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Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

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FEATURE ARTICLES

REGULAR FEATURES

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USAFE

It is fitting that this issue of AEROSPACE SAFETY salutes USAFE. Not only has the Command achieved the lowest aircraft major accident rate in its history, it has also made dramatic reductions in the number of injuries and fatalities resulting from ground accidents, primarily those occurring as the result of private motor vehicle accidents.

Our feature story describes some of the elements of the USAFE accident prevention programs. On page 1, General M. A. Preston, USAFE Commander-in-Chief, discusses his philosophy of safety. His thoughts are significant for us all and his editorial **Total Involvement** is recommended to all Air Force personnel.

The cover photo depicts a scene now common at USAFE bases as the Command converts from F-100 and F-105 aircraft to the twin engine F-4C Phantom.

AEROSPACE SAFETY congratulates USAFE on its accident prevention accomplishments and wishes the Command continued success in the years to come.

TOTAL INVOLVEMENT

We in USAFE are stressing a total involvement concept. For example, I want each motor vehicle driver to know that I, and all his intermediate commanders, are concerned for his safety. Also, we have a horizontal interest—personnel on one base concerned with safety activities at other bases.

Total involvement means concern for everything we do. Safety has to be a way of life, habit ingrained in each personality. I am certain that attainable goals will never be achieved otherwise. We can't have non-conformists nor can we follow a piecemeal approach. Concentrating only on most of our people, or only on specific areas, is like trying to survive in a lifeboat with only the big seams calked—seepage through the small seams will eventually sink you. There is no one's contribution so small and no potential hazard so slight that either can be overlooked.

Total involvement means, most of all—people. I don't mean just the officers and airmen in uniform. I mean their dependents and our allies in the host countries as well. Our safety objective is to conserve all resources, not just USAF equipment and our own military personnel.

Once everyone is sold on this concept, I am confident that we can eliminate preventable accidents. We know that most of our accidents are caused by people; they must be prevented by people—safety-motivated people.

Our philosophy is an extension of the President's Project 70 Program of Zero Defects, of PRIDE. These, too, are total involvement efforts.

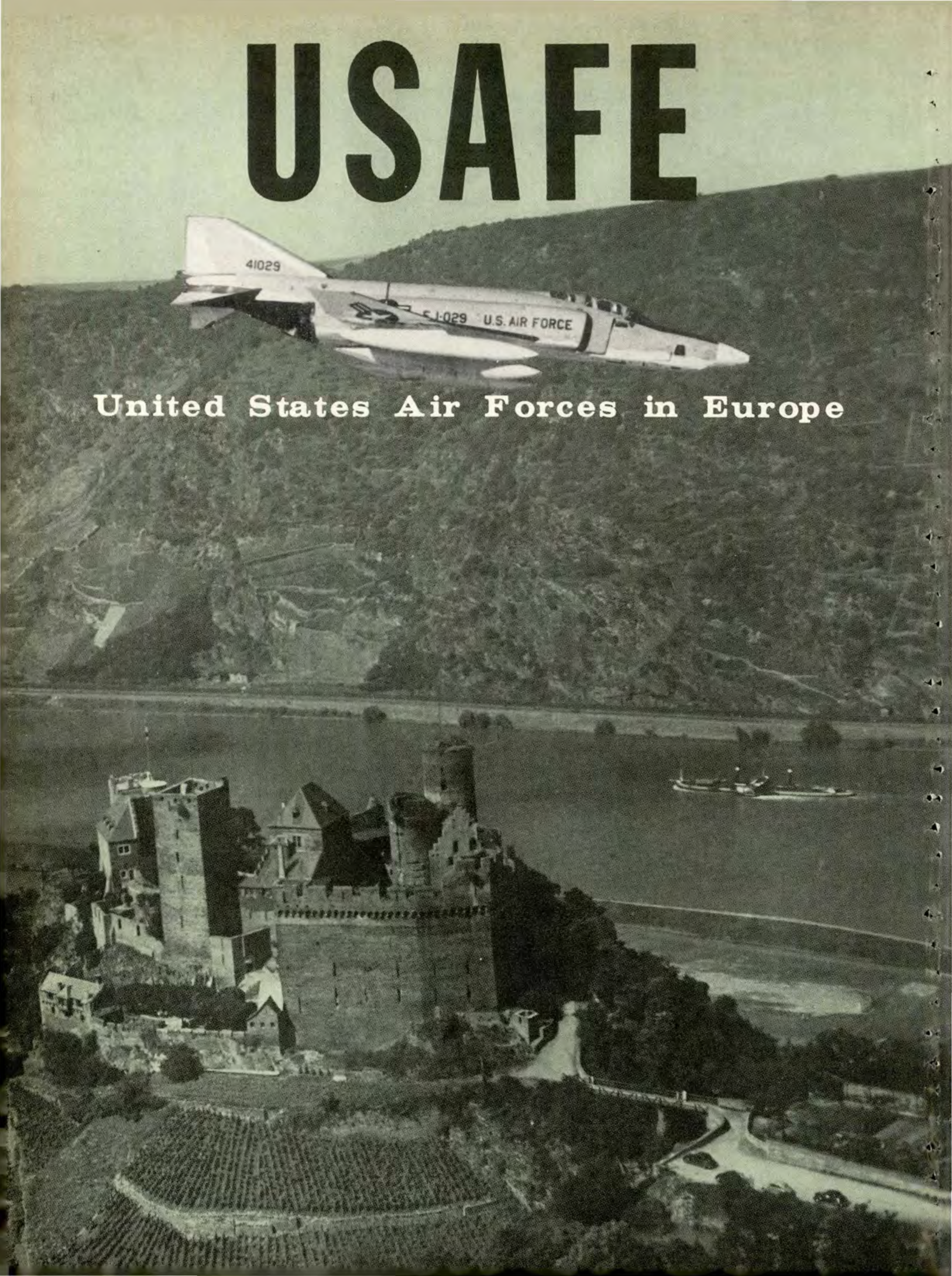
I also believe that safety has to be future oriented. Some of the programs we are working on now include three-point and rear seat belts, refinements in our driver control program, a skilled driver organization, mandatory use of snow tires or chains, expanded safety education, less hazardous storage conditions for conventional munitions, and a recognition program for maintenance men and crew chiefs. At the same time we are searching for better answers to such problems as congested airspace, personnel reductions, indoctrination of new personnel, aircraft engine reliability and improved escape systems.

Every time we have a major aircraft accident, and every time we have a traffic fatality—military, dependent or ally—I have the commander concerned come in and brief me. I am interested in what happened in the past, but I am much more interested in his accident prevention plans for the future.

I am confident that, with total involvement and new programs tailored to the future, we can continue to reduce accidents in USAFE. ★

M. A. PRESTON, General, USAF
Commander-in-Chief, USAFE

USAFE



United States Air Forces in Europe

The second in the Aerospace Safety series on the major air commands spotlights USAFE. With its all-time low major aircraft accident rate and drastic reduction in the number of private motor vehicle injuries and fatalities, USAFE provides an outstanding example of accident prevention in action. Aerospace Safety presents some of the elements of this success story.

Bob Harrison, Managing Editor

With the amount of attention focused on Southeast Asia, it would be easy to forget that a half a world away another Air Force Command guards against aggression from the East. That Command is USAFE—United States Air Forces Europe, commanded by General M. A. Preston. Its area of responsibility stretches from the Arctic to North Africa and from Eastern Europe around to India and back to the Atlantic Ocean.

Equipped with the most up-to-date weapons this nation possesses, USAFE is a major element in a complex defense organization that includes some 14 countries that make up the North Atlantic Treaty Organization. Created in 1945, its contributions to world peace have been many, and as the sands of world politics continue to shift, it adapts to the times to remain ready in any emergency.

Considering USAFE's vast area of responsibility and the many national interests of the countries within that area, it would be surprising if USAFE did not have its own set of problems, built in, so to speak, that many other Air Force commands do not have. The dual problems of flight safety and ground safety—primarily vehicle safety—are aggravated by the weather peculiar to much of Europe and by the many different national customs. This article will deal primarily with these two areas and how USAFE has met the problems realistically and with outstanding results. Traffic safety first because of the great success USAFE has had in reducing PMV accidents and fatalities.

