into their flight planning. Feeling that flying safety begins with flight planning, it was decided that there was a need to provide the pilot with better and more graphic pictures of the departure routes.

Experiments were made with several different methods of presenting the SIDs before the present display was completed. To be effective, the displays had to be large enough to be easily read and interpreted at a glance, and had to depict the necessary departure information without appearing cluttered.

The final result was a 20 X 30 plate which incorporates the actual SID as published by ACIC, an area sectional chart, and en route airways charts for the appropriate altitude structures. The actual flight path of the departure route is drawn on the sectional chart so that a pilot may see at a glance the terrain features over which he will be flying and the proper relationship to radio facilities to be used. Also prominently shown is the magnetic course of each leg of the departure to be flown, and Warning and Danger Areas which he might encounter. The published SID is shown as an inset for quick reference so that the pilot can make a mental note of the comparison between his printed SID and his flight path, and also that he may better understand the reasons for specified headings, altitudes, etc., which he will fly. To further aid the planning phase of his flight, the departure route is again shown on an inset of each en route airway chart for which that departure is appropriate. This gives the pilot a quick reference for planning the airways which he may wish to use or avoid upon completing his instrument departure and transitioning into the en route portion of his flight.

There is a separate plate displayed for each of the six published SIDs. Each is prominently labeled by name and indicates whether it is a Jet, Conventional, or Jet *and* Conventional departure. They have quickly become one of the most frequently referred to planning aids, and many pilots (both base assigned and transients) have commented that they are a valuable contribution to continued flying safety at March AFB. ☆

Aerobits

FASTEN IT! When a pilot has to eject he wants everything possible going his way. As has been stated frequently on the pages of this and other publications by a number of different people, the helmet is extremely important to the pilot's survival in an ejection situation. Nevertheless, there still is an occasional death or serious injury in which failure to retain his helmet cost the pilot dearly. In a recent case, it is suspected that the pilot failed to secure his chin strap and did not lock his helmet visor prior to ejection. The helmet was found near the canopy. Damage appeared to have been caused by impact with the ground. The visor was partly down, the friction knob not tightened.

Remember, Fasten It!

SAVED BY A JIGGLE. A recent nonreportable incident, involving an ATC T-33, brings out the importance of the gear handle "jiggle" check on final. This T-33 was on a GCA monitored ILS final. Gear was placed down and three safe indications were obtained prior to glide slope. On final the GCA controller advised to check gear down and locked. The pilot reached down to "jiggle" check the gear handle and it moved very freely up and down. Each time the handle was raised slightly the gear would unlock and "barber poles" show in the selsyn indicators. The weight of the gear handle itself was just enough to produce a safe indication. The pilot went around and during investigation in flight a slight porpoise or any maneuver other than positive "G" force would unlock the gear. The button on the gear handle was stuck in the depressed position. The gear handle was held down by the navigator in the rear cockpit until the gear pins were inserted on the runway after landing. Maintenance investigation revealed that the gear handle in the front seat had been bent inboard at some time causing a binding on the gear handle button linkage. In this case the "jiggle" check revealed a condition in time to prevent an accident. The gear would most probably have collapsed on landing roll if the condition had gone undetected.

Capt Riddering, FSO,
Tyndall AFB, Fla., ATC

THE WANDERER—The sortie on which this accident occurred was scheduled to be a high altitude mission of 6+15 hours duration in an overseas area.

Approximately four hours after takeoff, the aircraft started its overwater leg with slightly over two hours expected time en route to destination. Nearly an hour later the first celestial shots were attempted. When the heavenly bodies could not be located after the computed information was set into the sextant, it was apparent that a gross navigational error existed. Several additional celestial observations were attempted without success. When the heading check on Polaris revealed about 60 degrees difference between desired and actual aircraft heading, the crew tried to get high frequency direction finding steers.

