AEROSPACE SAFETY

UNITED STATES AIR FORCE

MARCH 1962

FAA Slush Tests

. . . page ten

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

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Major General Perry B. Griffith
Deputy Inspector General for Safety, USAF

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Colonel Carlos J. Cochrane
Director of Flight Safety

Colonel George T. Buck
Director of Missile Safety

Colonel Charles B. Stewart
Director of Nuclear Safety

Colonel Earl S. Howarth
Director of Ground Safety

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Colonel Jerome I. Steeves
Assistant for Education and Training

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IN THIS ISSUE

FALLOUT

Flashlight Holder

For those who haven't quite figured how to use the flashlight we're required to carry, in case of complete electrical failure at night, here's a suggestion by Capt. Thomas A. Campbell of the 3345th Technical School at Chanute AFB, which may be helpful:

"Use your standard issue kneeboard. I turned mine around on my knee one night and found that with a little movement of my knee, it works fine for the left side of the panel. Both red and white lights can be used and the metal cover shields against glare out side the cockpit. We still need the flashlight for other things but with the clipboard, we don't need that third hand for night landings."

Maj Milton Stein
FSO, Tech Tng Center
Chanute AFB, Ill.

Beating The Drum

We are beating the emergency frequency drum again, and we are not alone. The following is extracted from a letter in which the writer appeals, with strong reason, for an emergency frequency for bona fiide emergencies only.

"So far I have not been in a position to speak out on Flying Safety, but the back cover of your October 1961 issue hit a personal belief of mine right between the eyes.

Eighteen years of experience in everything up to '100s with less than three engines, and four landings without engines, yet no scratches, has taught me a lot about safety and how accidents don't just happen—they're made. They are an accumulation of things, most of which could be reversed and the pending accident prevented, if the right things were done. But pilots are human, and when in trouble need help. And where do they get that help? Through the radio. But *how*, when there is no *usable* emergency frequency?

In one of those no-engine landings (T-33) I referred to, I called MAYDAY three times during sixty of the longest seconds on record but couldn't break the clutter. Fortunately, I knew the GCA frequency and broke through a practice approach transmission for a perfect deadstick. During another emergency (IFR, radio transmitter out), I was able to signal via IFF for an AF base GCA to get off guard channel and thereby permit others to receive approach for alternate field instructions. Weather at this particular base went from good VFR to zero zero fog in about 15 minutes that night.

Personally, I feel the inability to make fast, good radio contact in cases of emergency is a major cause factor of more accidents than we know. In your 'Supposed' cases in the October issue, the red light came on. Before the explosions, the red light went on on the pilot's blood pressure. A word from his brother human would probably turn off the second red light. With the second red light off, the pilot can then *think*, and probably get himself out of a *made* accident. The first law for solution of every emergency is 'keep cool.'

I drive Gooneys nowadays and frequently spend the lazy hours switching from R/T&G to G in the middle of a transmission to see who is using G unnecessarily. When I find one, I politely remind him he is on guard. But I'm small potatoes. You're big. Let's get tough. Ground those pilots. Take FAA licenses away from ground operators. If I accidentally shot a man through a knowing act, it's second degree murder. Is cluttering guard channel anything less?"

Lt Col David P. Black, USAF
345 Wisteria Drive
Dayton, Ohio

Seat Belts

May I take violent exception to one of the arguments advanced by Captain Bernard B. Keller in his letter about Seat Belts (Nov 1961 FALLOUT)? The figures he quoted as to the number of people who were killed because *they* were speeding; *they* were on the wrong side of the road; *they* failed to yield right-of-way, and so on, are emphatically in error! These were the numbers of people killed because the *driver causing the accident* was guilty of wrong-doing. His argument would be

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VOLUME EIGHTEEN NUMBER THREE — USAF RECURRING PUBLICATION 62-1

Accident by PRACTICE

Toddy 49, a SAC B-47 with four crewmen aboard, was returning to Dyess Air Force Base from a routine training mission. After six hours in the cramped cockpit, the crew was looking forward to getting back on the ground and working out some of the kinks —they didn't know what was in store for them.

The heavy overcast that blanketed the area had risen slightly and weather was reporting a 700-foot ceiling, three miles vis with fog, wind north-six, temp 37, dew point 33.

As the bomber broke through the overcast on final, an officer who seemingly had been loafing around Operations sauntered over to the ops officer and handed him a sheet of paper. It read: **"This is a simulated crash. Situation: B-47E, SN 52-466, has folded the forward main gear while turning off the runway. Both wing tanks have ruptured and there is fuel on the taxiway. There is no fire involved. This aircraft has a nuclear weapon aboard. The copilot has injured his back and is incapacitated. Take appropriate action."**

This message touched off a series of events that lasted for 48 hours.

The tower actuated the primary crash alarm at 1503.

The first fire truck arrived at the crash scene at 1505.

The first security unit was in place at 1507—several others followed at short intervals to set up a command post and perimeter guard.

A special weather observation was taken at 1505.

A simulated NOTAM closing the field was issued at 1505.

Maintenance personnel were on the scene by 1514. Right behind them were munitions specialists, the medics, a photographer and other personnel who would be necessary were this a real accident.

The exercise was complicated by a Broken Arrow, thrown in as an added bonus by the wing safety officer. For a few minutes the flight line resembled an ant hive: trucks, ambulances, official cars and fire trucks scooting into position. Meanwhile the crew of Toddy 49, realizing that they were the accident victims, even simulated, stopped the airplane and vacated in the most expeditious manner. It was at this time that the copilot—although he didn't know it—injured his back while getting out of the airplane. Within a few minutes he found himself laid out on a stretcher with a doctor making over him like a real patient. Here was his chance to get a free ride in an ambulance, complete with siren and red light.

While these events were taking place members of the Accident Investigation Board were assembling

The investigation is real, only the accident is simulated.

at Operations, where they were directed to the Command Post. By 1545 all were present.

Let's pause here a moment to discuss simulation. The practice of substituting make-believe for the real thing has become useful in many activities. Science uses it frequently to solve knotty problems; business executives are learning the fine points of management by simulation of business problems and solutions. Although they don't call it by the same name, athletes use it and many a game has been won on the practice field before the big game. The armed forces, however, were probably the first to practice simulation on a big scale. Mock battles have long prepared inexperienced troops for the rigors of actual combat.

At Dyess AFB, simulation provides the closest thing to an actual accident. It is considered an excellent device for training fire supression, rescue, medical and investigating personnel in what to do in a real emergency. To this observer, two things are obvious: (1) the seriousness with which simulated accidents are taken, and (2) the effectiveness of the training program.

The exercises are held periodically and are unannounced to increase the surprise factor. Every effort is made to insure that every person involved will react as though the accident were real. In fact, many of the people responding to the alarm do not know whether it is the real thing or another test.

One of the most valuable things the simulated accident does is test the training and proficiency of the members of the Accident Investigation Board. They are not merely assigned to the board and forgotten until an actual emergency occurs. It is the responsibility of a new member and the man he is replacing to get together for a briefing of the new man by his predecessor. Then the Flying Safety Officer goes over the Base Pre-Accident Plan with the new member. This is followed by a training film on accident investigation. Further training is provided by periodic board meetings, where changes in the base plan are discussed and recommendations for improvement are evaluated.

As soon as both the simulated accident and Broken Arrow exercise were secured, the Command Post began to fill up with personnel who had been busy directing activities on the flight line. First item was a critique of the Broken Arrow led by Col. William L. McDowell, Jr., Commander of the 96th Bomb Wing. Several items brought out in the exercise were discussed and recommendations made to improve the response in event of a real emergency.

The Accident Investigation Board then convened under direction of Col. Ralph T. Holland, wing vice-commander. First order of business was to evaluate the response at the accident scene. It was learned that certain interested agencies not included in the secondary crash circuit had not been notified. Action was taken to immediately remedy that situation. Otherwise every activity had been in place according to plan and promptly after being alerted.

After the preliminaries the investigation of the accident was begun, with 1300 on Thursday (this was Tuesday) set as the time for the meeting of the board at which reports on all phases of the simulation would be made.

When the board reconvened at the appointed time, much had been accomplished. Immediately after the initial meeting the Flying Safety Officer prepared the reports (crash, preliminary and 24-hour) which would normally be made in connection with a real accident.

Later he would report to the board that he would produce samples of the reports for future use. They would be checked periodically and kept up to date.

The aircraft records were researched and a 10 per cent inspection of the aircraft was begun by the Maintenance Group. Operations froze the personnel records and began researching them for each man aboard the airplane. The doctors examined the crewmembers' medical records, and personal equipment was evaluated for proper items and condition. The Standardization Board, meanwhile, had to completely replot and evaluate the flight.

In other words, all the activities required in an actual accident were simulated—not by assumption, but by actually doing much of the work. When the board reassembled on Thursday afternoon, the room had the atmosphere of business with no frivolity. First to report was the Operations Group.

The mission was a routine training exercise. Scheduled training requirements were inflight refueling, low altitude navigation, simulated bombing on two targets and instrument training for the copilot. The testimony was that the crew briefing was considered adequate and was attended by all crewmembers. Takeoff was made on time.

Mission planning however was considered marginal due to non-annotation of positive control airways and RBS sites on the navigator's maps, the omission of takeoff data and emergency landing data on the SAC Form 1, and several minor omissions on the maps and charts. Although the discrepancies were not considered as contributory to the accident and were administrative and of minor importance, they would be used for training all wing navigators.

Other discrepancies included names and signatures missing from various forms. While the training records of three of the crewmen were up to date, it was found that none was available for the fourth man aboard.

Various annotations, such as entry point for refueling area and orbit point for the tanker were missing. Alternate and emergency airfields were not marked. The flight plan was filed to Abilene VOR. However, Abilene VOR was out of commission and there was a NOTAM in Base Ops to that effect.

Did Operations have any recommendations? They certainly did:

- Mission planning should have closer supervision. There was a recognized need for more supervisory personnel, and the suggestion was made by the board that the 96th BW DCO study UMD authorization currently in force and request augmentation as he saw fit.
- Central Flight Planning should immediately prepare a master map properly annotated with all RBS sites, positive control airways and other mandatory annotations. The map should be prominently displayed in the Flight Planning Room. Templates should be prepared, as feasible, to assist navigators in proper annotation of maps.
- The Flight Planning Section should prepare a checklist to be used by the Flight Planning Officers for reviewing flight plans, and the list should include all major items.

The Maintenance Group reported next. While the aircraft had been picked at random, it turned out that it had just come out of ISR inspection and this was its first flight since. Nevertheless there were 22 discrepancies, 21 of them minor and one safety of flight item. The latter was a blown 12th stage air bellows on No. 2 engine. Review of the records and shakedown of the aircraft did not reveal any discrepancy or malfunction that would have contributed to the simulated accident. It was thought that the one safety of flight item may have occurred during this flight.

Here the discussion turned to the fact that the airplane had just come out of inspection. Why wouldn't it be better to use one that had a significant amount of time on it since the last ISR? Why not a plane returning from *reflex* with a recently upgraded crew? That might give everybody a real workout.

But the crew—how about them? They would be tired and in no mood for playing games. No problem. They could worry about the crew the next day, after they'd rested. So, "let's try it."

A couple of other things. All personnel should be briefed that it is incumbent upon all ground and flight crews to immediately write up any discrepancies noted on any aircraft. Also, it appeared that continued emphasis must be placed on the proper documentation of records.

Then the medics came on. While in a simulated situation such as this, it could be expected that there would be no discrepancies, some might turn up. In this case there were none. This did not, however, prevent the doctor from making a full report covering all the medical aspects normally part of an actual medical report following an accident. Physical and mental factors were reported on for each of the crewmen. Personal equipment was discussed. The person coming in a few moments late would think he was hearing an actual case report.

The clock was edging toward 1500; they'd been at it for nearly two hours now. Anything else?

The Safety Officer got up. He'd been thinking about holding the next simulation off base. What did the others think of it? It would be more difficult to stage, but it would be a good way to test the base reaction plan. And it would test the discipline and knowledge of all those involved in dealing with factors peculiar to the off-base location and away from the more easily controlled and familiar concrete of the base flight line.

The reaction was good. They would try it.

Another suggestion. Previously the exercise had been conducted with two wings, one on the other. Now, since consolidation, there was only the 96th. Wouldn't it be a good idea to have some disinterested parties attend the next simulation to judge the overall effectiveness of the Accident Investigation Board?

This led to more discussion. The idea was okay, probably a good one. However, they must be honest with their own self-evaluation. If not, if anyone tried to hide anything, then they might as well stop the exercises. Their usefulness would be gone.

Now the final question. Were the results worth the time and effort the exercise took? The answer was simple. It came quickly and unanimously. Yes! ★

★ MATS SAFETY ... *in*

To the ears of natives in Central Africa, to a handful of scientists in Antarctica, to an unloading crew along a 4000-foot, 12-degree gravel strip in Alaskan mountains, and to people living in hundreds of less adventuresome points between, a slightly off-beat, distinctive sound made by four 4360s heralds the coming of a Military Air Transport Service C-124. Somewhere above, they all know, the familiar aluminum symbol of Air Force ability to haul "anything, anywhere, anytime" is making its way into its wide pattern. This airplane will bring supplies, often critical ones, to those waiting below.