SAFER DRIVERS

Driving conditions outside the United States are conducive to a high private motor vehicle accident rate for U.S. Air Force people. There are several reasons for this: traffic laws and customs vary from one country to another; these differ somewhat from those Americans are accustomed to; many narrow roads and streets increase the accident potential; in many countries weather is a definite factor. Add to these the uncertainty many individuals experience in a strange environment, the driving habits of many different nationalities, a tremendous growth in the number of automobiles operated by Europeans, and the constantly changing American military population.

There are, undoubtedly, many approaches that could be taken to such a formidable set of circumstances. USAFE took several and melded them into a program that during the past six years has just about halved the number of accidents and disabling injuries. Here are some of the elements of that program, the success of which is readily apparent from the figures at right.

USAFE was a pioneer in encouraging and finally demanding that its personnel use seat belts. In fact, USAFER 127-7 requires that seat belts be installed and *worn* in the front seats of all privately owned vehicles as a prerequisite to registration with either military or host country authorities. Commanders are required to not only enforce this regulation but must carry out a continuing educational effort on the benefits of wearing belts. Frequent checks are made and citations issued for failure to wear belts.

USAFE is in the process of implementing AFR 50-24, the multimedia driver education program. By the beginning of 1967 most of the instructor positions had been filled and equipment was in place.

PMV ACCIDENTS

	BEFORE (Sep 64-Aug 65)	AFTER (Sep 65-Aug 66)	REDUCTIONS	
Reportable Accidents	232	205	−27	−12%
Disabling Injuries to USAF Military	294	245	−49	−17%
Military Fatals	53	31	−22	−42%

PMV CHECK—Air Police and Safety personnel make random check of privately owned vehicles. Condition of lights, windshield wipers, brakes, muffler are some of the items checked. Use of seat belts is a major item.

MINOR INJURIES—This Air Force sedan collided head-on with a truck. The airman driving and his passenger received only cuts and bruises. They were wearing seat belts.

Some problems, however, hindered implementation of the program, for instance, converters needed to adapt the 60 cycle equipment to standard 50 cycle electrical circuits in European countries. Meanwhile, pending full operation of the driver safety course, an interim regulation continued the compulsory driver improvement course for persons under 26 years of age and for those desiring a civilian license.

INCENTIVES

Recognizing the need for commanders to emphasize safety for any program to be effective, USAFE established various awards for effective accident prevention efforts. One of these is the Commander-in-Chief's Trophy which goes to the wing or base with the most effective ground accident prevention program. The next five runners-up receive engraved silver plaques.

For individuals, there is a Ground Safety Achievement Award (plaque) presented to persons who make substantial contributions to the USAFE accident prevention effort.

Probably the most meaningful prize to an individual is the Belt Booster award consisting of a silver key chain and pendant or, as an option, a lapel pin and certificate. This award goes to the person whose life was saved or serious injuries prevented by the use of seat belts. During 1966, 14 of these awards were presented with one additional pending as of the end of the year. The photo at lower left indicates a case in point. The occupants of the nearly demolished auto escaped with cuts and bruises. They were wearing seat belts.

COMMAND EMPHASIS

Possibly the most effective element in the success of any military effort, regardless of its objective or scope, is the interest and personal involvement of the commander. The impetus generated by the man at the top permeates throughout the organization from the highest levels down to the individual at unit level. Such personal involvement of the Commander is evident in USAFE. General Preston requires wing commanders or their equivalent to brief him personally on the facts and circumstances of every traffic accident resulting in fatal injury to any person and involving command personnel, regardless of fault. The wing commander must also present a detailed briefing of his traffic accident prevention program.

USAFE uses several other means of keeping in close touch with traffic safety problems and involving commanders and supervisors in the accident prevention program.

Traffic Safety Council. Consisting of key staff members of Hq USAFE, this group, chaired by the Inspector General with the Director of Safety as vice-chairman, meets periodically to consider traffic safety problems as well as the results of past and current preventive efforts.

NCO Advisory Council. Consisting of senior NCOs in Hq USAFE, this group is concerned with a number of subjects of which traffic safety is not the least. Members are in touch with NCOs at USAFE bases and provide advice and assistance.

PMV and Operator Control Program. Considered by USAFE to be one of its most successful accident prevention efforts, the PMV and Operator Control Program was designed to place younger airmen and irresponsible drivers under responsible supervision.

The program consists of two units—PMV Flights and PMV Control Units. The flights consist of 10 or fewer PMV operators, grade E-1 through E-4, under the supervision of an individual senior to all members of the flight. Usually this is an NCO who also supervises the members of the flight during their normal duty assignments. The supervisor must have a record of no serious traffic offenses and possess a valid PMV operator's permit for the area.

The supervisor's duties normally consist of maintaining a file on each member of his flight, which includes such items as vehicle registration, insurance renewal, vehicle inspections, violations, etc. From time to time the supervisor briefs his flight on traffic laws, road and weather conditions, current accident experience and, in general, has a somewhat paternal influence over members of the flight.

He is expected to insure that members keep their cars properly maintained, through periodic inspections, and assure himself that seat belts, chains, emergency lights or flares as necessary are carried by the members and that they are in working order. He also keeps the commander informed as to the status of the flight.

Members also have responsibilities. When the supervisor calls a meeting, they will be there; they will follow his advice and instructions, present their cars for inspection and keep the supervisor informed as to any traffic violations or accidents.

There is no stigma attached to membership in a PMV flight. On the other hand, a PMV Control Unit is made up of individuals of any rank, even dependents, who have demonstrated poor driving habits or attitudes and who their commander feels require some control over their driving activities. A Control Unit normally consists of six or fewer members and may contain only a supervisor and one member—for example, a husband and wife, one of whom requires supervision.

A Control Unit supervisor functions pretty much like a flight supervisor. Membership in the unit is for a minimum of 90 days unless the individual surrenders his operator's permit. However, membership may last much longer, depending upon the progress the individual has made as determined by the supervisor and commander.

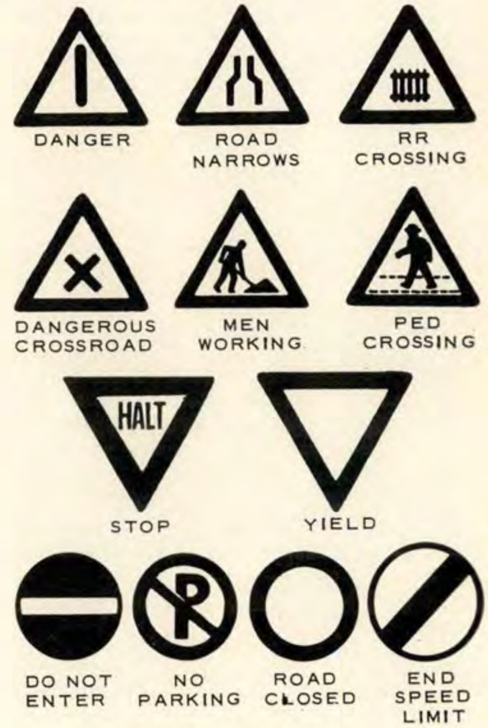
The objectives of this ambitious program are to reduce private motor vehicle accidents, injuries and deaths. The degree of success can be measured, in part, by the most cherished human possession—life.

During 1966, traffic fatalities were reduced 13 below 1965. This means that 13 people are still alive who might have been dead and forever lost to the Air Force.

FLIGHT SAFETY

Mix what at best can be called "lousy" weather, short runways, primarily fighter aircraft and all the problems that go with aircraft operations in foreign countries and you have USAFE.

HEED THESE—International road signs used in European countries are simple, easy to read. USAF drivers must know these prior to obtaining permit to drive.



ZAP POLE—A familiar sight at USAFE bases, these signs, reminiscent of totem poles, display unit standing in Command flying safety picture. ZAP goal pole was designed to promote professional performance among flying units.