At the expiration of their proposed time en route, the crew and destination ground station were still trying to determine the plane's exact position, and a low fuel condition was declared. At this time the aircraft was nearly 600 NM north of and flying directly away from destination. During the next hour, the aircraft was positively identified and position plotted with the ground station giving true heading steers to destination, which were followed by the crew. Despite the known N-1 and Doppler equipment malfunctions, the crew continued to follow the true headings given them by the ground station, which were later displayed on the radar scope as being about 50 degrees in error. No unslaved or free running gyro procedures were used.

When approximately 170 NM out, the aircraft began a very gradual descent and two engines were shut down to conserve fuel. When approximately 130 NM out and descending through 24,000 feet, the crew shut down two more engines. At 106 NM the aircraft passed through 19,000 feet. Shortly thereafter the aircraft was leveled off at 13,000 feet approximately 85 miles out.

With engines one and four operating, the aircraft was vectored for a straight-in, long, flat final approach.

After the landing gear and flaps were lowered, the pilot added power and the aircraft rolled to the right. Number one throttle was retarded and the aircraft landed short of the runway. The gear sheared and the aircraft burst into flames as it slid across a parking ramp, damaging a parked aircraft.

The copilot stated he was inadvertently ejected from the aircraft at initial touchdown. The three remaining crewmembers exited through the canopy opening when the aircraft came to a stop.

Recommendations as a result of this accident include:

• If a pilot or navigator can see Polaris, a reasonably good guess of direction can easily be determined. If, for example, Polaris is directly ahead of the aircraft (regardless of height) and the desired track is west, it is very obvious that the aircraft heading is about 90 degrees out of phase and immediate steps must be taken. Particularly when flying over water it is a good idea to cross-check all heading changes with the standby mag compass.

• When a flight crew is unable to determine the position of the aircraft by normal navigation procedures, every available navigational system must be employed to locate the aircraft position. If there is still doubt that the aircraft is where the flight plan predicted, an emergency should be declared so that all available ground and airborne assistance can be rendered to help the crew of the lost aircraft fly to the nearest landing base.

• If the engines are shut down for any reason and a landing is to be made with less than normal power available, the final approach should be very carefully planned to insure that adequate power will be available and that no asymmetric power factors will aggrevate the problem.

Lt Col David J. Schmidt
Directorate of Aerospace Safety

MISTAKEN IDENTITY. Upon arrival over the destination fix, the T-33 was cleared for an ADF approach to a municipal airport. The aircraft broke out of all clouds at 3000 feet MSL, 1300 feet above the ground. At this point the pilot sighted an airfield he believed to be his destination and began a straight in approach—disregarding instructions contained on the letdown plate to make a 40 degree turn and track to an LF beacon. By this time he was so convinced he was right that he paid no attention to the destination tower operator when he advised, "I do not have you in sight." Without receiving clearance to land, he landed on a 3700-foot wet runway at the wrong airport. The pilot then braked his aircraft to a stop by use of speed brakes, tiptanks, flaps and belly when the gear parted company with the aircraft as it left the far end of the runway.

It has happened before and probably will again. But it won't happen to you if you:

• Study the approach to your destination and alternate (it's more likely to happen at an alternate).

• Follow the letdown instructions.

• Don't land unless you are cleared to land.

• Wake up when the tower operator says, "I don't have you in sight"; you may be the victim of . . .

MISTAKEN IDENTITY ☆

Courtesy ATC's "Approach to Safety"

FALLOUT

(continued from page 1)

The events leading up to the incident are as follows: Our crew was scheduled for a night refueling mission. The take-off time was 2020 local and the flight was to be 7:00 in duration. At 0330 on the same day, my wife quite unexpectedly went into labor and I rushed her to the local hospital. I was with her until 0900 and then returned home to arrange for a baby-sitter for our other child. This was accomplished by about 1230 and I finally got to bed at 1300 to rest for the flight. Due to the excitement earlier in the day I did not sleep very well and woke up at about 1530 with a severe headache. I got ready for the flight and arrived at base operations at about 1730 for final mission planning. The headache was still with me so I bought a small box of headache tablets at the Base Ops snack bar and downed a couple of them. They helped a little. (Perhaps at this point I should note that I think I could have had emergency leave had I not been so gung-ho for the squadron. We were, and still are, desperately short of copilots and realizing the nightmare our operations officer was having with scheduling, I did not push the subject of emergency leave when advised of the problems involved. I could have gone over his head to the CO and Wing, and probably have gotten it, but I really didn't want to.)