But this is not to be a story of the C-124. For the C-124 is but one aircraft, involved in but one aspect of the Military Air Transport Service mission. Every week a Navy-crewed C-121 flies the "Embassy," a trip across Southeast Asia to Dhahran and back. F-89s scramble from their no-alternate base in Iceland on practice intercepts. Helicopters and SA-16s of Air Rescue Service practice and perform life saving missions in many places. Air Weather Service WB-50s ply their lonely 18 hour vigils across desolate oceans and, in season, probe the eyes of typhoons and hurricanes. Administrative personnel keep their hand in T-Birds, U-3s, T-29s and the omnipresent Gooneys. There is more.

In fact, there is so much more in an operation of this kind that only one aspect will be considered here, and that in condensed form. Space limitations permit only a sampling of operational and safety procedures that enabled MATS to establish, for the year 1961, **a rate of only 1.08 accidents per 100,000 flying hours,** an all-time low for a major Air Force command.

When the "how" of this accomplishment is investigated, a statement in MM 55-1, the MATS transport operations "bible," sets the stage. "CALCULATED RISKS IN MATS PEACETIME OPERATIONS WILL NOT BE FOSTERED OR CONDONED. ALL ASPECTS OF THE PEACETIME MISSION WILL BE BASED ON THE CONCEPT THAT FLYING SAFETY COMES FIRST."

Following are examples of how this concept is applied in operating the strategic airlift force. Each MATS subcommand and independent unit operates under similar policies geared to its specific mission requirements.

CLEARANCES: The final decision to delay a mission may be made by either the clearing authority or the aircraft commander when either considers conditions unsafe. If an aircraft commander refuses a mission, it will not be dispatched until the conditions causing his refusal have been corrected or improved so that the mission can operate safely. Another aircraft commander will not be alerted to take the same mission under the same conditions. As such operating rules illustrate, *the judgment of a MATS aircraft commander is respected.* TCC (Transport Control Center) controllers should not clear an aircraft for departure nor should aircraft commanders take off in questionable weather, even if minimums are met . . . a requirement that serves as a reminder that safety is the consideration, not mere legality.

When a TCC controller directs an aircraft commander to divert to an alternate, he will insure that the aircraft commander is informed of the existing weather and the forecast weather for estimated time of arrival at the alternate.

Commanders are required to insure that synthetic trainer periods are used to familiarize transport pilots with complex instrument procedures in areas of congested air traffic, and for specific problems relative to routes, terminal approaches and primary and alternate landing fields.

At turnaround stations, every effort will be made to depart missions on schedule provided there is no compromise with crew rest or other flying safety factors.

AIRCREW STANDARDIZATION: All pilots complete a local standardization flight semi-annually and all flight engineer technicians an annual local standardization flight. All crewmembers, except first and second pilots, also complete a line standardization flight semi-annually. One goal of standardization flights is scheduling so that the performance of each crewmember is observed at regularly spaced intervals.

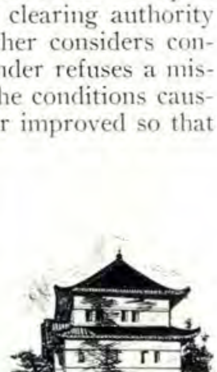
Pilots, flight engineers and flight mechanics must fly 60 hours each three consecutive months in aircraft in which currency is being maintained. Navigators must fly 60 hours each three consecutive months in transport aircraft.

INSTRUCTOR SELECTION: Here are the rules: Instructors are selected from experienced crewmembers who are thoroughly familiar with the equipment and functions of their crew positions, whose judgment and personal proficiency are of professional caliber and who have the ability to impart instruction. Flight examiners are selected from among the most qualified and competent instructors, and must be thoroughly familiar with MATS transport policies, procedures and standards. Attached personnel are not eligible for flight examiner status.

SCHEDULING: Crewmembers cannot be scheduled for flight after logging 125 hours in a single month or 330 hours during three consecutive calendar months. Operational policy directs that aircrewmembers will be scheduled so that flight time is evenly distributed among those in the same crew position.

In an effort to minimize "ramp pounding," crews will not be alerted for missions unless their aircraft are in commission or there is reasonable assurance that the ETIC is firm.

DUTY TIME: Maximum duty times are established for all aircraft and crew configurations. Normal



airlift operations

CRT FLYING

CRT pilots, or MSP (Mission Support Program) pilots as they are called (Will C. R. Terror change his name?), have posed a safety problem because of less stringent operating rules than required of line pilots. Action in the form of command regulations, has been taken to corrrect this situation. Before-flight crew rest time and crew duty times have been spelled out. For example, administrative duty hours prior to reporting for a flight are considered a part of total crew duty time. To insure proficiency training rather than "hole boring," a complete training prospectus has been provided for the mission support flyer. Even veteran Green Card holders are now bound by the requirement that takeoff minimums equal landing minimums, and in no case can they be less than 200 and one-half. Conventional engine aircraft in the mission support program must be operated in accordance with IFR on all flights outside the local area. T-33 aircraft cannot clear to a field forecasting below 300 and 1, or minimums, whichever are higher. Further, T-Birds must enter the pattern with not less than 120 gallons of fuel remaining. During VFR this means turning initial. During IFR this means low station inbound, turning base on GCA or procedure turn inbound on ILS. ★

ground time is 15 hours. The aircraft commander can request 12 hours, but only when the mission is operating behind schedule. Control center personnel are not allowed to request the crew to take less than 15 hours, nor can pressure of any nature be applied to influence the aircraft commander. Aircraft commanders will delay a mission to take crew rest whenever it is in the interest of safety. At the home station crewmembers, including administrative, are required to take crew rest beginning 12 hours before reporting to operations for a transport mission.

BRIEFING: Before departure the aircraft commander must brief his crew on duties and performance expected. The TCC duty officer will verbally brief departing crews on departure procedures, terrain obstructions and other pertinent information concerning local conditions which could affect takeoff and climb.

TAKEOFF AND LANDING CRITERIA: Takeoff may be made when weather conditions are equal to or better than published landing minimums, if the facility upon which the minimums are based is fully operational. Takeoff minimums of 100 feet and one-quarter mile (green card pilots) and 300 feet and one mile (white card pilots) are authorized, provided a suitable alternate airport is available within a 30 minute radius of the departure field. Terrain features within this radius cannot present a hazard in the event of engine failure. Existing weather at the proposed departure alternate must be equal to or above the published approach minimums and forecast to remain so for one hour after takeoff. Landing minimums are the same as AFR 60-16 except that landings cannot be made with less than 200 and one-half.

A qualified aircraft commander must make all takeoffs and landings from the left seat when passengers are carried, when hazardous cargo is carried, and under adverse flight conditions.

Before taking the runway for takeoff the aircraft commander is required to brief the crew on the procedures he intends to follow during takeoff and climb to cruising altitude, to include instructions for returning to the airport. The copilot, navigator and engineer assist and monitor. A like procedure is utilized before and during all approaches. The aircraft commander periodically announces his intentions throughout these flight regimes.

APPROACHES AND LANDINGS: Crewmem-

bers use 100 per cent oxygen for 10 minutes out of the last 45 minutes of every flight before starting an approach.

To preclude misreading altimeters, the pilot not flying calls out passing each multiple of 5000 feet down to 10,000 indicated, every 1000 feet thereafter and 100 feet above, and at minimum altitude. In aircraft so equipped, the aircraft commander must check his radar altimeter with the pressure altimeter during descent.

When GCA or ILS is available and can be operational upon arrival over destination, PAR or ILS approaches must be made for all night landings. Aircraft commanders are directed to request GCA where prior notification is required. Requests for backup frequencies are mandatory when aircraft are UHF and VHF equipped.

Under normal conditions the pilot crosses the runway threshold and lands with one hand on the throttles.

A simulated 50-foot obstacle must be cleared at the approach end of the runway on all landings except when available runway length and aircraft configuration prohibit.

Positive thrust is normally maintained during final approach and landing.

Under VFR conditions, when not under GCA control or practicing a standard instrument approach, a definite rectangular traffic pattern is flown.

COMMUNICATIONS AND CONTROL: While in flight, and regardless of location, all MATS aircraft on transport missions are required to be under surveillance of a TCC with flight progress responsibility. To provide command control of transport operations, MATS has jig sawed most of the world into coordinate-fenced areas over which a specific Transport Control Center exercises authority.

With aircraft ranging worldwide, and often out of range of U.S. Air Force aeronautical stations, thorough and explicit guidance has been provided for communications procedures.

FORMS AND REPORTS: As an organization whose crews and equipment must be capable of, and frequently subject to, diversion to international destinations, MATS has evolved considerable paperwork to guarantee that this can be accomplished with efficiency and safety. This includes:

An unsatisfactory crewmember report is required, should substandard performance be discovered on a standardization flight. The aircrewmember will not be scheduled for airlift missions until the conditions have been corrected and a written report to this effect filed. Flight plans must be filed with the corresponding DD Form 175 and all flights conducted in accordance with IFR. En route procedure (Form 115) will be issued to aircrews with the clearance or briefing kit. Aircraft commanders are required to prepare Outstanding or Unsatisfactory Reports on each crewmember whose performance of duty so warrants. Aircraft Commander's Trip Reports (Form 54) are required whenever a condition encountered is unsatisfactory, detrimental to efficient and safe operation or worthy of consideration as a procedure or standard to be adopted by other MATS organizations. Operational Hazard Reports (OHR) are required on any condition that affects or might affect the safety of aircraft or associated personnel. Fuel planning manuals have been prepared and are mandatory for mission planning. Flight Engineer Technicians on long range flights prepare aircraft performance logs which are turned in to Group Performance Engineers. Any that disclose apparent discrepancies in aircraft performance are forwarded to the appropriate maintenance agency for action.

SAFETY: As might be expected in a command where one accident can cost millions of dollars in equipment and cargo, and possibly scores of lives, safety receives special and continuing attention. Many operational procedures and limitations are based on accident-learned experience. In recent years, increased effort has been expended to adjust operational procedures and limitations on the basis of before-the-fact hazards. (You don't achieve a declining rate for nine consecutive years from accident-taught principles alone.) Indicative of such effort are safety surveys, added emphasis on hazard reporting, stringent application of 66-1 maintenace concepts to assure most effective utilization of skills, revised ground damage to aircraft reporting and a concept of accident prevention through staff management that has been instrumental in a sizeable improvement in this area.

MISSILE/NUCLEAR: Although MATS is primarily concerned with airlift only of missiles and nuclear devices, the potential loss is still astronomical. The headquarters organized a missile-nuclear branch, sends personnel to special schools, and has produced safety manuals that are recognized as models of accident-prevention guidance in this critical area. Effective? MATSmen have been able to decrease the missile-involved accident rate despite rapid growth in this phase of operations. In the missile/nuclear field MATS achieved a rate of none in '61!

THE FUTURE: How far can an accident rate be reduced? Other Air Force eyes are on MATS, the first major command to approach a rate of one. By being constantly on the lookout for *potential* hazards, then applying techniques and procedures to eliminate such hazards *before* an accident occurs, they have set a goal even lower than a rate of one—elimination of *all* preventable accidents. Indications are, if the trend of the past nine years continues, this goal will be achieved. ★

The 49th Air Force—Industry Conference, "Electronically Controlled Systems," will be held 28 Feb—2 Mar at the Riviera Hotel, Palm Springs, Calif.

SLIGHT MISCALCULATIONS

They began laying the foam strip from the end of the runway because that is the way the pilot wanted it. He circled while the foam was being spread, then began his final approach for the gear-up landing. He had long since exhausted every possible means of gear extension that the crew and specialists on the ground could suggest. The transport, most of its fuel now consumed, came down final in perfect alignment with the runway. Roundout was smoothly executed; if this had been a normal landing the gear would have rolled on near the end. But this pilot wasn't used to making gear-up landings. Ever so slowly the plane eased toward the runway while the precious foam slid rapidly underneath. Finally, 2000 feet from the end and with most of the foam now behind, the aircraft touched down in a smooth belly landing. Runout carried the plane beyond the foam blanket. Fortunately there was no fire. All passengers and crewmembers escaped uninjured. Aircraft damage was minimal for this type landing.

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The pilot of the twin engine jet had his immediate emergency under control. He had secured the failed engine and was squared away for his single engine approach and landing. Then, for some reason, he followed normal procedures rather than emergency procedures. He lowered full flaps before he had the field made. Consequently, he got too low, too slow and too far behind the power curve. The aircraft crashed. In this case it is easy to say that the aircraft crashed because full flaps were lowered before the landing was assured. It is more difficult to say *why* this was done by a qualified pilot. It is difficult to properly weigh some extenuating circumstances that may have had some bearing. He had not eaten since the night before, had not retired until after 0400 and was up at 0800; weather on the morning of the accident had been bad and caused him to be delayed; passages in the radio conversation indicated some degree of preoccupation and inattention.