Low Viz—Typical winter weather at most USAFE bases in northern Europe. Instrument proficiency is a must.

With these conditions one might expect an accident rate of astronomical proportions. The reverse, however, is true and USAFE enjoys a very low rate (5.6 in 1966) considering that it operates primarily fighter aircraft. It is hoped this will be further lowered as the replacement of F-100s and F-105s by the twin engine F-4 is completed. With RF-4s and RF-101s filling the reconnaissance role, the F-102 (air defense) and T-33 will be the only single engine aircraft in any quantity operated by the command.

Weather is one of the most serious problems USAFE pilots have to contend with. Much of Europe is covered a big part of the time with thick cloud layers that produce all the elements pilots hate most—rain, low visibility, fog, ice. Winters, of course, are the worst with these conditions prevailing almost daily. Bitburg AB, Germany, is below 1000 feet and two miles 45 per cent of the time. Hahn AB is even worse—53 per cent.

Fog, of course, is a common problem in England. Experienced weather forecasters keep the problems associated with fog to a minimum but the stuff can sneak up on you. At Bentwaters AB, 70 miles east of London, for example, a wind shift will sock in the base in minutes.

If one studies a map of Europe he will see that Northern Europe is relatively flat and that the Alps provide the only weather barrier this side of Eastern Europe. Consequently, all of the low countries, the United Kingdom, Germany, and much of France can be experiencing the same kind of weather at the same time. This presents problems when it comes to selecting alternates, and the recent closing of many NATO bases compounds the problems. Pilots know that if homeplate is socked in they can frequently expect the same almost anywhere within hundreds of miles. This means USAFE, of necessity, has some of the sharpest instrument pilots in the business. It also means that weather men have to be just as sharp at their profession.

AIR TRAFFIC

Imagine for a minute that each of our 50 states had its own set of rules pertaining to flying. Suppose that the positive control area floor were 18,000 feet in Illinois, 22,000 feet in Missouri and 20,000 feet in Kansas. Suppose that each state required permission to enter its airspace and that each state had its own set of restrictions as to what kind of cargo and who, by national origin or religion, might enter its airspace. Crank in a few more restrictions and differences in practice and customs and you have the kind of flight operating environment that exists in USAFE.

This means that flight planning is the name of the game for USAFE crews. Poor and incomplete planning can result in inconvenience, at the least, and disaster at the worst. Consequently, tremendous emphasis has beeen placed on this subject. It is a primary topic of flying safety meetings, command emphasis and pilot conversation. Each pilot operating in Europe must have a buffer zone briefing and USAFE pilots operating in the buffer zone are required to receive this briefing every seven days.

Communications in Europe are generally good, but not as good as in the U.S. During the past few years a number of VORs and TACANs have been installed but often one still finds the only navigation aid may be an ADF. Frequency changes come quickly, and often the frequency change introduces another European accent. Occasionally almost impossible situations arise due to the interests of one or more countries. While these interests may be perfectly reasonable and legitimate, they can cause an aircraft to deviate so far that fuel may become a problem, or perhaps, make the flight almost impossible. Nevertheless, missions must be flown and some of the inconveniences tolerated.

For these reasons, and weather, radar is one of the most widely used tools employed by USAFE in controlling its aircraft, probably more so than anywhere in the world except, possibly, in the positively controlled airspace of the United States.

USAFE has all the hazards to flying that can be found anywhere in the world. However, only those that are of particular concern are mentioned here. These are not unique to USAFE, but are undoubtedly aggravated by existing conditions. To operate safely under these conditions, USAFE has concentrated on pilot proficiency, detailed flight planning, strong supervision, and discipline. The Command also participates in various groups made up of representatives of the NATO countries in the continuing effort to meet all common hazards. One example of these groups is a European Bird Strike Committee, which is currently studying the use of radar in identifying large concentrations of birds and means of sharing this information expeditiously.

LOCAL PROGRAMS

In addition to Command methods of preventing accidents, individual bases and units have tailored their own means designed to cope with conditions as they exist locally. The TOS System of Flying Supervision employed at Bitburg AB is a good example. TOS stands for Tactical Operations Supervisor. His job is similar to that of the flying supervisor who used to rush to the tower when things got rough. At Bitburg, the TOS, a field grader, goes to work in the tower when:

• Weather in the Bitburg area or the approach zone of the active is below 800 feet or two miles visibility.

• The runway is closed long enough to cause diversion of aircraft.

• The RCR decreases to 12 or below.

• Approach Control reports its radar or radios inoperative.

Before he goes on duty the TOS receives a weather briefing which the duty forecaster keeps up to date by telephone. Tower facilities include, in addition to normal equipment, three extra telephones, a hot line to the COC, a direct line to the weather forecaster and a regular dial phone.

Guidance for the TOS is included in a manual that is kept in the tower at all times. Some of the items it contains are instructions, checklist, weather minimums for various categories of pilots, wing policy of alternate airfield fuel reserve requirements, change of run-

WHEELS UP AT WHEELUS — Range on desert near Wheelus AB, Libya, is used by USAFE fighter units for weapons delivery practice.

MAINTAINERS—Intent faces of maintenance men reflect interest in doing their jobs. USAFE enjoys quality maintenance record.

way instructions, aircraft emergency instructions, aircraft Dash One, etc.

Environmental conditions being what they are at USAFE bases, particularly weather, the value of having a qualified officer running the show is obvious.

• *20 Tactical Fighter Wing TCTO Compliance Program.* This effort to keep a tight grip on TCTOs has attracted a lot of attention and has been highly praised for its effectiveness. A TCTO Review Board keeps tabs on the program, and a locally devised status report enables the wing to keep accurate account of the TCTO manhour backlog. The Wing is updating the system by converting to machine accounting.

• *Flight Control Rigging.* The 20 TFW began a flight control rerigging program about eight or nine months ago that puts each aircraft through rerigging on a four-day cycle. USAFE has recognized the value of this program and is working on extending it command-wide.

The 20th also initiated a unique bird control method. Birds are a bane to aircraft operating in England and the coastal areas of Western Europe. After a couple of near-accidents at Wethersfield AB, England, the 20th embarked on a vigorous drive to overcome the bird hazard. All of the conventional methods of controlling birds were employed and a new wrinkle was added. A visiting Netherlands Air Force officer remarked that grass at bases in his country was allowed to grow tall as a means of bird control. This was contrary to the generally accepted method of cutting grass short to remove cover for birds. After further study, the decision was made to try letting the grass grow adjacent to the main runway. While this may not be the only answer, and not the solution everywhere, it seems to have worked at Wethersfield. During the following summer, when the bird hazard should have been at a peak, the problem was negligible. Now we're not advocating that all bases allow grass on the airpatch to grow long. We mention this as an example of the kind of spirit USAFE people demonstrate in trying to solve problems.

• With the climate prevailing in Europe, especially in the United Kingdom, corrosion, primarily in older aircraft such as the F-100 must be carefully watched. In addition to a complete annual checkup, an effective training device has been put into use by the 915 Field Training Detachment (ATC). The FTD operates a mobile laboratory that can be moved from base to base on a pickup truck. The lab can easily be moved into a classroom where instructors use it as an aid in teaching corrosion control to maintenance personnel.

MAINTENANCE

It is a commonly known fact that efficient and safe flying depends to a great extent on quality maintenance. USAFE has been fortunate in having good maintenance despite the demands put on the maintenance people by heavy flying schedules, adverse weather, and a shortage of skilled personnel. In fact, as of December 20, 1966, only

SLIGHT PAUSE—Maintenance technician pauses during work on landing gear. Parka is standard equipment during much of the year.

ARMAMENT men loading F-102 with 2.75 rockets.

ELECTRONICS technicians replacing antenna in nose of F-4.

one major accident had been charged to maintenance. Quality maintenance has many facets; here are a few examples selected from USAFE and some of its wings.