We launched on schedule at 2020. Things went quite well considering how hectic some missions are. All the while I was taking headache tablets to calm my aching head (I was getting a cold too) and drinking what seemed to be gallons of coffee to keep awake. My AC did all the flying that night since I was quite busy plotting ten-minute fixes for the navigator and fulfilling my other duties as chief radio operator. I was doing quite well and completely unaware of my condition until we started descent for landing. Actually I was in some kind of stupor from the headache tablets and coffee. There probably is a medical term for it but I don't know what it is. I was due a landing (after about 45 days without one) so the AC and I traded control of the aircraft and checklist.

Somehow I was able to fake my way through the whole thing and I don't think that my AC realized what sort of a near panic dilemma I was in. My cross check was super slow, we were in weather, it was very dark, and for about one minute I experienced vertigo so severely I nearly screamed in panic. This was my first experience with vertigo in nearly 1200 hours of flying but I realized it as such and the only thing that kept me from telling my AC to take the aircraft was that I absolutely stared at the attitude indicator and flew it without reference to the other instruments. The AC was busy talking to approach control and running the checklist with the engineer, but they both soon noticed the airspeed 25 knots low and falling off. They advised me of this and at about this time we broke out of the overcast. I regained control of myself but I was thoroughly frightened. (This all took place within two or three minutes after I took control of the aircraft.) It goes without saying that the approach and landing were rather erratic but *we* made it. I emphasize the fact that *we* made the approach and landing because I feel that as surely as I am sitting here tonight typing this letter, had I been flying alone that night in a fighter (I have had some small amount of experience in the T-Bird and the F-86L) I would this day be a statistic and my wife a widow. And it was all caused by a little box of headache tablets and a gross amount of personal negligence.

I consider my self a fairly good pilot and a helluva lot smarter after this incident.

Name Withheld by Request

THE INNER MAN

I was quite interested in the article "The Inner Man" by Dr. A. F. Zeller in the February issue of *Aerospace Safety*. My experience with a similar problem may help explain why such problems are not brought out.

About two years ago I was in a situation where one has two equally bad alternatives, i.e., damned if you do and damned if you don't. The pressure built up over a period of almost six months, and I noticed the effect on my performance both in and out of the cockpit. So having no intention of buying the farm, I went to the Flight Surgeon for advice. He sent me to a psychologist who duly noted I was nervous, tense, and depressed but which constituted no hazard in the cockpit. The situation eased and things got back to normal shortly thereafter. But about a year later, another Flight Surgeon saw the notation about depression on my record and got all shook up about it, couldn't clear me for flying without a waiver for my "mental condition." I was interviewed by a local head shrinker who said, "You're fine, couldn't be better." Then I had to go to Brooks for a real going-over. The psychiatrist there also agreed that there was no psychological deficiency. However, the thorough physical did find a minor deficiency that is not now a barrier to flying but in 10 or 15 years may be one (I am now 40.)

To cap it off, I was offered a regular commission this year, something I have desired, but when my physical was reviewed I was rejected because of my "mental condition" and the other deficiency.

To sum it up, my career has been detrimentally affected and I now have to get two waivers to stay on flying status. What other effects my indiscretion will have on my career I do not know. But with situations such as this, it is certainly no surprise that your friendly Flight Surgeon does not have more cooperation from his victim.

Name Withheld by Request

This letter represents one point of view. How about some others? ☆

CORRECTION

Pictures, illustrating the Aerobit "Let There Be Light" in the April issue, were inadvertently reversed. They have been reprinted below, showing what happens to a small filament shocked in the cold state (left) and in the heated state.