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A helicopter pilot continued to fly an SH-19B after the "Low Fuel Warning" light came ON. Five to 10 minutes later, when the engine began to lose RPM, the pilot started autorotation. During or immediately preceding the flare, the fuel selector was switched from aft to forward tank. The aircraft fell through the flare and struck the ground with the tailskid, tail rotor and main gear. The engine, however, surged during the flare near the ground, and the helicopter went back into the air about 100 feet, then entered a spin. The nose was lowered in an attempt to gain airspeed but the aircraft spiraled into the ground, coming to rest on its left side. The pilot had disregarded flight handbook procedures by continuing to use fuel from the aft tank when the warning light was illuminated. As for miscalculations: This pilot miscomputed hours of fuel on board when filing his clearance, and he didn't investigate the difference in the quantity of fuel observed by visual inspection, the quantity listed in his flight orders, and that entered in the 781. Furthermore, the aircraft was not serviced with additional fuel at the en route stop.

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Touchdown was unsatisfactory, and the F-105D pilot elected to make a go-around. He initiated his go-around procedure, lifted the aircraft off, then retracted the landing gear too soon.

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Shortly after takeoff in closed traffic a T-Bird jockey initiated a simulated flameout and was unable to reach a suitable low key position. He didn't break off the maneuver. On his turn to downwind, he failed to turn a full 180 degrees, allowing the aircraft to drift farther from the runway and thereby aggravate the situation. He still continued. Although he was unable to establish a normal final approach position, apparent by an angling final turn toward the runway, he failed to add power and initiate a go-around, despite advice from the tower and his copilot. Finally, attempting to stretch his glide, the pilot allowed the aircraft to stall out and crash—miscalculations in series.

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Clearance for the transport was narrow, but the crew made it on the way in. Not so on the way out. The right wingtip struck a floodlight post with sufficient severity to clip the post off its base. Impact was not noticed by any crewmember or ground personnel. The next two floodlight posts were missed, but the fourth was clipped in the same manner as the first. This time the mishap was witnessed by the copilot and the aircraft was stopped. Wing walkers had been neither provided nor requested, and a truck that hadn't been there on the way in, had moved to the left side of the access way . . . extenuating circumstances, but no excuses. ★

COMMON

If your name were Uncle Sam you could justifiably be shaking your head and mumbling, "You tell 'em and tell 'em and what good does it do?" It must be extremely discouraging at times. You have a huge fleet of the best aircraft you can buy, a corps of mechanics and pilots that you have spared no expense to train, and still you keep losing airplanes.

Now, some of these losses you consider under "calculated risk." Some of your airplanes are new, and systems you were told would work satisfactorily have to be modified. The modifications are expensive, and sometimes the means of discovering the need for modifications is expensive. You don't like any losses; airplanes cost money, and you have humanitarian reasons too. When you lose pilots as well as aircraft you insist on better training, better ejection equipment, improved aircraft reliability. You do a lot of soul searching in this business—and you've employed a large group of safety specialists to help you—because you feel deep responsibility for the men who operate your equipment.

But there are some losses you can't seem to comprehend. This causes the head shaking and mumbling. And when you ask your safety people you find them shaking their heads and mumbling too. They give you the bit about no definite trend, the lack of a handle to grab hold of to correct the situation.

This morning the thing that has you baffled is fuel exhaustion. The pretty little twin-engine transport that crashed less than one mile short of the runway did so for one reason—out of fuel. When you went through the report you were absolutely amazed at the warped reasoning exhibited in this case. You jotted down on paper the fact that at takeoff the amount of fuel on board was shown as eight hours by the pilot. Still, after five hours and 26 minutes of flight, he refiled and, without refueling, showed that he still had four hours of fuel. How did this airplane "manufacture" the extra hour and 26 minutes worth of fuel on the five hour and 26 minute flight? It didn't, obviously, because it ran out and crashed two hours and 27 minutes later. In fact, for the manner in which it was flown, this airplane didn't even have eight hours fuel.

You lean back at this point, and find yourself saying, half aloud, "Why in the name of common sense . . .?" You stop. You have come to the same baff-

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ling wall you so often run into in losses of this kind. Why in the name of common sense?

Another thing you marvel at: the size of the report on your desk. Actually, it was all so simple. It happens in an airplane just like it does in a car—when you run out of gas the engine quits. The big difference is, there is no side of the road to coast off on when you're in an airplane.

Looks like you'll have to spell out another procedure. The briefing officer explained that it is customary to show the maximum hours of fuel on board the aircraft using long range cruise or maximum endurance power. The hours of fuel, as indicated on the 175, rarely reflect the endurance for the power settings that will actually be used. Common sense again. You'll have to put out the order that the hours of fuel on board will have to be computed and shown for power settings that are planned on.

And another thing, what about the fuel gages. They were not quite accurate. Quantity gages still showed fuel remaining in the tanks when the engines quit. This is not an unusual occurrence, you are told. You'll have to get your engineers in and find out why an accurate gage can't be provided. You have made up your mind you aren't going to hold still for the rather loose criteria, "That's good enough for Uncle Sam." You're going to tell them that any group of people who can design equipment that can exceed 4000 miles per hour and put satellites in orbit can design a simple little fuel quantity gage that is accurate.

But what about some cross checking? This airplane had fuel flow-meters, fuel consumption charts and the procedure for visually checking fuel in tanks still remains in effect. You suspect that only the indications that are most optimistic are accepted. Not much self preservation instinct displayed here. Why do they think you spend all that money to buy such things as totalizer gages, fuel flow meters, torquemeters, power charts.

You've asked that a stat run be made on the fuel exhaustion cases. Already you know that it will serve to reaffirm your determination to hit this area hard. You can recall cases where your crews have run out of fuel in everything from B-52s to U-3s.

You feel a great responsibility when you lose an aircraft, particularly when you also lose the crew. You ask yourself if you have provided them everything necessary for successful mission accomplishment. Such thoughts go through your mind now. When trouble of any kind develops all pilots are instructed to use their communications equipment to obtain whatever assistance they desire. You have even set aside emergency frequencies which hundreds of ground stations and aircraft monitor at all times. You have a widespread network of weather people who constantly watch and report meteorological conditions. You have even set up direct communications with many of these people. If a pilot falls behind flight plan, or encounters unforecast weather, or wants weather information of any kind, all he has to do is press his mike button and ask. It doesn't cost a cent. In fact, you've encouraged such calls.

And you have DF nets, radar, ILS, VORTAC, TACAN, ADF, ranges. Also, you wish pilots would ask for help. All your facilities people improve with practice. You want them utilized. If you expected the pilot to do it all, all the time, you wouldn't have gone to the expense of setting up this complex support system.

Another thing, it's not the new pilots. Particularly aggravating was the case of the two T-Bird IPs. Surely you'd think they would know that you can't stretch fuel. Still, they tried, destroyed an airplane and then demonstrated that there were serious gaps in their survival procedures. You reach over to press another button on the intercom—better get the human factors people in on this. Somehow, some way, you have to find the answer to "why experienced pilots will occasionally fly until they are out of fuel."

You push this problem aside temporarily, or rather, you try to; things like this can't be completely shunted out of the way while you grapple with other matters that need attention. Just as you are trying, the phone rings. Your safety director is on the line. Another one! Particulars aren't in yet. A *Gooney Bird*. You feel your temper slipping. These things have been around for years and years. "Set up a meeting of the staff in 30 minutes," you order. You'll need the 30 minutes, you know, to simmer down. Where are those pills that doctor left?

You are unaware that your fingers drum the table as you go over this one again. The pattern is so familiar. What you can't understand is why some of your supervisors can't take the reins and get the team straightened out again before you have to get into the picture. Is it because no one takes things seriously until the "Old Man" gets into the act?

Hell, they ought to know the pattern; it's been used enough times: Messages to everyone, down through the usual channels, emphasizing the seriousness of this hazard and the importance of vigilance by all to prevent recurrence; reiteration of proper operating procedures and restress of fuel reserve requirements; subject to be brought up at all meetings of unit personnel; posters and articles in publications media; special messages to commanders and safety directors.

What's the matter with staffs anymore? Can't anyone see the problem, jump in and get *effective* corrective action? You shake your head. Probably not. You will have to put on a display; pound the table, work the cords in your neck, get red in the fact—an image you suppose the ad boys would call it—before the real emphasis will get home to everyone and your aircrews will stop running out of gas.

You have a few minutes yet before the meeting. You lean forward, elbows on the desk, head in hands, eyes closed, and ask yourself again, "Why, in the name of common sense . . . ?" ★

HAZARDS OF SLUSH

(1) Subplaning speed (80K). Heavy bow wave from main wheels throws slush in wheel wells and around inboard flaps. Heavy slush on fuselage, wing roots, flaps and tail. (2) Hydroplaning starts (120K). Smaller bow wave and spray pattern, less slush impingement. Nosewheels hydroplaning.

Not all slush runs are the nerve relaxing post flight types amid pleasant surroundings at the clubs. In fact, some can be classified as truly nerve-wracking experiences if they occur on the slush-covered runway.

Runway-covering slush (watery snow) hasn't received a lot of attention in the past. It's generally been considered pretty harmless stuff, particularly if you cycle the gear a couple of times after takeoff to shake off what was picked up on takeoff run. So then why should you worry about slush? You shouldn't: unless you try to take off or land in the stuff, and then you've got more to worry about than you probably appreciate.

Pilots of prop-driven airplanes with their high thrust weight ratio and low takeoff speeds aren't too badly off and can, without reading further, and by using reasonable caution, enjoy an acceptable life expectancy. However, if you are, or hope to be, the jockey of a kerosene horse, you had best read on, lest your first slush takeoff be your last.

The Federal Aviation Agency, at its Atlantic City Experimental Center, recently conducted a test program under the direction of Col Aldro Lingard to define and evaluate the problems faced during takeoff of a jet transport from slush-covered runways. Task Managers C. M. Middlesworth and D. E. Sommers received valuable technical assistance in the program from NASA (Langley) Engineers W. B. Horne and R. H. Sawyer. Their test results help explain more cold weather accidents, both civil and military, than any one had expected.

The test vehicle, a four-engine jet transport with 46,600 pounds rated thrust, was operated in manufactured slush at a weight of approximately 150,000 pounds, which made it a pretty hot bird. When reading through the numbers which follow, consider how your airplane, which might be a 300,000-pound machine with about the same takeoff thrust, is going to perform.

• *BRAKING*

In slush depths of ½ inch or more, by the time the airplane was making 80 knots groundspeed, the two nosewheels and four leading main wheels had spun down to half dry runway speed. At approximately 110 knots aft main wheels were spinning down and sometimes stopped (on a free rolling wheel, airplane in takeoff configuration). If wheels slow down and stop without using the brakes, then how much good are brakes going to do if you want to stop? You're right! Above 80 knots, nearly zero. Below 80 knots, they are better—about as good as on wet ice. Fortunately, slush drag on the wheels raises total retarding force up to the extremely poor level available while braking on a very wet runway.

Figure One shows the braking coefficients with and without the beneficial effect of slush drag. Braking on the same runway dry gave coefficients above .46 at all speeds.

Related to braking is nosewheel steering which is almost equally poor. At 60 knots the lateral traction is practically zero and at 80-90 knots, when the tires are beginning to hydroplane, the only response to nosewheel steering is an insignificant Newtonian reaction to the mass of slush deflected by the side of the cocked wheels.

• *SLUSH DRAG*

Extremely high drag forces are experienced by aircraft operating on slush-covered runways at high ground speeds. The majority of this is displacement drag which occurs because the slush displaced by the wheels must be accelerated up to wheel speed. A good deal more slush is sprayed around than was located in the direct path of the tire and some of this impacts on the airplane causing additional drag (approximately 15 per cent of the total slush drag on the test airplane but varies considerably with airplane geometry).

Slush drag forces measured during the test program indicate that the slush drag curve is shaped as shown in Figure Two. The drag appears to build up as the square of the velocity to a peak (where extensive hydroplaning is noted) then drops back down when the tires are "riding high" in the slush and the spray does not impact on the airplanes. Aerodynamic drag and

OPERATIONS • I. H. Hoover, R and D Service FAA, Washington 25, D.C.

(3) Intermediate speed (135K) hydroplaning. No bow waves, small narrow spray pattern, little slush impingement, no direct tire-to-runway contact.
(4) High speed (155K) hydroplaning. Note decrease in slush pattern from No. 1 with six leading wheels in intermittent runway contact.

rolling friction are not included in the drag forces shown but would add another 10,000 pounds drag at approximately takeoff speed.

The forces measured indicate that in slush depths of two inches (slush specific gravity of .82), the test airplane would reach a terminal velocity of approximately 110 knots and never be able to take off. At 1.5 inches the length of the takeoff roll would be three times as long as the dry runway roll. A 1.25-inch slush depth would double the dry runway takeoff roll. If an engine failure were to occur above V_1 speed but below V_r speed, the airplane would be unable to take off since 3-engine terminal velocity is about V_1 speed and the airplane would immediately begin to slow down. One inch of slush would increase the takeoff roll 60 per cent and ½ inch would increase the roll almost 20 per cent.

Slush drag forces measured in the test program were nearly twice as large as those predicted by previously accepted theory.

• SLUSH DAMAGE

Slush spray impingement on light airframe structure such as fairings and flaps caused minor damage. Forward facing openings in the lower fuselage and wing-root areas, such as air conditioning plenum chamber inlets, ingest large amounts of slush at high velocity which can damage exposed systems components. Engines mounted at or near the wing roots or pod-mounted engines located near the tail can also ingest large amounts of slush causing power loss or damage. Slush also acts as a carrier for assorted runway debris.