• *USAFE Non-Destructive Inspection Laboratories.* USAFE has instituted a policy of encouraging all units to make maximum utilization of the command's Non-Destructive Inspection (NDI) Laboratories by making equipment and operators available to perform station laboratory analysis and on-the-spot theater coverage with portable equipment and traveling teams. The assigned NDI equipment includes x-ray, eddy current, magnetic particle conductivity, and ultrasonics. Inspection with this equipment is precise, efficient, and requires little or no aircraft disassembly, thus reducing the number of manhours required to perform a detailed inspection.

An example of NDI efficiency occurred in USAFE recently when C-130 aircraft fuel cells were suspected of corrosion. By use of an ultrasonascope, laboratory technicians determined there was corrosion in several aircraft in approximately six hours per aircraft, compared to about 800 manhours per aircraft for visual inspection.

SUPPORT A/C MAINTENANCE

The importance of a sound support-type aircraft maintenance program is often underrated.

USAFE has recognized this problem and is presently overseer of one of the most widespread support aircraft maintenance programs in the world. These aircraft are assigned to units in 32 countries.

But how can such a far-reaching program be effectively monitored to insure that quality maintenance is performed on each aircraft? The most important innovation has been the establishment of central heavy maintenance areas located at strategic points throughout the area of responsibility. This action has allowed the assignment of properly trained maintenance personnel and adequate support equipment to one maintenance activity. That activity is then capable of performing professional maintenance on one or several types of aircraft flown in from outlying areas.

Space does not permit an exhaustive recount of all the programs, projects and techniques by which USAFE endeavors to prevent accident losses of all kinds. We have tried to present some of the problems of Air Force operations in one area outside the U.S. and a few of the methods employed to counter these problems. One thing we think is obvious is the determination to conserve USAF resources through aggressive and imaginative accident prevention. The frosting on the cake, however, and probably the most effective ingredient in this success formula, has been Command Emphasis. USAFE people we talked to in preparing this article stressed this point again and again. As one officer said, "A succession of USAFE commanders recognized that the Command's area of operations presented certain safety hazards, and through their determination to keep accident losses to a minimum they gave enough emphasis to guarantee results."

We think that sums up the USAFE success story. ★

AEROSPACE SAFETY thanks members of the USAFE Directorate of Safety and, in particular, the Safety Education staff for their fine assistance in gathering material for this article. Ed.

THE PILOT TRAP

Lt Col James M. Campbell, Hq SAC, Offutt AFB, Nebr

In the not-too-distant past the ability to pilot an airplane with skill and grace was considered an undistinguished talent comparable to being lucky at dice or having some unusual attraction to the opposite sex. Possession of the reflexes necessary for proficiency in flight was believed to be a natural endowment, and the learning procedure for aerial survival was largely a matter of individual discovery. This impression of the talent necessary to fly airplanes probably started in the barnstorming era when devil-may-care pilots with fine-lined mustaches terrified audiences with their performances in the air and cut wide swaths through susceptible country girls after landing.

This distorted image continued in World War II when hot-eyed lieutenants wearing crushed caps, sun glasses, crash bracelets, and two wrist watches often displayed alarming gaps in their knowledge in the air and appalling judgment on the ground. (Don't be too scornful of these types—not only did they win the war but the safety conscious commander of your unit may be an alumnus of the group.)

New methods and techniques pioneered by the United States Air Force have changed the military pilot's image. Knowledge and calculation have replaced daring. Scientific learning processes, standardization, and dissemination of technical data have been substituted for chance discoveries. Drill and practice have augmented natural motor skills and the 1966 pilot has abilities and insights unknown to his WWII predecessors. While one could become nostalgic and bemoan the fact that the current aviator might be more at home at an accountant's meeting than a P-47 pilot's beer bust, an objective recall will bring to mind that the good old days were all too often marred by greasy palls of black smoke that signaled heartaches and tragedy and decreased combat effectiveness. Many of these accidents could have been prevented by modest applications of today's methods.

The value of the Air Force's concepts of minimum training requirements, proficiency standards, periodic checks, and comprehensive evaluations are amply demonstrated by the low crew error accident rate. The lives saved, the airplanes preserved, and the resultant increase in our deterrent posture represent a contribution of tremendous significance to the Air Force and the nation.

Despite the success of the current methods of guaranteeing pilot proficiency, there remain inherent deficiencies that form a trap for the unwary.

The confidence and pride warranted by successful completion of the comprehensive and demanding evaluations of the command check teams or the local standardization board may blind us to the realities of our own inadequacies. The success of the systems in use accounts for the low accident rate, but the

"Turn around so I can see how the suit looks from the back."

". . . so naturally, with one wheel gone, I decided the smart thing to do would be to land inverted."

Air Force must not be satisfied until it achieves a zero pilot error accident rate. We can proceed toward this goal by improving the system. We must no longer be faced with the dilemma created by the pilot who passes the required checks in an outstanding manner, then on a subsequent flight becomes a pilot-error accident statistic.

It may be that we are approaching the upper limits in our regulatory effects to stop crew error accidents, and future gains must be based on concepts of self-evaluation. Following are some suggested avenues of self-appraisal.

WHAT DO YOU KNOW?

Of course, you were "H" in your last examination battery, but the limitations of multiple choice testing have long been widely recognized by educators. The physical laws governing flight dynamics lend themselves well to objective testing for given a set of conditions; there can be only one correct answer that is provable and measurable. In practice, the inputs to problems in flight are as fluid as the atmosphere itself, and interpretation of the solution becomes an art as well as a scientific exercise. It is not enough to enter a chart and emerge with an optimum altitude; it is necessary for the pilot to visualize the high angle of attack and resultant airflow separation if the optimum is exceeded. The mechanical procedures of inflight fuel management must be tempered with a knowledge of static margin and understanding of the range penalty of a forward center of gravity and the danger of instability if the static margin is decreased. If these examples sound sophomoric, ask a representative group of the officers in your unit who compute weight and balance to explain the mean aerodynamic chord. If you find that computing critical takeoff loading factors is a numerical exercise using poorly understood inputs, it could be assumed that the possibility of a disastrous takeoff attempt is vastly enhanced. The knowledge required of today's pilot is often more specialized than generalized. Viewed as a separate problem, it is probably more important for the pilot to know that X pounds of hydraulic pressure indicates a limit of brake effectiveness than to have a grasp of the energy exchange functions of stopping devices. However, utter dependence on "idiot light" concepts of detecting hardware malfunctions has limitations that can be overcome only by knowledge and understanding of general, underlying principles that are largely incapable of measurement, and thus become an individual responsibility.

Today's aircraft are more demanding than those of yesteryear, have no room for amateurs in the cockpit.

HOW DO YOU FLY?

Even more elusive than the determination of the knowledge necessary for safety are the reasons for inflight lapses in the physical skills and failure to use possessed knowledge that lead to an accident.

In the Air Force we are blessed with many pilots who can simultaneously eat a sandwich, monitor the salient points of a VOR weather broadcast (with background music on the radio compass), read the bomb run checklist while manually flying the aircraft, and maintain precise flight values. Obviously these pilots have never experienced an inadvertent disconnect during air refueling and they have never been out of the green. Unfortunately, many of us do not possess this ability to "fly the crate it came in" and must compensate for our lack of natural endowment with considered practice.

The most competent and perceptive instructor pilot is incapable of the depth of critique that careful self-analysis can afford. There is probably no other profession that requires so many rapid and related judgments. One could explain to an alert teenager in 30 minutes the basic principles of landing a B-52, but it would take hours to explain the dozens of decisions made on the final approach as the pilot compensates for nuances of shifting winds, changing aircraft configuration, atmospheric changes, ground effect, power responses, and scores of other variables. Conscientious appraisal of the failure of the aircraft to react precisely according to your intentions may prevent an accident under adverse conditions. This considered analysis is not easy; it requires objectivity and patience. If you wonder why you consistently touch down left gear first, it might take some time before you relate it to the original cause — perhaps the angle of bank turning on the base leg. The professional pilot must continuously indulge in this type of self-criticism to improve his standards and decrease the likelihood of catastrophic errors.