WELL DONE

CAPT. ROBERT L. SMITH

4781 COMBAT CREW TRAINING SQUADRON, PERRIN AFB, TEXAS

While on a student training mission on 11 September 1963, and upon turning to the base leg, Captain Robert L. Smith noticed that the main landing gear position indicator light of the TF-102A was not illuminated. Captain Smith immediately assumed control of the aircraft and executed a go around. He directed the student to recycle the landing gear and then attempted to extend the gear using the emergency gear extension, but without success. Fuel remaining was approximately 800 pounds. Captain Smith flew another closed pattern, yawing the aircraft and "pulling G," but could not obtain a down safe indication. Due to the critically low fuel state, he then elected to make an approach end BAK-9 barrier engagement. When established on final approach, Captain Smith directed the student to jettison the canopy and extend the arrest hook. Both systems operated normally. In a wings level attitude, Captain Smith flared the aircraft over the runway overrun and held the left main gear approximately one foot in the air. At 145 KIAS, and while the aircraft was still airborne, the arrest hook engaged the BAK-9 barrier. Upon engagement, the aircraft immediately contacted the runway on the left main gear, sheared the nose gear strut below the fuselage, and shortly thereafter settled on the right wing tip. The aircraft came to a halt 735 feet down the runway. Captain Smith and his student were unhurt and immediately evacuated the aircraft. Captain Smith's skill and ability as a pilot are particularly impressive due to finesse required to engage the BAK-9 barrier on the approach end of the runway at this base. An MA-1 barrier system is installed 55 feet in front of the BAK-9 barrier. The time factor dictated by the critical fuel shortage in this instance, precluded its removal prior to BAK-9 engagement. The arrest hook of Captain Smith's aircraft contacted the surface of the runway overrun 12 feet in front of the BAK-9 barrier. Through his calm judgment and outstanding display of professional airmanship, Captain Smith undoubtedly saved the Air Force a valuable aircraft and averted possible injury to himself and his student. His superior performance in the face of an emergency reflects great credit on Captain Smith, his organization, and the United States Air Force. ☆

For Meritorious Achievement in Flight Safety for the period 1 January through 31 December 1963, the units listed here have been selected to receive the Air Force Flying Safety Plaque. The stringent criteria insure that each recipient has achieved an outstanding flying safety record while maintaining mission capability.

Flight Safety Awards

AAC	• 5017 Operations Squadron, Elmendorf AFB, Alaska
ADC	• 18 Fighter Interceptor Squadron, Grand Forks AFB, North Dakota
	• 87 Fighter Interceptor Squadron, Lockbourne AFB, Ohio
	• 78 Fighter Wing, Hamilton AFB, California
ATC	• 3575 Pilot Training Wing, Vance AFB, Oklahoma
MATS	• 1502 Air Transport Wing, Hickam AFB, Hawaii
	• 1370 Photo Mapping Wing, Turner AFB, Georgia
PACAF	• 45 Tactical Reconnaissance Squadron, Misawa AB, Japan
	• 40 Fighter Interceptor Squadron, Yokota AB, Japan
	• 90 Bombardment Squadron, Yokota AB, Japan
SAC	• 100 Bombardment Wing, Pease AFB, New Hampshire
	• 416 Bombardment Wing, Griffiss AFB, New York
	• 376 Bombardment Wing, Lockbourne AFB, Ohio
TAC	• 314 Troop Carrier Wing, Sewart AFB, Tennessee
	• 27 Tactical Fighter Wing, Cannon AFB, New Mexico
	• 363 Tactical Reconnaissance Wing, Shaw AFB, South Carolina
USAFE	• 49 Tactical Fighter Wing, Spangdahlem AB, Germany
	• 10 Tactical Reconnaissance Wing, RAF Alconbury, England
	• 86 Air Division, Ramstein AB, Germany
	• 81 Tactical Fighter Wing, RAF Bentwaters, England
AFRES	• 434 Troop Carrier Wing, Bakalar AFB, Indiana
	• 452 Troop Carrier Wing, March AFB, California
ANG	• 163 Fighter Group, Ontario Intl Aprt, Ontario, California
	• 131 Tactical Fighter Group, Lambert Fld, St Louis, Missouri
	• 138 Air Transport Group, Municipal Airport, Tulsa, Oklahoma

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