• FREEZING SLUSH

During a mile or two of takeoff roll, slush is sprayed all over the lower fuselage, inboard wing, flaps, landing gear, tail, etc. Some of it will stick to the airplane and freeze solid. That portion which freezes before cleanup can interfere with the retraction of the gear and high lift devices. That which freezes at altitudes will interfere with their extension. The test airplane picked up large amounts of slush in only a 1000-foot test strip.

TEST AIRPLANE BRAKING IN SLUSH

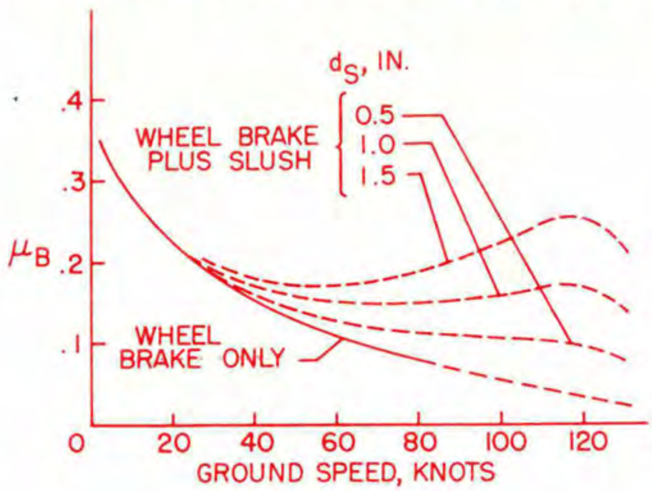
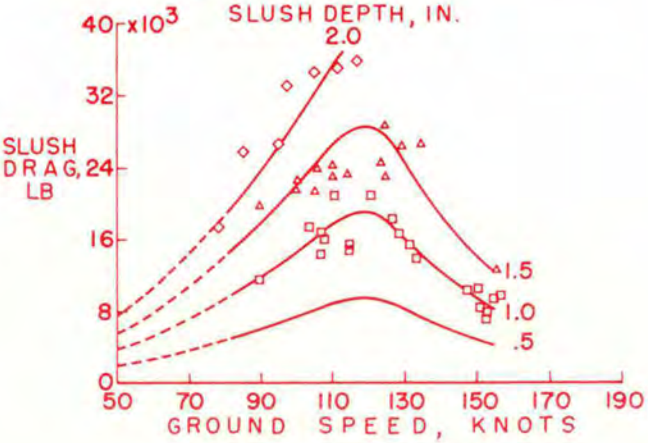


Figure One

Figure Two

AIRCRAFT RETARDATION DUE TO SLUSH

$D_S \approx \rho d V^2$, V < 110 KNOTS



HAZARDS OF SLUSH OPERATIONS

• CONTROL PROBLEMS

After one airplane has taken off or landed, a slush-covered runway is "used" and has wide "wheel track bare strips" and parallel areas on each side and between with slush deeper than before. These and "natural" variations in slush depth cause differential drag on the main gears. As previously mentioned, hydroplaning causes nosewheel steering to be of little value at high steering speeds and wheel braking is less than poor. When asymmetrical drag on the gears or crosswind cause directional problems, it is necessary to use spoilers or cut back power on one side to maintain directional control. This is a poor way to take off if runway length is critical. At higher speeds rudder effectiveness comes in and will control direction well; however, the airplane is like a sail boat without a keel and in an unfortunate spot to experience on engine failure.

On the slick runway the airplane weathercocks into the crosswind so that at 60 knots the yaw angle in degrees is equal to the crosswind component in knots. At 120 knots the yaw angle is equal to half the crosswind component.

Control problems during landing are similar but are compounded by the possibility of asymmetrical reverse thrust and slower engine response time.

During takeoff rotations in 1.2 and 1.4 inches of slush, the response of the airplane was described by Test Pilot Cyril E. Richards as "normal, although slightly sluggish," indicating that nose-down pitching moments caused by slush drag on the wheels and slush impingement on the aft fuselage were dissipated gradually at high planing speeds and during the rotation. Slush accumulating in plenum chambers and other recesses did cause a small change in CG location and increased the gross weight by a small percentage.

• SLUSH MEASUREMENT

Slush drag is linear with slush depth and density but its effect on the length of takeoff roll is highly non-linear, making it extremely important not to underestimate slush depth or density. Measurement of slush (depth and density, mass/unit area, or drag directly) is not a simple problem and is being studied by several agencies.

• SOLUTIONS

The previous discussion makes the prospects for safe operations in slush appear pretty bleak, and they are unless proper precautions are taken. Obviously, clearing the runway is the best solution and a commendable objective but there are practical limits to what can be done with runway clearing equipment and time is required for these operations. The next best solution is to suspend operations and *the commercial airlines are required to do this when slush depths exceed one-half inch;* however, operational units essential to national defense are not permitted this luxury and "when the whistle blows, you go" if there is any reasonable expectancy of becoming airborne. The accomplishment of this end requires first that the individual capabilities of each aircraft type be defined, and second, that the optimum compromise between these operational capabilities and the practical limits of snow and slush clearing equipment be reached.

Slush, by definition (watery snow), behaves like a fluid. Wet or dry snow, which packs down under the wheels, does not cause nearly as much drag so that operations in dry or wet snow can be conducted in depths significantly greater than in slush or water.

Drag, caused by fluid displacement, is not limited to winter operations since standing water is more dense, hence more critical, than slush. Tropical operators who have poorly drained runways may have more serious problems with standing water immediately after a rainstorm than their cold-weather counterparts have with slush. Water has nearly identical effects on airplane performance and control as slush with the exception of quick freezing. Actually, hydroplaning with its resultant loss of braking and nose gear steering occurs at a slightly lower speed with standing water than with slush because of water's higher density.

The break (after the peak) in the slush drag curve in Figure Two shows that slush drag drops at high speed when you get the big bird "on the step." This suggests that hydroplaning could be of benefit if it could be induced early; however, ground control dictates that every attempt be made to keep the wheels firmly on the ground throughout the complete takeoff and landing roll, even at the cost of the additional drag. Prudence requires that the beneficial effects of hydroplaning not be considered when calculating takeoff length but that the control problems which result both on takeoff and landing be considered. (Hydroplaning speed varies with gross weight, tire width, pressure, tread pattern, fluid density and depth.)

• CONCLUSIONS

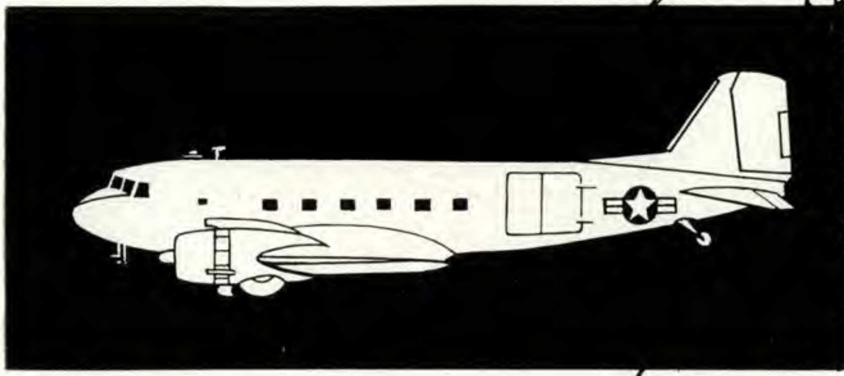
The conclusions of FAA and NASA engineers participating in the program were in complete agreement with those of the pilots operating the test airplane.

• Slush impingement and ingestion can be serious problems depending on airplane geometry.

• High speed braking is almost nonexistent and can increase "accelerate-stop" and landing distances to impracticable values.

• Aircraft performance suffers to such a degree from slush drag forces as to make takeoffs in deep slush impossible.

• If you must operate in slush or standing water, know your aircraft's capabilities and the runway condition accurately. ★



WELL · DONE

MAJOR

Wickliff H. Horne

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TECH TNG CENTER, KEESLER AFB

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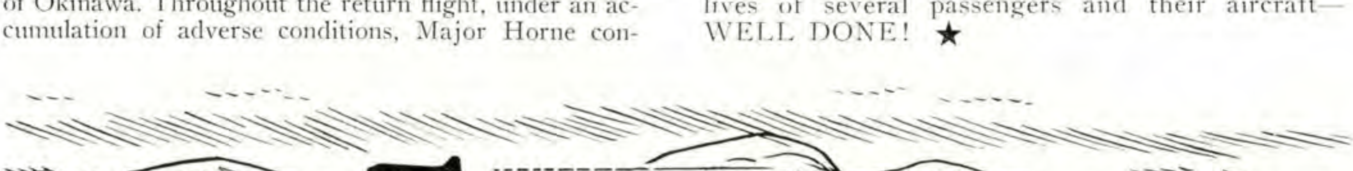
Major Wickliff H. Horne displayed professional leadership during a night inflight emergency near Okinawa. As aircraft commander of a C-47, his mission was to transport passengers and cargo from Naha Air Base to Tachikawa. (Major Horne has since been assigned to the Technical Training Center at Keesler AFB.)

At 1835I, while cruising at 9000 feet, approximately 266 NM northwest of Naha along Airway Green 8, the C-47's No. 2 engine failed with an internal explosion and disintegration. Major Horne's initiative and his ability to quickly and accurately direct emergency procedures undoubtedly accounted for the safe return of his aircraft to Okinawa. Not only was this single-engine, return flight conducted at night, most of it was made under actual instrument conditions, including icing. During periods of icing, the No. 1 engine lost partial power, creating an even more serious situation. The aircraft continued to lose altitude, and level flight could not be maintained until it had descended to 1600 feet, which is well below the peaks and hills of small islands along the route and on the northern area of Okinawa. Throughout the return flight, under an accumulation of adverse conditions, Major Horne continued to display exceptional ability in his application of proper ice elimination and prevention procedures, clear and concise communications techniques with his crew, and constant monitoring of all crew positions.

The C-47 experienced more difficulty during descent through 750 feet on GCA final about one mile from point of touchdown. A safe gear-down indication could not be obtained—another period of extreme anxiety. Here again, Major Horne distinguished himself by calmly and explicitly directing procedures which resulted in a positive gear safe indication, followed by a safe landing of his aircraft.

Inspection revealed that had the inoperative engine not been feathered immediately, such action would have been impossible within seconds because of numerous holes, points of separation and internal failure.

To Major Horne and his crew—who, by their actions during an inflight emergency, saved the lives of several passengers and their aircraft—WELL DONE! ★



FOAMING THE

The use of foam on the runway for emergency landings has become a fairly common occurrence. Yet there remains a number of questions regarding the use of foam and queries continue to be made to DIG/Safety.

Edwards Air Force Base probably has more experience with foam landings than any other Air Force installation, since it not only handles its own emergencies but also is used by other Air Force and civilian pilots in trouble. Therefore, we went to Edwards and asked a number of questions of Mr. Howard P. Crews, base fire chief. These questions and his answers, based on a dozen foamings at Edwards, are presented as follows.

Q—Why do you use foam in an emergency? Is it for fire suppression or better directional control?

A—We use it (foam) for two reasons. Primarily it's for fire. You can actually see sparks and fire if the foam is thin and watch it go out as the aircraft moves into heavy foam.

Q—We've heard that a foamed runway has a favorable psychological effect on the pilot making an emergency landing. Is it true?

A—Yes; we use it for that reason too. The pilot knows that something is being done for his safety down on the ground. Incidentally, we have noted that a pilot is most likely to call for foam if he has seen a foam landing.

Q—Now we'd like to discuss

RUNWAY

under what conditions you would use foam. What if the temperature is below freezing?

A—Depending on the circumstances, I would use foam then. Even on ice it would have some fire suppression ability. Of course you would want to get the airplane down immediately after laying the foam.

Q—What about a real hot day? Would it dry out quickly?

A—On a hot day foam will dry out much quicker. The thing to do, if you have time, is to wet down the area to be foamed prior to laying the foam. Then the foam will last longer.

Q—Does it make any difference whether it's day or night?