In March of 1965, General Ryan, CINCSAC, wrote of the ". . . . intangible and unequalled contribution of man to the mission. . . .". United States Air Force pilots must stand in the fore of these contributors by precise utilization and conscientious improvement of their skills. ★

THE IPIS APPROACH

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

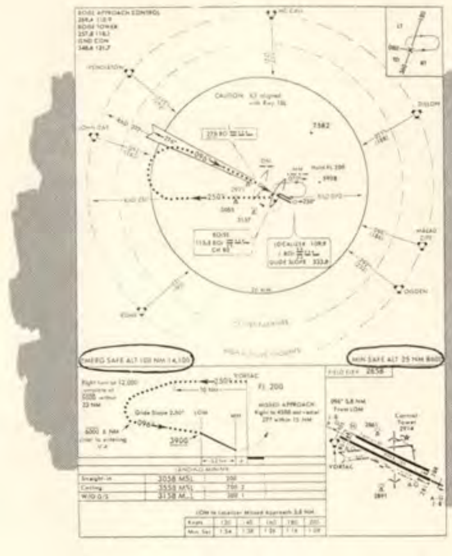
Q AFM 60-16, par 8-15, states: "If a penetration/approach is started and the pilot observes or is advised that weather is below the published minimums for that approach, he (the pilot) may elect to continue the approach to published missed approach *altitude* and execute a missed approach procedure." Does this mean that the missed approach altitude is the lowest the pilot can descend? If so, at what point should he begin the missed approach procedure?

A The altitude specified in the missed approach procedure should not be confused with the published minimum altitude for the approach. The intent of the above statement from AFM 60-16 is to allow the pilot to continue the approach to the missed approach *point* and the published minimum altitude, then, perform the missed approach procedure if necessary. Perhaps the weather may improve during the approach in which case a landing could be accomplished.

Q What are the criteria for establishing emergency safe and minimum safe altitudes depicted on the terminal instrument approach procedure chart?

A *Emergency Safe Altitude* (100 NM)—For all areas designated as non-mountainous, the altitude will be 1000 feet above the highest obstruction/terrain, rounded off to the next higher 100-foot increment. For areas designated as mountainous, the altitude will be 2000 feet above the highest obstruction/terrain, rounded off to the next higher 100-foot increment.

Minimum Safe Altitude (25 NM)—This altitude affords 1000 feet clearance (mountainous or non-mountainous) above the highest obstruction rounded off to the next higher 100-foot increment. The minimum safe altitude applies within a radius of 25 NM from the navigational aid used for the final approach of the procedure.

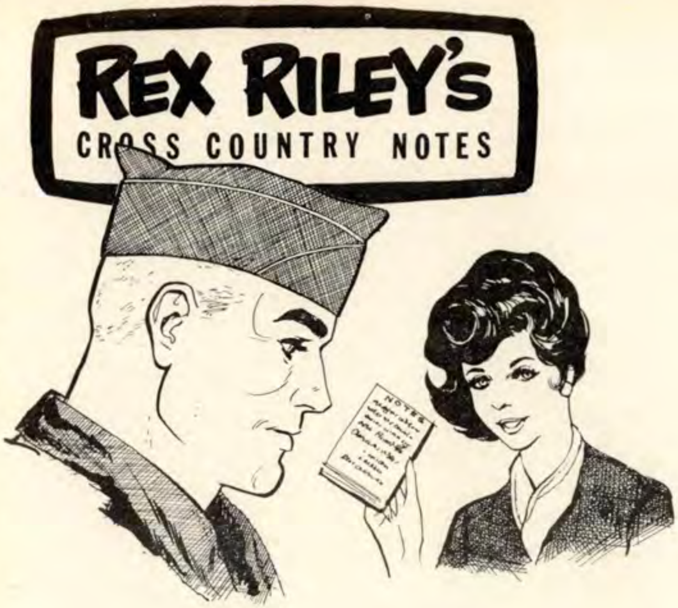


Q What are the tolerances for operational check of the aircraft's TACAN equipment?

A There is no known published DOD pilot guidance for checking the accuracy of the aircraft's TACAN equipment. Here at the IPIS, we use the same tolerances that are used for checking VOR accuracy, i.e., ground check points—plus or minus four degrees, airborne check points using a VORTAC station with a published airborne check point—plus or minus six degrees.

The AIRMAN'S INFORMATION MANUAL states the DME is capable of an accuracy of better than one-fourth mile or two per cent of the distance being measured, whichever is greater. However, the UNITED STATES STANDARD FLIGHT INSPECTION MANUAL (AFM 55-8) provides a *facility* flight check tolerance for TACAN distance error of three per cent or one-half mile slant range, whichever is greater. The aircraft's DME indication should be as accurate as the ground station being interrogated. ★

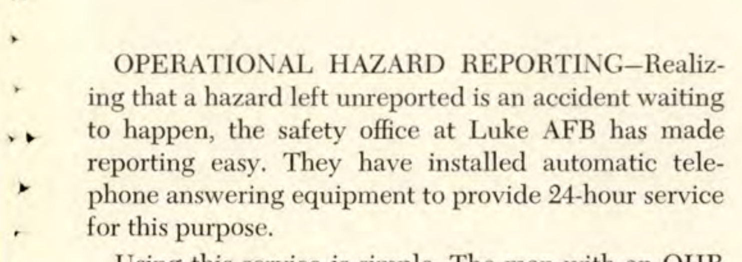
AFM 51-37, INSTRUMENT FLYING, is being revised to incorporate changes to various Air Force and FAA publications that affect instrument flight. At the same time, approved recommendations which were submitted by commands and individuals during the past year will be incorporated. This is an excellent time to submit recommendations for changes in content, presentation or illustration. Project Officers are: Captains Peter D. Hanrahan and Jack W. Wimer. Address: USAF IPIS (PT-IPIS-T), Randolph AFB, Texas 78148.



OPERATIONAL HAZARD REPORTING—Realizing that a hazard left unreported is an accident waiting to happen, the safety office at Luke AFB has made reporting easy. They have installed automatic telephone answering equipment to provide 24-hour service for this purpose.

Using this service is simple. The man with an OHR begins by dialing extension 2662 and listening carefully to a recorded message. At the end of this message there are a couple of beeps; then he can start talking. About 30 seconds later, a second tone signal sounds and the equipment stops recording. If the report isn't finished, the man can re-dial the number and continue as before.

According to Major Bruce Jones, Director of Safety at Luke AFB, this system is particularly handy for those who are too shaken to hold a steady hand.



TOWING and taxiing accident reports continue to pour in from every direction. When there is a qualified aircrew member at the controls during a taxi operation, we've got a cardinal rule: if it looks doubtful, shut down and wait for a qualified tow team. But, towing is another kettle of fish; it must be done by a well qualified team whose members may range from airman third to civilians. They can't just shut down the operation and turn it over to someone else—they're stuck with it! So, those of you who help with the annual safety survey or who are in the maintenance supervisory chain or who are influential with the flight line "supers" must do whatever you can to make sure these tow teams are thoroughly trained, qualified and properly used.

Training and qualification are easily understood terms, not so with the "properly used" element. We've just received a report telling of a tug driver who towed an aircraft in such a manner that the wing passed over a test stand and ripped the wingtip panel. This man had been carefully trained but he didn't request wing walkers to assist him through a congested area. In this case a one-man team wasn't enough; the tug operator didn't use the available human resources. You aircrew members must shut down if it looks doubtful, and you tow team members must be certain that you've got enough qualified men to do the job right.

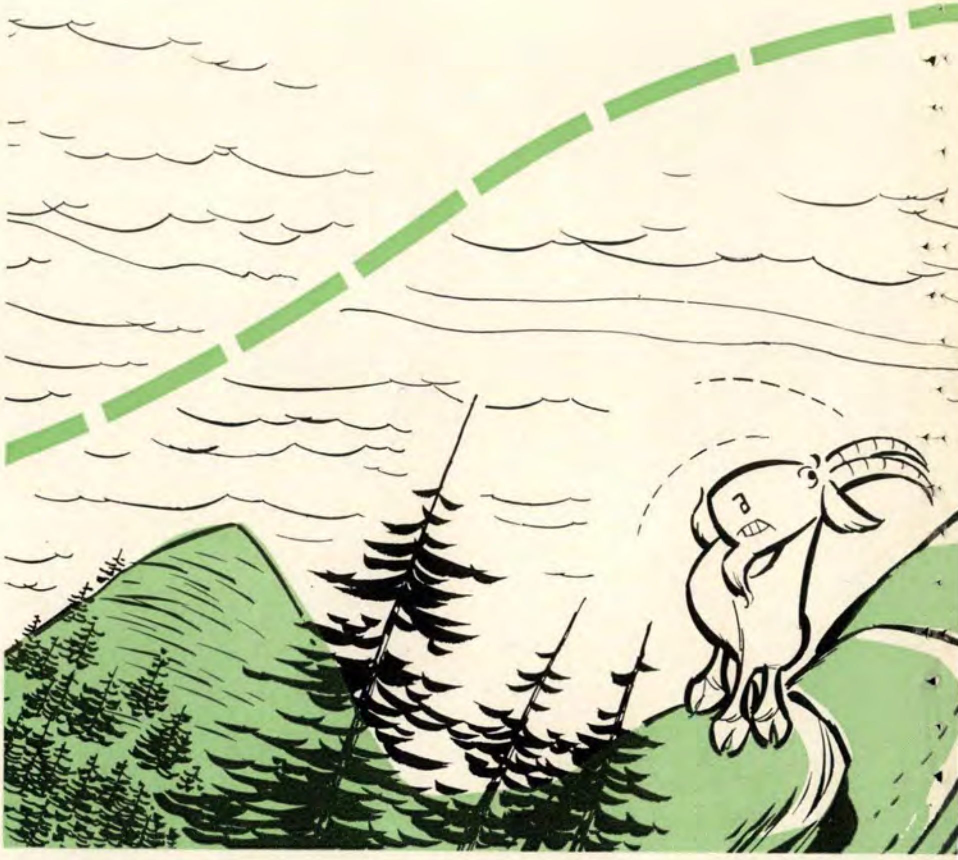
FOD continues to be a major problem which consumes many dollars and manhours that could be used to increase mission effectiveness rather than in "keep-your-head-above-water" type maintenance. With very few exceptions we must assume that foreign object damage is preventable and one sure-fire method is to learn from the mishaps of others.

Winter isn't over yet so we might still profit from this recent incident. All bases servicing similar equipment should adopt standard operating procedures to preclude like occurrences. A '101 returned to home plate from deployment. While the engine was idling, the crew chief was assisting in offloading the crewmembers' flight bags from the armament door. He had approached the aft end of the door from the right main gear area underneath the fuselage. He felt himself sliding on the slick, snow-covered ramp and being sucked toward the right engine intake. The suction pulled upward on his parka, his ear protectors and his hat. By bracing on the underside of the fuselage and intake duct, the crew chief stopped sliding but his ear protectors and hat were sucked into the engine, severely damaging it.

From now on, this outfit will install a screen on the right engine before rotating the armament door for unloading. If a screen isn't readily available, the engine will be shut down and the door rotated with a hydraulic mule.

All you supervisors, aircrew and ground crew men should critically observe the various activities on your flight lines. You might be the one who spots (1) a potential FOD situation, and (2) prevents a serious injury or fatality. ★

through the valleys and over the hills...... SAFELY



Grover C. Tate,
General Dynamics, Ft Worth, Tex

It is difficult to spell out the sounds of two four-bladed props churning at full power through a sugar cane field, but for a time during the growing up years, it was the sound of the pilot who was really hot. Cane stains all the way up to the prop hubs were real marks of distinction – and in most cases a tip-off for the administrative types to get busy on the obituaries. It was also a marker along the pathway to sudden, unscheduled meetings with mountaintops, treetops, towers, housetops, plus other fixed assorted objects that suddenly loomed big and unavoidable. A lot of accidents resulting from the buzzing type of activity were directly caused by poor pilot judgment and a wink at flying regulations. Others were caused by poor visibility, instrument error, navigational misses and many other things that made their insidious contributions to the statistics.

Many of the accidents were avoidable because the basic philosophy of bombing enemy targets was based on high altitude flying – well above natural and man-made obstacles. That philosophy has now yielded to the accuracies of high scanning radars and accompanying missiles, so that it is necessary to intrude into enemy areas beneath the probing eyes of the radar. Now the problem of obstacle clearance is no longer one of the lone low-flying hot-rodder, but with the total effort. The problem is aggravated by a requirement to penetrate the electronic curtain during daylight, darkness, or IFR conditions.

Of the many different approaches to the low-level penetration problem, the F-111 has an operational system that is proving to be efficient and reliable. It is a Terrain Following Radar (TFR).

The F-111 is designed for supersonic flight at sea level so that it can penetrate at low levels and perform its mission with a high degree of success and survival. The TFR is the system that will provide the pilot with continuous terrain clearance information and allow him to maintain a constant separation from the ground and any objects in his flight path.

The TFR may be used in either a manual or automatic mode. In the automatic mode, the flight control system automatically responds to commands from the TFR to fly

the aircraft along the vertical flight profile that will maintain the selected clearance above the terrain. The pilot may fly the system manually by performing horizontal course corrections to clear those obstacles that are presented to him on a radar scope. Steering commands for vertical separation are provided on the pilot's attitude director indicator and on an optical sight. The pilot can use these steering commands to manually fly a terrain avoidance pattern or to monitor the automatic terrain following mode.

Two independent antennas and transmitters provide two separate TFR channels, each of which may be operated in any of three modes, Terrain Following, Situation Display or Ground Mapping.

In the Terrain Following Mode, the aircraft can be flown manually or automatically to maintain a preselected clearance above the terrain. In this mode, climb and dive signals are furnished to the attitude director indicator, an optical sight, and to the autopilot. For manual operation, the pilot can fly the steering bar on the attitude director indicator and optical sight or he can couple the commands to the autopilot and terrain clearance will be maintained automatically. The Terrain Following Mode can also be used for making blind let-downs to a selected terrain clearance using either the automatic or manual procedure. Only one of the two available channels can be used in the Terrain Following Mode at one time. If both channels are selected to the Terrain Following Mode at the same time, the second channel will go to standby condition and will come into operation automatically if the first channel should malfunction or fail. If the operating channel fails, a fly-up command will be generated and the aircraft will either be flown up automatically or a command will be given for the pilot to initiate the fly-up.

In the Terrain Following Mode, the operating antenna is scanning vertically and an E-Scope display is presented to the pilot. Terrain clearance reference is provided by a cursor on the scope, the slope of which will vary with the speed of the airplane, terrain clearance selected, and the type of ride selected. The range display on the scope is non-linear so that ranges up to two miles are displayed on the first three-fourths of the scope and the remaining one-fourth of the scope displays the next ten miles. To maintain the selected terrain clearance, the pilot flies the aircraft to keep any video returns on the scope on or below the cursor reference line. Whenever a return appears above the cursor it indicates that an object higher than the present flight path is in front of the aircraft.

A second mode of operation, the Situation Mode, is used in conjunction with the Terrain Following Mode, during which the antenna scans in azimuth, 30 degrees on each side of ground track. Returns from terrain that is higher than the altitude of the aircraft are displayed to the pilot on the radar scope.

A third mode of operation that can be selected is the Ground Mapping Mode, which gives the pilot a scope presentation much like other navigational and bombing radars and is used primarily for navigation. In this mode, the terrain ahead of the aircraft, both above and below the aircraft, is painted on the scope.

Three basic options, or combinations of these options, are available to the pilot. Any one of six selections for terrain separation can be selected. The range varies from the minimum to the maximum limits of the equipment. Like choosing a toothbrush, either a soft, medium or hard ride can be selected. This selection controls the magnitude of the negative "G" forces imposed on the airplane during terrain clearing maneuvers. The third basic choice is between automatic or manual flight. So, as the aircraft starts its run through the hills and valleys, the pilot can preplan how he wants to fly the course — how high above the terrain, the magnitude of the maneuver to maintain that clearance, and whether he wants to do it himself or to let the autopilot do it.