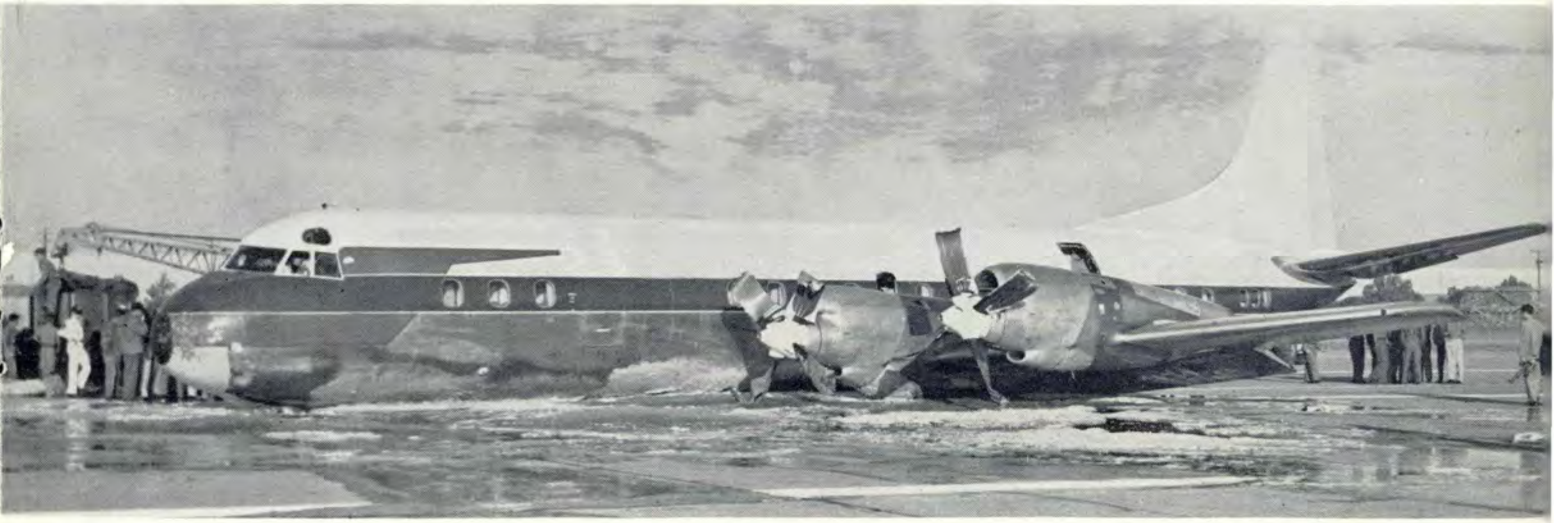
A—No. Except that foam will last longer at night. There is another problem however; the pilot may have more difficulty in locating the foam patch at night. Of course, you can mark the beginning of the foam by a flare or truck lights.

Q—Does the type of aircraft have any effect?

A—Well, you need more length for jets. Depending on the landing speed of the aircraft, we lay from 4000 to 8000 feet of foam for jets. For conventionals 2000 to 2500 is usually enough.

Q—What about gear configuration? Suppose the main gear is okay but the nose gear is up?

A—In that case, if we were requested to foam, we would in order to minimize drag and provide fire suppression. However, if you had one of the main gear



hung up it would be best to belly land. Be sure to jettison external tanks.

Q—Some bases have only one runway. Would a crosswind have a serious effect?

A—It wouldn't have much effect on the foam. However, you might want to position the trucks differently while applying the foam to get it where you want it. High wind will speed deterioration of the foam, so the aircraft should land as soon as possible after the foam is laid.

Q—What if there is other traffic that has to land as soon as the emergency is over? Would foam be a hazard to a normal landing?

A—There wouldn't be any particular problem. We try to get the foam off the runway but it doesn't make much difference. With foam on the runway it's about the same as landing on a

wet runway. It's possible that an airplane might have to land over the crippled aircraft. Then he'd have a shorter distance in which to stop. But foam wouldn't have anything to do with that.

Q—Who determines whether or not to foam?

A—Here at Edwards it might be base operations, or the officer in charge of the project, or the pilot. In any case it is not the fire department. We are only advisers.

Q—Going back to something you said awhile ago on the length of the foam strip. How wide and how deep should it be?

A—Usually about 25 feet wide, but this varies. For multi-engine aircraft we try to cover the area where the engines would hit on a belly landing. Because of the large amount of foam required, it might be necessary to foam intermittently. But the strip should be a little wider than the distance between the outside of the outboard engines. If its just a damaged gear, about 10 to 15 feet wide. If a main gear is damaged the pilot should try to keep the nose gear out of the foam for steering. Of course, if it's a nose gear that's causing the trouble, keep it in the center. There are a couple of points you ought to stress: It is very important to have a quick system for replenishing foam and water; and it is much better for the pilot to land short and slide into the foam than to hit in the foam and slide out the other end.

Q—How deep should the foam be?

A—One to two inches. Two inches should be plenty.

Q—Where do you start laying the foam? How far from the end of the runway?

A—Normally about the 2000-foot mark here at Edwards. This may vary slightly depending on the length of the runway, amount of foam and water available.

Q—Now after the foam is laid and the aircraft is preparing to land, where do you position your fire trucks?

A—This depends on the type of aircraft and its landing speed. We put a truck at the point where the aircraft is expected to stop, one just after the touchdown point and others between those. If you think you need it you shouldn't hesitate to call for aid from other bases or nearby communities.

Q—What kind of equipment do you use?

A—We use 0-11As and Bs—they're fast for experienced operators. We can refill two trucks in 10 minutes.

Q—Are there different types of foam? What kind do you use?

A—We use standard 0-11A and 0-11B metering, seven parts water to one part foam. Experimental work is being done with chemical foams, but there's a problem in that there may be a chemical reaction with aircraft metals.

Q—How does foam actually work? What does it do?

A—I suppose you are familiar with the combustion triangle. It's a three-sided drawing used to illustrate the three ingredients necessary for combustion. These, of course, are fuel, heat and oxygen. Foam smothers fire by eliminating most of the oxygen and some of the heat.

Q—Going back to removal. Will you elaborate on that?

A—We try to remove it as soon as the emergency is secured, primarily for the psychological effect on the pilot. He knows what it is used for and might be a little apprehensive about landing in it. If the foam is still wet, we wash it off. If it's dry we use an ordinary runway or ramp sweeper.

Q—In case you didn't remove it, how long would it take to disappear?

A—That depends on the weather. If it's a hot day it will dry out in about an hour. On a wet day—high humidity—it could last for hours. Incidentally, mechanical foam—the kind we use—will not damage or corrode aircraft and the effect on a landing aircraft is about the same as a wet runway.

Q—How many times have you foamed here at Edwards?

A—For actual emergencies about a dozen times.

Q—Well, Chief, that's about all the questions we have. Do you have anything to add, any advice?

A—You didn't ask when we don't foam. Usually we don't foam for a blown tire. If the wheel is round and will roll or skid, tests show that foam isn't necessary. Placing fire equipment at the expected point of touchdown and stopping point is the important thing here. If a foam landing is contemplated, the foam should be laid at the last possible moment. And the pilot should try to land as soon as possible after the foam is on. This way as much moisture as possible will still be retained in the foam.

Two final points.

• Pilots should try to make a normal landing and approach. This will put the aircraft at approximately the right point to get the maximum benefit from the foam layer.

• Don't jeopardize your fire fighting capability by laying foam. Be sure you can have the necessary equipment with which to fight a fire available in addition to that used in the foam laying. Better to do without the foam than not have your equipment ready to act in case of a fire. ★

CONTACT LENSES

Contact lenses might be just the thing for a pretty young miss who doesn't want to hide a dandy pair of eyes, but for a pilot they might be the worst thing in the world.

How many Air Force pilots are flying around with contacts is anybody's guess, probably not many, but there are probably quite a few who have been thinking about the little pieces of glass. After all, the old style specs get pretty uncomfortable over the ears or on the nose when an oxygen mask puts the pressure on. Why not contacts, then? They should be just the answer.

But are they? The School of Aviation Medicine suggests that the patient, the flight surgeon and ophthalmologist should do a little soul searching before contact lenses are prescribed and worn. There are some advantages but there are also several disadvantages that should be carefully considered.

Requests for contacts have been made on the basis of the discomfort of spectacles, fogging of lenses under various conditions and the inability of the pilot to position his eye close enough to navigational instruments.

These all may be valid reasons, but you have to have more than just a reason such as one of these. Consider some of the disadvantages.

"Spectacle blur," resulting from slight deformation of the corneal curvature and slight swelling of the surface layer of the eye. Vision might be decreased as much as one or two lines on the Snellen Chart (20/30 or 20/40) for several hours following removal of contact lenses and replacement of conventional spectacles.

Wearing time is a definite limiting factor. This may vary from 2 to 24 hours or more, depending upon the individual. If you are a pilot on an alert basis you might be required to scramble at about the time when you had reached your limit of tolerance for the lenses.

There is also the possibility of losing a lens in flight, so it would be necessary to carry a pair of spectacles with you. And imagine fishing around a cockpit looking for a misplaced lens and then having to insert it while trying to fly the airplane!

Then there may actually be a loss of visual acuity. Astigmatism may cause this, with eye secretions or lens flare as secondary causes. Lenses can dry between winks causing a "windshield wiper" or off-on effect. A slight oxygen leak could aggravate this condition. Other medical reasons such as infections, allergies and diseases may preclude the use of contacts.

Finally, they are more expensive, may require a long time for fitting and may be hard to adjust to.

If you now wear spectacles and have been considering contact lenses it may be that with the new MBU-5P oxygen mask you will change your mind. This mask is smaller and may help to eliminate discomfort. Your problem may be that your spectacles just aren't fitted right, and a trip to the eye doctor will solve your problem.

The School of Aviation Medicine, the only Air Force contact lens facility for flying personnel in the United States, urges flight surgeons to be extremely vigilant in the flight examinations of flying personnel who are experiencing any complications. If there is any doubt as to the feasibility of further wear, action should be taken to preclude the wearing of contact lenses. Individuals desiring contacts should be carefully screened and examined and patients will not be accepted for contact lenses if the uncorrected visual acuity is better than 20/30 in either eye.

If you are still intrigued by the idea of getting yourself a pair of contacts, fine. They may be just right for you. Here's what you will have to do:

- Apply through the Registrar, Consultation Services, School of Aerospace Medicine, Brooks AFB, Texas.

- If you are approved for evaluation, be prepared to spend at least 14 days at the school for consultation, examination and possible fitting. Then look forward to the probability of subsequent visits for adjustments or modifications. The school will pay for the lenses but travel and per diem funds will be on your base.

A word of caution from the school: Although there is no present regulation which prohibits an aircrewmember from securing contact lenses from civilian sources at his own expense, the practice is discouraged.

Meanwhile the school is continuing clinical and physiological studies and research toward improving contact lens fitting techniques, fabrication of lenses, better materials and sterilization procedures. ★

(We are indebted to the School of Aviation Medicine Medical Service Digest for the information contained in this article. While we're concerned primarily with aircrew members in the above, the information applies to everyone wearing or considering contact lenses. Ed.)

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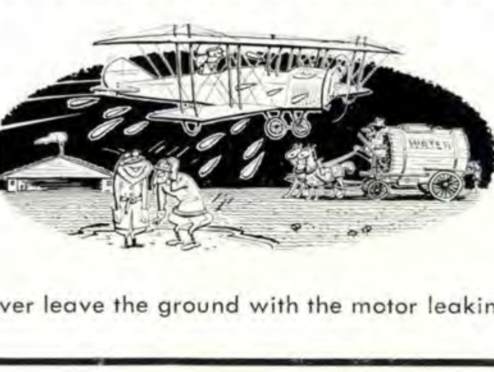
First Set of Flying Rules—Circa 1920
Air Service (Signal Corps) Regulations



Never leave the ground with the motor leaking.

TOP RAIL

"Hello, Cy. What you doing sitting up on that fence?"

The man addressed as Cy turned on the top rail, looked back, and said, "Mornin', Dave. Climb on up here. I'm watching the Air Force go through their wreck procedure."

"Wreck procedure?" Dave asked, climbing up on the fence.

"See that airplane down there where the trucks and cars and those fellows are moving around. They wrecked it yesterday."

"That's too bad; how'd they do it?"

"Well, one of the fellows came over last evening, said he was called a safety officer, and wanted permission to search for parts in my alfalfa field. He told me about it. It seems the pilot came in too fast and too high, landed farther down that runway than he should have, then the parachute they throw out to help slow down came off. This fellow said that the pilot got on the brakes pretty hard, a tire blew, the machine swerved off the runway, ran across the field a ways, then hit a concrete cover on that old drainage ditch. This knocked the wheels off, some pieces flew off and their airplane stopped where you see it there."

"That's too bad," Dave shook his head. "Did the fella who was driving it get hurt?"

"No. They got them pilots strapped in good, you know. And they wear big upholstered hats, too."

"Must be pretty dangerous."

"Maybe, but I think its mostly 'cause them fellas never seem to learn."

"You mean they do this all the time?" Dave asked.

"More'n they should, way I figure," Cy said. "When they first built that field, they used to fly around down there in them old two wing airplanes. I've seen them do the same thing twenty years ago they did yesterday. Every once in a while they'd go off the side and smash up. Only difference, the drainage ditch was open then; they wouldn't skid beyond it like they can now."

"Filling it in should have helped," Dave observed.

"Would have, but they couldn't just put in a big tile and cover it with dirt. They had to make concrete sides and a top. But that's not their real problem."

"What is?"

"I think they go about it all wrong. They'd never admit it, I'm sure, but they don't really care if they have a few wrecks—so long as they have less than the year before. I was down there one time and they showed me a bunch of charts. They wanted to buy some more of my land to make their runway longer and the charts were part of their sales talk. They showed how the rate—that's the number of accidents according to how much they fly—had dropped steadily year after year. Actually, they had some mighty pretty charts. Looked to me like as long as they kept the main line coming down they were happy, even though every once in a while they had some mighty stupid wrecks."

"How could you tell?" Dave asked.

"Well, they'd try comin' in when I could hardly find my way to the barn for the fog. They'd try to fly in bad storms and they'd slip off that runway when it had ice on it. They'd do things just like yesterday. Now that was downright stupid. I've seen them planes come in when it looked to me they had everything set up just right, then they'd go around and try again. This fella yesterday should not have tried to get in and land way down the runway like that. Besides see that little trailer with the glass top on it?"