The TFR provides either the pilot or the autopilot with a fly-up signal anytime there is a malfunction in the system. Warning and caution lights are also provided to give the pilot a definitive indication of malfunctions.

It may take a new breed of tiger to go busting into a mountainous area with minimum terrain clearance selected and let an autopilot guide him safely over the hills. A newer breed may be needed to do the same thing at night or during IFR conditions, but the equipment works and with experience, pilots will fly it in absolute faith.

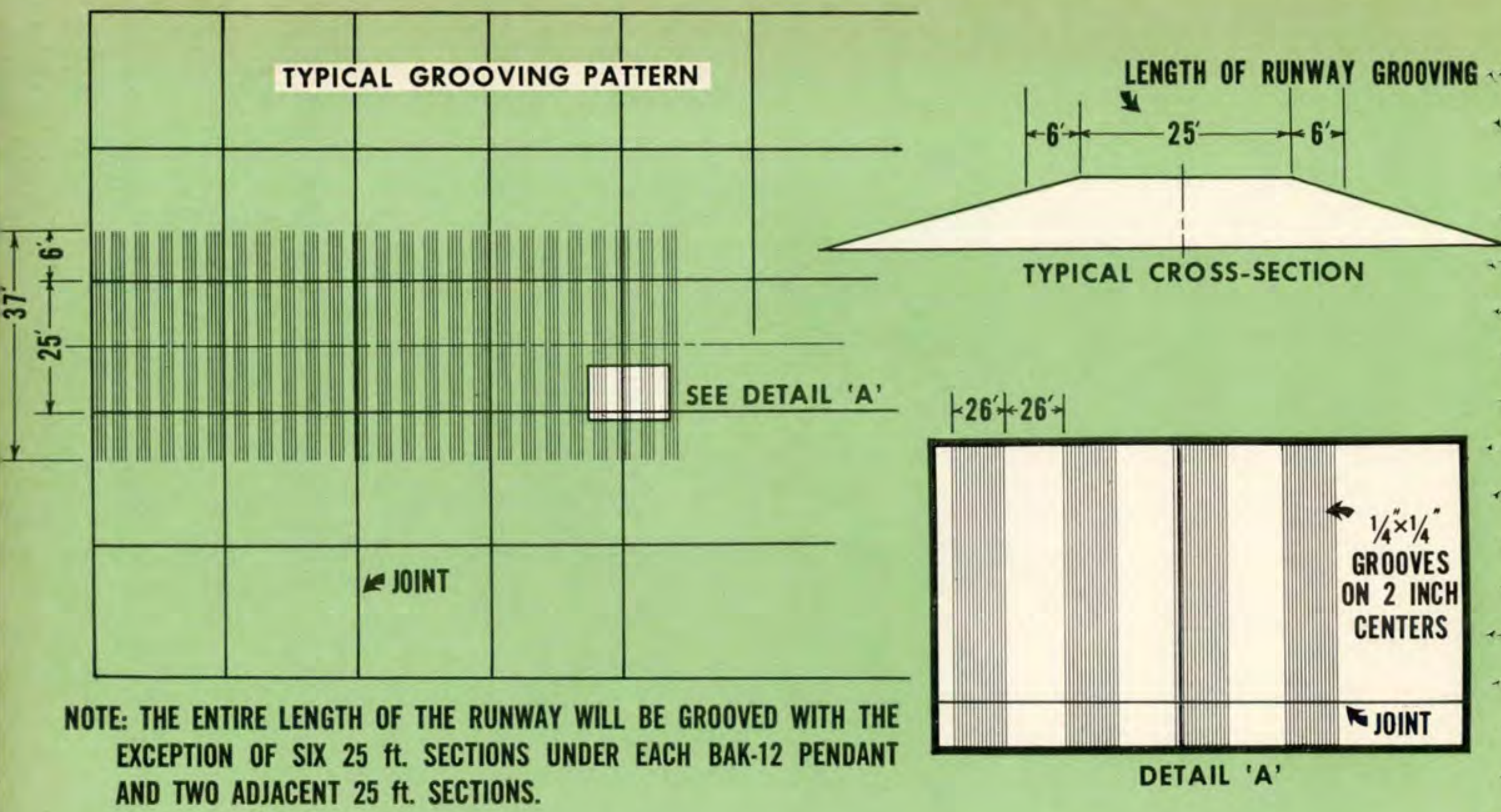
After all, it hasn't been too many years ago that only a couple of bicycle mechanics had any real faith in the idea that man could fly. ★

Lt Col Norman H. Frisbie, Directorate of Aerospace Safety

PHANTOM PANCAKES ON PHLOODED PATCHES

As of November 30th, there were nine landing roll major accidents for F/RF-4 aircraft in 1965-66. Only one accident was out of the combat zone and all but three were on a wet runway. If you have flown the F-4 in SEA, you can stop reading because your wet runway landing experience makes this article "old hat." What is said below may be important to the rest of us. In any case, if you ever plan to land an F-4 on a wet runway, the following will serve as a reminder for wet runway landing procedures.

There was an excellent article, "The F-4 and a Wet Runway" in the June '66 issue of AEROSPACE SAFETY. The procedures recommended in that article are still



valid. Recommend you dig up an old copy of that issue and review it for a good background in wet runway landings. Also, there is a good article on the F-4 anti-skid system on pages 81-84 of "Tiger Talk." The Directorate of Aerospace Safety is in process of purchasing over 1000 copies of this McDonnell publication for issue to each F-4 driver. Distribution is scheduled to be made to each base in the near future.

The AEROSPACE SAFETY article included a discussion on three-groove tires that requires clarification. The old three-groove tires were ineffective, but the new, wide three-groove tires (with the same stock number) and some four-groove tires are now being utilized throughout the Air Force and they do reduce the hydroplaning effect.

In SEA, directed times over a relatively small target area result in considerable numbers of aircraft being in the same area at the same time. This causes saturation of air refuelings and recovery facilities such as GCI and GCA, all of which depletes normal recovery fuel loads. The facilities saturation, monsoon weather, and airfields with facilities substandard to ZI criteria, coupled with known F-4 directional control problems on wet runways, taxes supervisory decisions and pilot ability to the maximum. All of this makes landings, at best, hazardous. For example, four of the seven SEA landing roll accidents in 1966 were critically short of fuel.

Low pilot experience is evident in only one 1965 and two of the 1966 landing roll accidents. Without a statement in the Accident Report (Form 711) as to how much front seat time former rear seat pilots have, it is almost impossible to determine aircraft commander (A/C) experience. Review of Form 5s does not give front seat time since crews split pilot/copilot time and landings. When 711s are not available, A/C experience is frequently estimated. Accident reporting messages should state A/C experience and a change in the directives should be forthcoming.

Transverse runway grooving has been used in the RAF in England and proved effective at two SEA bases. (See figure above for typical runway grooving.) Pilots state they can feel the difference in braking effect when contacting the grooved portion of runways. NASA at the Langley Research Center, is currently conducting tests on this feature and informally reports considerable reduction in hydroplaning. This NASA test may also result in new tire tread design, determine useful wear of existing tire treads, and possibly design changes in anti-skid and nose steering. There are many unknowns on the effect of friction of tires on wet runways that this test may resolve.

Five, and possibly eight, of the 1966 F-4 landing roll accidents probably could have been avoided had mid-field operational arrestment gear been available and had pilots *planned* to use it. The Pentagon is monitoring a new Air Force operational barrier development that will take all fighters at all reasonable loads and speeds. Fourteen of these barriers are programmed for SEA by December 1967. However, the arresting gear currently used by Marine F-4Bs (M-21 or M-44 barriers) is suitable for F/RF-4Cs at this time due to the design strength of the tailhook. Existing Air Force barriers, such as the BAK-9 or 12, are unsuitable due to the extensive recycle time (4-5 minutes) and wear on gear not designed for constant use. Training and manning of barrier personnel requires attention, since the operational concept will be similar to Navy carrier landings. Barrier crews should be allowed to meet aircrews to discuss problems. Barrier crew to aircrew hand signals or light signals should be established. After engagement, as the aircraft rolls backward, the ground crew want pilots to hold their brakes, raise their hooks and then taxi. Barrier crews should be briefed on standard ground signals.