Dave looked where Cy pointed, then nodded.

"Well, there's a fella sits in there with a radio. He's supposed to tell them pilots to go around if things don't look right."

"How'd you ever learn so much about it?"

"Oh, they took me all over and explained it to me after I'd sold them 40 acres of my best bottom land. When they first got them jets they were scootin' out in that field and settin' down in it before they'd get to the runway so often I couldn't grow anything anyway."

"I heard they tried to buy your woods, too."

"That was later. One night, three years ago, we were having a humdinger of an electric storm. One of their planes—the kind with two engines on each side—tried to take off and that storm pushed him right back into my woods."

"How'd you keep from selling?"

"We dickered around for a few weeks and finally they bought the timber—two hundred yards wide and clear across the woods. They cut it all down. I still own the land and can grow anything on it I please, except trees, of course."

Dave returned his attention to the wreck site where a huge yellow crane was maneuvering.

"I bet that costs quite a bit to bust up an airplane like that," he said.

"That's what they call a century series fighter. It costs over a million dollars," Cy explained.

Dave nearly lost his balance. "And it didn't have to happen?" he asked, incredulously, tightening his grip on the top rail.

"Not the way this safety guy was telling me. He told me how it happened, but not why. I got to asking him some questions and he didn't seem very pleased to admit some of the answers."

Cy demonstrated his skill at fence sitting at this point by holding up his hands and unfolding fingers as he talked. "First, he could have gone around and got set up again when things didn't look right. Second, the guy in the glass trailer should have told him to go around. Third, his stopping parachute broke; maybe it wasn't made right or hooked up right. Fourth, he blew out a tire; he might have gotten on the brakes too hard, or maybe the tire was bad, or had too much air, or too little air. Fifth, he went off the runway. Probably he couldn't help it, but maybe he didn't know enough about handling his machine. Sixth, even after this happened he might still have been all right if it hadn't been for that cement ditch they built a few years ago."

"And they've been having the same kind of airplane wrecks for 20 years?" Dave asked, incredulously.

"The same kind," Cy slapped his right knee. "The first one I ever saw was just like this. This fellow was flying one of them old two wingers. He came right over my head when I was plowing corn ground. He landed, tipped up on one wing, swerved around and into that drainage ditch. I even went over to see if he was hurt."

"Was he?"

"Nope, just shaken up, and all splattered with mud from when that propeller dug into the far side of the ditch."

Dave shook his head, then nodded toward the wreck. "What's all them fellas doin' out there?" he asked.

"I suppose they are the investigators this safety fella told me about. They mill around figuring out what caused the accident, then make a big report of it."

"How come? Looks pretty simple to me."

"This safety fella says they do this with every accident, then tell everyone what caused it and how to stop it from happening again."

"Doesn't 'pear like they've done much good." Dave watched the hook from the crane as it swung over the wreck.

"I've never been able to figure it out," Cy commented, "they all seem real sincere. They dug around in my woods for two weeks after one accident, picking up parts, tieing little tags on them—everybody just as serious as could be. And they keep all kinds of records, too. Like I was explainin', when they had me down there trying to buy that bottom land, they had the fanciest charts you ever saw. They showed how many wrecks they have when they try to take off and land, how often they land before they get to the runway, all sorts of reasons why they had to have more land. They have two miles of runway now. Think of it, Dave, two miles of runway, and they still don't have what they think is enough."

Cy tamped a fresh load of tobacco into his pipe, then went on. "Another thing. These safety fellows showed me some fancy plaques they'd won for safety. Said it was all based on reduction in rates. I said, "What about an outfit that didn't have any wrecks? They couldn't show improvement; how could they ever win?" One of them grinned kinda funny and said something about the way they bounce a ball. I didn't understand at all, so didn't say anymore."

"Have you ever tried to help them out? Sounds like you have it figured out," said Dave.

"No, they'd think I was just some dumb farmer buttin' in. When we was dickerin' about my woods they told me just what happened in every wreck they've had on my property, and how most of them wouldn't have happened if it hadn't been for my woods."

"And you sold the woods so they would have less wrecks."

Cy laughed, "I think that was the reason. Might have been cause I couldn't stand any more coffee. You know me, Dave, I always try to be polite, but them fellas drink coffee all the time. When I signed the agreement on the timber I think if I'd drunk another cup of coffee it would've run out my ears."

Dave started to climb down off the fence. "Well, if we can't help them guess I'd better be getting along." He rubbed the place where the top rail had cut in. "Kinda makes you sore, don't it?"

"Yeah, you'd think that after all these years they'd," he paused, rubbing the backside of his overalls, "oh, you mean that top rail. I'm either gonna have to put a thicker pole up there or quit watchin' their wrecks. Gets pretty discouragin' anyway." ★

HELP!

Major Roy J. Broughton, Jr, Directorate of Flight Safety, Hq ATC

Fire scares me. I mean it really shakes me good!! Flameouts, thunderstorms, and the like are problems; but to me fire tops them all. Maybe that's why when I picked up the June 1960 issue of Flying Safety, I turned right away to an item called "Rx for Rescue." Perhaps you remember it—the tale of the helicopter that fights fires. The H-43, it's called.

Well, I read it and thought about it and decided it was a pipe dream. I'd no sooner convinced myself, when I looked down the ramp and, what do you suppose? We had those queer birds at our base. Here's where my fear of fire led me on. I couldn't resist talking to one of the 'copter pilots to see how he felt about this thing called "fire supression."

I'll admit that I was surprised at first glance. Just as the story said, there sat the bird with a big red "bomb" in front of it. At that moment I heard a klaxon and things happened. I'm not really sure what, but things anyway. Before the shock of the horn and activity was gone, so were the bird, its big red "bomb," and the people. Then I realized I'd been treated to an actual H-43 scramble. Right then I was impressed.

In a very few minutes the 'copter was back; and as the pilot crossed the ramp, I intercepted him. After introductions and such, I told him of what I'd read and what I thought. I learned a lesson right there—give a helicopter pilot an inch, and he'll take your ear. I really got the word!

Getting a word in, I threw a mean curve, not purposely, but in reaction. He was so positive, so cocksure that I had to calm him down a bit. My curve was this! "All well and good, Laddie, you *can* suppress fire, and in a hurry. You *can* save my life, and I thank you. The catch is that I fly at night, when you can't tell a smoke stack from an apple tree."

I had him with that and I knew it. I hardly heard him tell me of the practice fires he'd worked on at night or the rest of his story. We did become real friends, though, and I learned a lot about helicopter rescue. You might say I was converted, or at least so I thought at the time. That was last week, before the big fire!

I had been on a dual night mission and was coming home to roost. I'm not sure I can tell you exactly how things happened, but somewhere in the pattern a fire warning light came on. The biggest, reddest light I'd ever seen! I realized that it was the left engine and that I was about to turn final. Folks have said we should have ejected right then—that I was a fool to land a burning bird. Maybe they are right, and maybe not. I was in a descending turn, gear and flaps down, and no airspeed to spare. I'm not sure I could have ejected and be sitting here now.

Right or wrong, I decided and told the tower of my choice: I'd land and leave the rest to the fire trucks.

As I touched down, I could see that my bird was really burning. Too bad, I thought; it's night and my 'copter friends won't be able to help me. As the bird swerved to a stop, flames came up to the left of the canopy, and things looked hot. Man, was I scared! I was about to blow the canopy (I'd forgotten that, too) when the flames disappeared. There on my left above me was an H-43. What a beautiful sight!

The canopy separated nicely and we started out. Bud, in the back seat, had no trouble; but I was delayed a bit getting out of the cockpit. I could see that the fire was still burning, but I was cool. "Just like the story said," I remember thinking.

I finally got clear and away from the blazing bird. It was simple—I merely walked out under the helicopter. As I left, the 'copter pulled back, too, and landed to offer aid. To tell you the truth, I needed treatment for shock, so they took me to the hospital, landing right by the door, no less!!

The next day I saw what was left of my airplane—not much but cinders 'cause it had burned for half an hour after I left it. As I looked at the remains, I thought about myself and of the H-43. I decided to pay my respects to the helicopter crew.

The first thing I saw when I reached the alert room was their shiny new sign in bold letters, "We Save You Right, Day or NIGHT!!" The sign was for my benefit, but that was all right—so is the H-43!

The story is based on fact, for an H-43 *has* rescued two crew members from a burning aircraft—at night!

Night fire suppression began officially in early 1960 when base rescue units in Air Training Command were told to start practicing at night. This practice developed the technique that made this story possible.

The Helicopter School at Stead Air Force Base teaches night fire fighting as a routine procedure, and rescue has made another giant step. 'Round the clock rescue is now possible and has been proved.

Fire suppression is but one of many talents of Air Rescue Service crews manning H-43 helicopters at many Air Force bases, one talent, but unique. In the short history of the aircraft it has added to the lon gevity of several crew members. Crews of the T-33, F-89, F-105, C-123, C-97 and B-52 owe their lives, or at least their health, to the H-43. Size is not important—only time counts when fire is the problem

Night fire suppression does have its limitations. The greatest is the psychological problem of approaching a fuel-fed fire at night and what it does to things such as night vision. Future training at Stead, plus diligent practice at home, can solve this.

Another problem is obstacles, none of which is going to be removed just to please an H-43 pilot. The only solution is pilots who are so current in airfield obstructions that they can fly by the "Braille" system, plus an assurance that *EVERY* obstruction is lighted at night.

If you are lucky enough to have a modern rescue system on your airpatch, find out today how they work and what they can do. *TONIGHT* you may need help—and they'll be ready. ★

After more than six years of operational life, the F-100 continues to come up with unsuspected idiosyncrasies which, in themselves, might well be filed away as little gems of wisdom better forgotten. However, knowledge of these little gems can suddenly become important, and perhaps keep an emergency situation from getting completely out of hand.

I'm referring now to the fact that actuating the flap handle on the D and F models can, with utility system failure, activate the pitch change actuator without the flaps lowering. "Okay," you say, "so what?"

Well, one fine day an unsuspecting pilot experienced an emergency on takeoff which produced, among other things, a utility system failure. The aircraft being controllable, the pilot decided to make an immediate landing. Turning base to final he put the flap handle to the DOWN position and the aircraft pitched down. He interpreted this as partial loss of control. Not being in any position to calmly analyze the situation, he leaped smartly out—at an extremely low altitude.

So, two things to remember here: The first rather obvious point is "Don't put flap handle to DOWN position with known utility system failure, unless you intend to exercise the emergency flap extension system. Second, if you do put the handle down, no flap air speeds for weight and configuration will give ample control to land the aircraft, so it's best you always compute "landing immediately after takeoff" airspeeds for flap and no flaps—*before takeoff*.

Maj. Clarence H. Doyle, Jr., Tactical Br., Fighter Div.

DON'T WAIT — COMMUNICATE. It didn't take F-101 pilots long to discover that their aircraft had a longitudinal instability trait that, under certain conditions, manifested itself in a maneuver quickly tagged "pitchup!" Even hardy fighter pilots didn't go for this one. They screamed loud and clear. The word pitchup spread rapidly. A prescription was needed to tangle with pitchup and live. Therefore, investigative work was begun to explore the seriousness and to provide a fix.

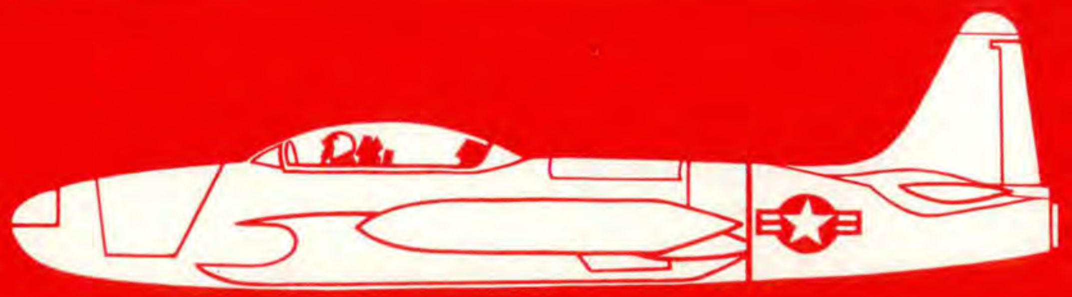
The result? A continued reduction in the F-101 accident rate from this cause. In 1959, pitchup was the culprit in six major accidents; in 1960, four. Last year there were five pitchup incidents with successful recoveries. There was one accident, but Flight Handbook procedures were not followed . . . you can't expect to win if you don't follow the rules. The record indicates that improved pilot education has paid off.

But, like coins, problems often have more than one side. One day a '101 nosed down and crashed at an East Coast base. Why? Was this an isolated case? Investigators heard of a previous nosedown occurrence. When checked out, this had all the symptoms of the one that led to the crash. Were there more? F-101 units were queried. NDSF (Nose Down Stick Force) reports began to come in. Actually, there were quite a few (approximately 29 reports), *but none prior to the first accident.* We've found out that NDSF incidents are caused by the Pitch Control System and/or the Flight Control System. Present state of the art rules out complete elimination of NDSF due to incorporation of devices designed to prevent pitchup. The crux of the problem is to provide the pilot with 100 per cent reliability to disconnect these systems when random nosedown signals occur. TO discrepancies were corrected to provide increased reliability. New TOs have been published to insure positive disengagement of these systems. Completion of these fixes should give sufficient disconnect reliability to minimize the flight safety aspect of NDSF. These are two cases in point to illustrate the importance of reporting.

Share your problems.

If you have one that doesn't act right, or look right, REPORT IT. Someone may come up with a fix, or at least some info on the safest way to live with the problem. ★

Maj. James O. Modisette, Defense Br., Fighter Div.



T-BIRD TIPS

Coolstone's Swan Song, a very informative article, made a few waves, particularly when he said: "All accidents can be traced to personnel error." Perusing reports of T-33 accidents during 1961—not a successful year—makes one nod the head in agreement. Of course, many accidents, especially the materiel failure type, cause one to do a bit of Monday morning quarter-backing; but on the other hand, far too many accidents, particularly the pilot factor type, cause one to shrug the shoulders and wonder WHY?

The following incident is typical of many pilot factor mishaps. It happened during November 1961.

A T-33 aircraft took off with ETA 2+22 with 2+50 fuel aboard. The position reports showed arrival at the en route fixes to be progressively later. At a fix 46 miles from destination, the ATA exceeded the destination ETA by 30 minutes. At this time the aircraft was over an Air Force base in VFR conditions. The pilot declared an emergency and proceeded to destination which had a known broken cloud coverage at 11,000 feet. The T-Bird landed after three hours one minute of flight and was refueled with 787 gallons of JP-4. Why?

Jock! Let's make 1962 a good year for flight safety.

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PISTON PATTER

There have been so many changes to the hoary old C-47 that someone suggested the numbers ought to be turned around to C-74. Maybe so. But here is a new one for you Goon types that ought to be welcome.

This one, submitted by James H. Voyles at McClellan, concerns the radio equipment. Heretofore pilots have been unable to monitor audio on the UHF and VFH command sets when the interphone control box is in *Interphone* position. This has created a problem for the IP who is busy trying to monitor the command radio while instructing with his microphone selector on *Interphone*. Under certain conditions this could result in a serious safety problem.

Mr. Voyles has finally solved this problem with a few simple changes in the pilot's and the copilot's mixer boxes. Here's how to do it:

Copilot Mixer Box *Ref. T.O. 1C-47 (S)-2, page 74, Fig. 13-6.*

(1) Remove wire No. 5138 from terminal No. 8 and install on terminal No. 9.

(2) Connect a 560 Ohm resistor between No. 8 and No. 1 terminals.

(3) Remove interphone mixer switch from panel, turn to UP position and pull inside box. Switch should be taped and secured.

(4) Plug panel hole.

Pilot Mixer Box

Change same as above, except wire No. 513D is moved to terminal No. 9 from terminal No. 8, and no resistor is needed in this box.

This information was presented in an Unsatisfactory Report by Mr. Voyles to Warner Robins Air Materiel Area, the prime AMA. They did not agree with the suggestion that the change be published as a TCTO. However, WRAMA had no objection to the mod as a Class I modification in accordance with AFR 57-4. ★

We repeat, ***VAGUE ON VOR?***

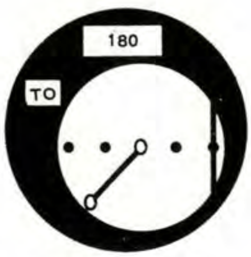
"Vague on VOR?" by A2C James A. Stagner, first appeared in this magazine in January 1960. With slight modifications it is being reprinted because: several accidents have disclosed that pilots were not aware that the ID-249 is usable in the event of AC power failure; response after the article first appeared indicated this type information is well received; instrument schools might want to use this procedure in their curriculum.

First, there's the Ambiguity Meter (or To-From) window—simple—but it is the *first* step in locating yourself on an Omni problem. It tells if the bearing you've selected will take you *to* or *from* the station. It has no connection, however, with the heading the aircraft is flying, so it cannot tell you if you are flying *toward* the station or correcting your selected course. The other two parts of the instrument will do that for you.

Second, you have the DoNut needle. It tells you the heading of your aircraft in relation to the course you have selected. The best way to picture it is to realize that it works off of your Gyro Compass system. With 360 degrees cranked into the course selector window, the DoNut needle is a Gyro Compass. Now, if you turn a heading into your selector window it is the same as turning the compass card to bring that heading to the twelve o'clock (North) position. The DoNut is in the same position that your heading needle would be, with the compass card rotated to the selected bearing.

Third, we have the Vertical needle. With the other two solved, this is the easiest. If the heading of your aircraft will cross your selected bearings, the vertical needle is deflected to the same side as your DoNut needle points. If the aircraft heading will not cross your selected bearing, it will be deflected to the opposite side.

If you are not "Vague on VOR" you should be able to look at the eight ID-249 diagrams and correctly locate the aircraft and its heading on the large diagram. In each case the RMI is inoperative and you must depend entirely upon the ID-249. Suggestion—if you have difficulty restudy Chapter 10 of AFM 51-37, also, personnel of instrument training sections are always glad to assist. ★



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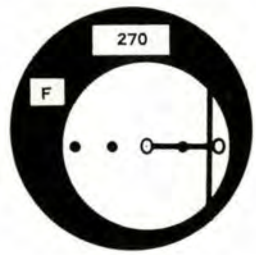

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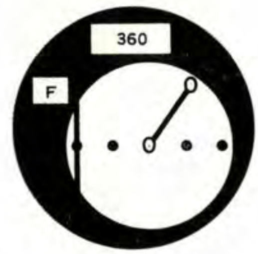

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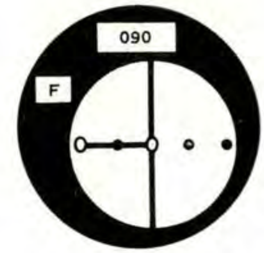

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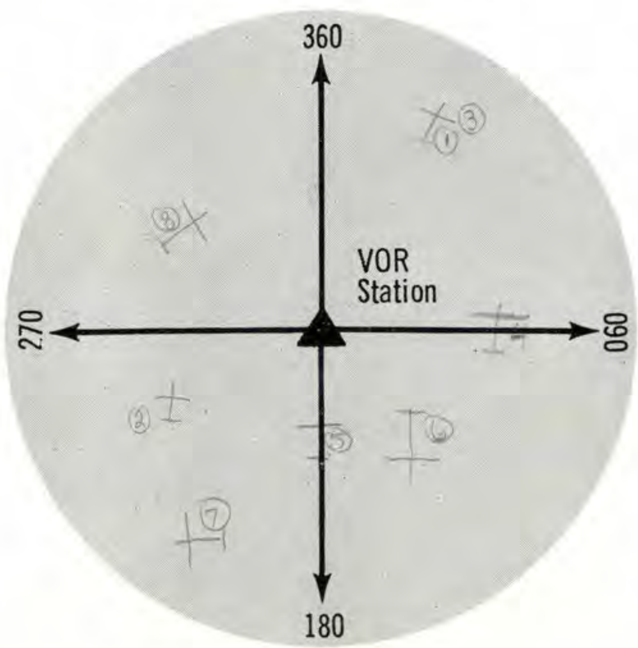

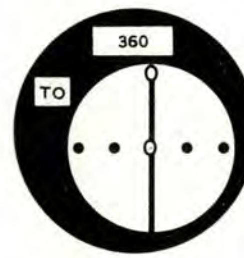

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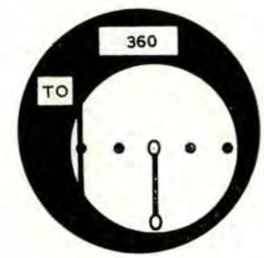

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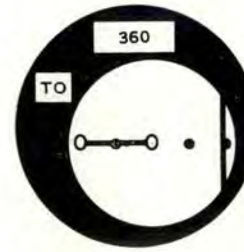

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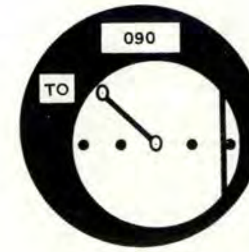

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Figure Two. Wingtip of swept-wing airplane moves opposite to direction of turn through a moon-shaped area during transition from straight ahead motion to curve. Clearance must be allowed for outward motion of tip during turns as shown in detail.

Figure One. Wingtip of straight wing airplane follows a curved path roughly tangent to line at beginning of turn.

Courtesy: Boeing Airliner
Boeing Company, Renton, Washington

PREVENT WINGTIP DAMAGE

Despite a number of precautions that have been in effect since 707s and 720s were introduced, damage to wingtips during taxiing continues to be reported. In most cases damage occurs when a wingtip hits a building or some unit of mobile equipment. Incidents have been reported even when ground personnel were closely watching and directing the airplane and when pilots were being as cautious as possible from their position.

What may not be fully understood is the difference in the path followed by a swept wing and a straight wing during turns. The forward position of the two pilots' seats makes it difficult to observe the path of the wingtip. The sweepback of the wing makes it even more difficult for a pilot to judge the relation between the wingtip and an obstruction. When a wing walker is following the path, the tendency of the wingtip to swing out from a path parallel to the forward path of the wingtip is more obvious. However, unless a ground crewman has observed the extent of this deviation from the expected path during a turn, he may not be prepared for the change in actual path. Figure Two shows the wingtip path as it changes from a straight line through a turn. Unless the wing walker is prepared for the wing's outward motion, he may allow less clearance than is required.

With older, relatively straight wing aircraft, the wingtip followed a path parallel or tangent to the wingtip similar to that shown in Figure One. As the nosewheel started the turn, the wingtip simply swung off toward the turn and followed a path roughly tangent to the wingtip path followed up to the beginning of the turn. If the wingtip was not in line with an obstruction, it would not collide with the obstruction during the turn.

Landing gear geometry and the sweepback of jetliner wings require a change in planning for taxi and towing turns. Figure Two indicates the typical path of a wingtip as it progresses from a straight line through the early part of a turn. The widest area extending beyond a straight line path occurs with an Intercontinental wing due to the wingspread. However, all Boeing jetliner models follow a path roughly similar despite differences in body lengths and the turning angle of the nosewheels.

With this information on the outward motion of the wingtip during a turn, ramp or taxiway guidelines might well be reviewed for their clearance from fixed obstructions. Wing walkers should allow the recommended six feet clearance in addition to the outward movement of the wing as shown in the diagrams. ★

TORTURED TIRES

Early one hot, humid, tropical, midsummer morning our fearless birdmen suited up and briefed for a pre-dawn combat profile mission in an F-100F. All occurrences up to the point of nosewheel liftoff were normal; thirty seconds later found our heroes desperately grasping for altitude with gear extended, both main tires blown and firey swath of burning fuel from four jettisoned external fuel tanks illuminating the runway behind. Being the prudent types, they elected to remain airborne, burning out internal fuel until the sun rose.

Anyone will agree at this point that our lads were sharp and fast with the emergency procedures and were using the best of judgment. To make a long story short, the landing on two blown tires was perfect and even though the wheels were ground to the stubs, no other damage was incurred and no injuries sustained.

The wing commander, squadron commander, wing operations officer, squadron operations officer, chief of maintenance, and so on into the night were considerably more shaken than our young heroes. But who has a better right to be? This was the sixth instance of blown tires in two weeks!

What is the answer? There must be a reason. Did we get rid of all those condemned tires last month as directed? Yes. Were we abiding by the point system? Well, in most every case—aha, a lead! Did we receive the message directing the use of 20 ply tires only and are we complying? Yes. How about tire pressures? Are they being checked religiously? Yes and no. Aha, another lead! Let's go to work.

A local maintenance SOP was written and enforced through quality control, stressing tire changes on the point system and not the wear holes. Particular emphasis was placed on thorough tire preflight to check for cuts, tread separation, slippage and points remaining; particularly, the latter when heavy weight configurations were being scheduled.

The most lucrative field was tire inflation. An SOP was established whereby each tire pressure was recorded as being correct prior to the first flight each day and carried as an entry in the 781. Upon arrival at the aircraft the pilot, using a properly calibrated tire gage, personally checked the tire pressures with an assist from the crew chief and signed off the 781 entry in the inspector's column. This was repeated on each subsequent flight. Naturally, the tire pressure was higher after each flight but experience has shown that under-inflation contributes far more to high pressure tire failures than over-inflation. Consequently, pressures were not bled off. Insuring the minimum pressures were being met for various aircraft gross weights and applying all the aforementioned procedures dramatically reduced the tire failure rate in this Wing.

The story does not end here. Operating procedures were next examined with a critical eye, and pilot briefings were held to emphasize the need for using the drag chute promptly after touchdown (crosswinds considered of course); proper application of brakes emphasizing the function of anti-skid; slowing the aircraft sufficiently before turning off the runway and into parking areas to prevent the unnecessary heating and wearing of tires due to "hot rodding" (in more formal language—preventing the molecular breakdown of the rubber surface through friction induced heating); proper use of nosewheel steering and, in general, removing any complacent or indifferent attitude towards proper care of the tires.

Combining the proper approach to tire care from both an operational and maintenance standpoint proved the answer and the mishaps involving tire failures in this unit dropped to a negligible figure.

Much has been said about tire and gear allowances for growth of various types aircraft, particularly fighters, after they are accepted into the USAF inventory. The usual reason for this growth is the addition of more external stores, including fuel tanks and weapons, for greater mission capability. For example, the F-100 has grown to over 40,000 pounds gross weight and necessitated changing from 18 ply rating tires to 20 ply and finally to 22 ply. The next weight increase will require a larger size tire and enlargement of the wheelwell. Initial design should provide for these changes, and an over-strength landing gear adequate for the increases in gross weight. In addition, tire and wheel load capacity for a multiple wheeled landing gear should be adequate to take up the load of any one failed tire during maximum gross weight taxi or takeoff.

In discussing the introduction of non-frangible wheels, studies reveal that the reliability of tires remains below that of metal structures because of the large amount of handwork and other variables upon which the quality of the tire depends. Furthermore, detection of tire incipient failure in service is difficult and in many cases impossible by visual inspection. For these reasons, a wheel with a blown tire should be capable of rolling on a prepared runway without disintegration of the wheel flanges. A non-frangible wheel of forged aluminum has been developed and adopted for B-58 aircraft. A non-frangible wheel is just as desirable for single-wheeled landing gears, especially since fighter aircraft have been destroyed by disintegration of wheel flanges which pierced the wing or body of fuel tanks to cause

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Lt Col Don E. Miller
Tactical Br., Fighter Div, D/FS

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fire. The real "bug" here is weight again, as non-frangible type wheels lean toward the heavy side.

One more item receiving wide publicity in the engineering offices these days is the development of fusible plugs in aircraft wheels. A wheel insert plug which melts at approximately 390° F is available to release tire inflation pressure to prevent disintegration of the wheel flanges. Flange disintegrations have occurred as a result of overheat from heavy braking which builds up temperature and pressure. *Shrapnel effect of explosive disintegration has been fatal in two cases on record.* Fusible plugs were proposed for B-52 and KC-135 aircraft approximately two years ago and adopted. Were the Air Force to have these on all aircraft wheels, safety to ground personnel would be enhanced because wheel heat reaches maximum temperature at approximately 15 to 30 minutes after landing. Also, fusible plugs prevent explosion of wheels and tires in the wheelwell during flight.

What have we really said in all the preceding verbiage? Well, basically our pitch is that "to kick the tire and light the fire" today is inviting disaster. If all of us remember to treat the lowly tire as we would our weapon system the results will be evident in drastic reductions of blown tires, "bent" aircraft, and shattered nerves. ★

This can happen when an F-100 tire blows.

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RAT HOLING

Rat holing is a game. To play it, you should understand the terms. Rat holing means, in military parlance, surreptitiously slipping something into a desk drawer, file or other suitable retaining place. In more subtle forms, rat holing can be achieved by simply failing to initial material and not placing it in the "out" basket. In its most flagrant form rat holing can be played by taking the material home, with the weak self-justification that time does not permit adequate perusal in a busy office, and with a probability even weaker that it will return, read, the next morning.

Evidence that this game is played in the Air Force turns up from time to time, especially during inspections and surveys. The material can often be readily dug out of its rat hole to show the visitor that it not only is received, but is so highly thought of that it is kept in a special rat hole.

Now this isn't just exactly the desired optimum. From the standpoint of distribution, it is anything but optimum. The fact that material may be considered worthy of a special rat hole doesn't offset the requirement that information be disseminated as intended.

We are concerned, of course, about USAF RECURRING PUBLICATION 62-1, or, as it is more commonly known, AEROSPACE SAFETY MAGAZINE. Distribution is on the basis of one copy for each 10 readers. Distribution is also on the basis of need to know. From the safety standpoint it is considered most effective when "open-flame heaters, lead pots, cutting torches, flare pots, and the like should be removed from the vicinity," is information that is made available to the men who refuel airplanes; not small dependents at home, or those unknowns who read the fifth item down in stacked "inbaskets" or in the lower left drawer rear.

How many of the pilots who experienced accidents that were virtual duplicates of previous accidents never "got the word" because of a rat holer?

Most of you, most of the time, can get along quite safely. The only reason for 62-1 is to provide information that might prevent an accident. Since there is no way of knowing who will be next exposed, the goal is to to make safety information available to all.

You can help. Please don't be a rat holer. ★

valid if we could be assured that only the stupid, careless, uncharitable drivers would die—but what about the innocent victims of the drivers who violate the rules? Should they also die when a reasonable chance for survival exists?

I am required to investigate automobile accidents as well as aircraft accidents occasionally. I have recently seen the body of a teenage boy who was *sitting on his seat belt* when the car in which he was riding was hit by a drinking, speeding driver on the wrong side of the road.

I "sweated out" three airmen for several days when they were on the critically injured list. They were picked up by a lady in a convertible at an airman pickup stop. The driver started speeding and soon lost control; the car did not turn over, but all four people were severely injured by hitting various objects in the car.

On the credit side, I know of two families and a pair of sergeants who were forced to take to the ditch by other drivers. In all three cases, the car was wrecked but no injuries resulted.

You can be careful, courteous, alert and law-abiding, Captain Keller, and still wind up in a position where seat belts might save YOUR life—or your wife's.

I still say seat belts are the best survival insurance a sane driver can procure. I've helped sell 4500 this year and won't rest until every car on this base is equipped with them.

Maj Robert N. Crain
Director of Safety
305th Bomb Wg (M) SAC
Bunker Hill AFB, Indiana

Tower Battles

In his letter, "Tower Battles" in the September issue, Airman Whitman touches on a subject that could stand wider understanding and much improvement. In the past thirty months I have logged over 300 hours of off-duty T-34 time with the local Aero Club, most of it instructing novices and giving checkouts to older heads. In addition to this, I have flown into twelve other bases in Aero Club birds. With two or three exceptions, VHF radio contact was poor. The Aero Club tiedown areas are usually located in a "radio dead spot" and it often requires taxiing some distance to get half decent reception. On the other hand, civilian fields seem to offer fine radio reception both in the air and on the ground.

Here at Myrtle Beach AFB, we have an FAA radio station, and the contrast between it and the tower is notable. At altitude I have worked this station as far out as 100 nautical miles with fair results using T-34's ARC-12 tranceiver. However, the tower is often difficult or impossible to read at 15 miles, regardless of altitude. If the UHF in tactical aricraft worked like this, GCI, GCA, etc., would be impossible. We place considerable emphasis on heads up flying in our Aero Club since we share the concrete with F-100s, but faulty VHF communications occasionally place undue stress on novice pilots. Knowing and using light signals is good emergency procedure, but certainly doesn't constitute a substitute for a dependable VHF transmitter in the tower. Also, "listening 121.5" is bad procedure unless an emergency exists.

Besides the Aero Clubs, commercial freighters fly into many bases, and believe it or not, there are planes in the USAF inventory that don't have UHF gear in them. I hold a 3034 AFSC (Communications Officer) myself, and I know some of the problems. The BC-640s are old and should all be replaced with the new AN/URT-3 equipment. From my experience, Aero Club pilots and aircraft radios are pretty reliable; however, the tower VHF radios could stand more PMs and better antenna placement in many instances.

1/Lt Jerome T. Ruzicka
727th AC&W Sq,
Myrtle Beach AFB, S.C.

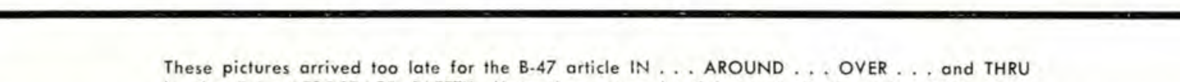
47-41-41

Here are the dimensions of the C-124 nosewheel Go No-Go gage which were questioned by CMSgt Cassadei, 63 PM Sq, Donaldson AFB (FALLOUT, Nov '61):

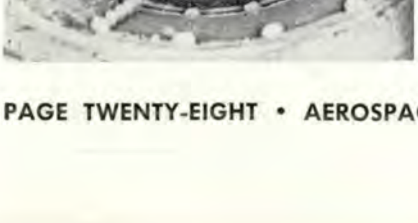
The overall length of the gage is 47⅞ inches. The inside dimension of the gage lugs is 41⅞, allowing three inches on each end of the bar for handholds.

Incidentally, before any word about this gage was published, one was presented to a pilot of the 63d TC Wg upon his arrival at this station. Copies of the drawings for the manufacture of the gage have been furnished CMSgt Cassadei. It would be interesting to know how the Sgt can remove his gage from the wheel after it is installed, if it is only 41¾ inches long overall?

Lt Col William E. Barber, Jr
Chief of Maintenance, 1502d AT Wg
APO 953 San Francisco, Calif.



These pictures arrived too late for the B-47 article IN . . . AROUND . . . OVER . . . and THRU in the Feb. AEROSPACE SAFETY. Here they are—pictorial proof—B-47 engine icing tests.



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Newest adjunct to the missile safety program is the Missile Safety Award. Comparable to the unit Flying Safety Awards for which aircraft organizations vie, the newly created Missile Safety Award can place a maximum of twelve missile units per year in a similar position of prestige.

Missile Safety Award plaques will be presented to USAF missile organizations (selected in accordance with AFR 58-19) judged by the awards board to have made the most outstanding achievements or contributions to missile accident prevention during the previous calendar year. Nominations of missile organizations will be made to Headquarters USAF by the major command exercising control of the particular unit. Such nominations will be supported by documentary data detailing contributions to missile safety or specific accomplishments.

The plaque portrays a silver missile badge accented by a boldly angular golden streak, with the USAF seal in the lower right corner below the legend: "For Outstanding Achievement in Missile Safety." ★

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ATC EJECTION SEAT TRAINING

The **Air Training Command** requires that all aircrew members and passengers periodically receive ejection seat training. Personnel are required to show proficiency in the proper hookup of personal equipment, the pre-ejection, ejection, and post-ejection phase as outlined in the applicable flight manual. Other procedures peculiar to the equipment and the aircraft are discussed during training. These discussions include such equipment as survival kits, dinghys, life preservers, etc.

Appropriate aircraft simulator or cockpit procedures trainers, such as those pictured, may be used if all procedures as described in the flight manual or in outlined training directives can be accomplished. If a simulator or cockpit procedures trainer is not used, an ejection seat identical to that of the appropriate aircraft is used to simulate the procedures. In no case are "live charge" trainers used.

The training stresses the use of the automatic ejection procedures and equipment, bailout altitudes, airspeeds and aircraft attitudes. Manual bailout procedures are reviewed. The trainee is required to strap in the seat while wearing all appropriate equipment. On a given signal, he must properly execute all steps in the pre-ejection, ejecttion, and post-ejection phases. Immediately following the ejection phase, the instructor will activate a switch which will open the automatic safety belt. The trainee then stands and separates from the seat, thus activating the timer device and/or zero lanyard. A *dummy* parachute is used for this training.

The trainee repeats the automatic ejection procedures as necessary to establish the proper continuity of action and develop to a high degree the desired habit patterns for automatic ejection. ★


WHILE ON A NAVIGATIONAL FLIGHT AN F-102 PILOT EXPERIENCED OIL PRESSURE AND POWER FAILURE.
REX RILEY
SAFETY OFFICER
SMSGT. HolcH
FUMBLING THE BALL IS NOT ALWAYS A SERIOUS MATTER, BUT WHEN IT OCCURS IN MAINTAINING HIGH PERFORMANCE AIRCRAFT THE RESULT IS USUALLY COSTLY!
MAYDAY!
U.S. AIR FORCE
...THE FLIGHT LEADER CONTACTED THE NEAREST AIR BASE AND DECLARED AN EMERGENCY.... GCA PICKED UP A "SQUAWK" A SHORT DISTANCE FROM THE BASE AND TOOK CONTROL.......
...WITH ALTITUDE 1500 FEET, TWO MILES OUT, GEAR DOWN, SPEED 170 KNOTS, AIRCRAFT TO THE LEFT OF THE RUNWAY, THE PILOT REALIZED THAT HE COULD NOT MAKE THE FIELD WITH THE EXISTING CONFIGURATION.......
...HE RETRACTED THE GEAR AND TRIED TO ADD POWER — NO SUCCESS...
U.S. AIR FORCE
...EMERGENCY FUEL — STILL NO POWER..... HE LOWERED THE GEAR AND PREPARED FOR A CRASH LANDING......
...TOUCHDOWN WAS THREE QUARTERS OF A MILE FROM THE RUNWAY..... THE GEAR COLLAPSED AND THE '102 SLID 855 FEET BEFORE STOPPING..... THE PILOT ESCAPED SAFELY........
USAF
.....PRIMARY CAUSE— MAINTENANCE ERROR..... THE OIL STRAINER HAD BEEN IMPROPERLY AS-SEMBLED AT THE LAST PERIODIC INSPECTION AND IMPROPERLY CLEANED AT THE 50 HOUR POST-FLIGHT INSPECTION.....
....RESULT— SEAL FAILURE, LOSS OF OIL, LOSS OF THRUST, AND LOSS OF ONE F-102!
.....SUPERVISORY ERROR—FAILURE TO CHECK QUALIFICATIONS OF NEW PERSONNEL BEFORE ASSIGNING DUTIES.....FAILURE TO UTILIZE WORK CARDS AND ADHER-ENCE TO ESTABLISHED INSPECTION PROCEDURES....BETTER BALL HAND-LING MIGHT HAVE MADE A GAIN INSTEAD OF A LOSS!