Barrier engagements are a matter of course for F-4 drivers in SEA. For instance, there were 100 of them between 1 January and 30 June 1966. With the installation of operational arrestment gear at midfield for all F/RF-4 "patches" in SEA by early '67, it will be common for every crew to experience at least one or two arrested landings. In SEA, barrier crews man equipment during inclement weather, but if notified early enough, they are available to assist crews any time they are needed. PACAF has forwarded the following discussion of barrier engagement procedures to SEA units. These procedures were prepared by a PACAF staff officer who has completed a SEA tour in F-4Cs and has made over 40 arrested landings:

PRIOR TO LANDING: 1. Notify the Tower. Estimated gross weight for landing should be transmitted to operations. This will give Ops, referring to barrier charts, a chance to determine if a safe engagement can be made.

2. Reduce gross weight as much as possible. Maximum safe gross weight for the more commonly used BAK-12 is 40,000 pounds. Maximum speed is 190K, but these conditions should not exist concurrently. At 40,000 pounds, maximum safe engagement speed is 155K.

3. Lock shoulder harness. In tests, it was found that it is more important for the pilot in the rear cockpit to have his harness locked. The aircraft commander will lean forward, but not enough to hit the instrument panel. However, *lock the harnesses*.

4. Stow loose equipment.

TRAFFIC PATTERN: The pattern is dictated by weather conditions, and/or type of emergency. All patterns will have one thing in common – a well established "on speed" final approach so that you can pinpoint your touchdown. Gear call should be "Gear, flaps, hook and harness checked."

ARRESTING HOOK DOWN: Get the hook down early as it does not affect flight characteristics. With utility failure or purely gear problems, wait until your gear are indicating down and locked before lowering hook. You might not want the hook down with nose gear up or unlocked.

LANDING: 1. Aiming Point. Most runways, even in SEA, have multiple white rectangles painted on the end, 500 feet, 1000 feet and 1500 feet down the runway. If the barrier were 1000 feet down the runway, it would be simple to aim at one of these sets of stripes to land 300-500 feet short of the wire. Your glide path should intersect the runway at this point.

2. Touchdown. Touch down firmly, don't try to "grease it in," holding the "on-speed" light. (Use the Dash One procedures.) Point of touchdown is more important than a smooth landing. A firm touchdown will result as the tail hook normally contacts the runway before the gear, pivoting the aircraft on the hook. If you land at the correct speed, it is impossible to hold the nosewheel off. Although not recommended, the barrier has been engaged with nosewheel still in the air with no damaging results.

3. Landing Roll. Concentrate on hitting the center. Once you bring the power back to idle, take your hand off the throttle(s). With a stiff arm on the throttle, the rapid deceleration will cause an inadvertent power and speed increase which will, in turn, cause the barrier tape to stretch further. After reaching limits of the tape, it will return you from whence you came like a slingshot.

4. Arrestment. When the hook picks up the wire, the hook will be pulled up and will point straight back like the tail of a hunting dog. The hook can swivel from side to side a few degrees to compensate for asymmetrical deceleration of the barrier brakes. If you arrest at high speeds, after stopping you should expect a startling roll back of approximately 100 feet. Unless you are prepared, you will not be able to directionally control the aircraft. If you are confused during the roll back, don't attempt to correct any deviations of heading. Keep your

feet off the rudder pedals. If you do decide to use nose wheel steering, a simple rule of thumb is: If the nose is pointing left, use left rudder and vice-versa to straighten the aircraft out. If a new tape was installed on one side only and an old tape on the other, you will have slight asymmetrical stretching and contracting.

5. Post-Arrestment Procedures. Raise your hook, if possible, as you roll back. This will simplify the ground crew's task. If you forget and the cable is firmly against your hook, you may, *if pre-briefed and coordinated,* add power, stretch the tape just enough to gain momentum for a roll back, then raise hook as you roll rearward. Your ability to get the hook off the cable quickly might prevent diversion of airborne aircraft. Before taxiing, obtain clearance from ground crew to do so.

6. Other Comments. After experiencing an arrested landing, aircrews should discuss problems encountered at pilot meetings, briefing, and in conversation. Every F/RF-4C pilot in SEA should be thoroughly familiar with arrested landing techniques.

TAC has recently directed three short field (wet runway simulation) landings for all SEA replacements. This may blow some tires, delay traffic on single runway training bases, and cause brake wear, but it will give future SEA pilots required confidence and experience. One-half flap practice approaches should also be made for utility hydraulic failure landing simulation. This will assist aircrews in touching down at the desired point on the runway for barrier engagements. Approach end engagements are recommended when utility hydraulic failure occurs.

The cause of problems in directional control on wet runway landings has not yet been scientifically determined. The wide gear and low pressure tires providing a large skid surface have been discussed. However, the Marine and Navy F-4Bs with the narrow, high pressure tires have also had the same problems on some runways. They have had six wet runway landing accidents this year. The F/RF-4C anti-skid system is supposedly one of the best systems available and none of the 1966 accidents have been attributed to it. The F-4C has had a history of hard-overs with nose steering due to water in potentiometers causing false signals. This has destroyed pilot confidence and many experienced pilots violate the Handbook instructions by using this system only at very slow speeds or when absolutely necessary to straighten a swerving airplane. Director of Aerospace Safety recommendations concur with our "old heads" and differ from the Pilots' Handbook and the June '66 article only on use of this system, i.e., the Handbook and the article say to use nose steering before brakes on wet runway landings. When the nose steering system is upgraded by TCTO 608 including oil-filled potentiometers, the Dash One procedure is appropriate. By the publication date of this magazine, these TCTO kits should begin arriving in the field.

Emphasis is needed to instruct pilots to jettison the drag-chute in a crosswind as soon as the opening shock has slowed the aircraft and before it gives a skidding vector. Use of differential power is demonstrated in CCTS and RTUs but no evidence is available of its use in the F-4 landing roll accidents. The F-4 rain removal improvement was identified two years ago, but no "get well" date is available at this time. The Engineering Change Proposal (ECP) is stacked up awaiting tests with other high priority items at the Naval Test Center at Patuxent.

The following procedures do not differ from the wet runaway landing procedures in the Flight Manual except for use of nose steering on unmodified aircraft. These procedures merely amplify and explain what is already in effect:

- Fly the "on speed" approach according to the Flight Manual and make a no-flare, spot landing. This type of landing will dissipate five to ten knots speed and assist in maximum anti-skid braking by bringing wheels up to speed immediately.

- Hold the stick full aft during the landing roll. Full flaps and the stick full aft provide maximum aerodynamic braking and increase the weight on the main gear, allowing maximum braking effectiveness.

- Deploy the drag-chute upon touchdown and immediately depress and hold the brake pedals to full deflection as soon as the drag-chute is deployed. The anti-skid system is designed to operate in this manner and will have the maximum effect only when fully applied.

- Do NOT use differential braking while rolling straight. Use nose wheel steering if aircraft begins to swerve. Due to the history of occasional "hard-overs" during taxiing, the maintenance effort should assure that nose gear steering potentiometers are sealed with water-proof compound, and potentiometers should be covered when the aircraft is on the wash rack. When the system is updated with oil-filled potentiometers, the system should have reliability to dispel all fears from aircrews.

- Use all efforts to stay on the runway including the use of differential power and jettisoning drag-chute in a crosswind. If skidding sideways begins, a quick and nearly full "blast" on the correct throttle will assist in directional control. Application of differential power may increase landing roll speed, but it is better to take the barrier than to go off the runway.

• With terminal barriers installed, pilots must be cautioned against complacency with a moderate landing roll speed toward the end of the runway. Unless normal taxi speed is obtained well in advance of the barrier, the tailhook should be dropped in anticipation of a barrier engagement. Remember, it normally requires about four seconds for the hook to contact the runway.

• Supervisors of flying should continually keep in mind availability and status of diversion airfields with the probability of many barrier engagements closing home airfields during periods when runways are wet. This problem should be eliminated when operational arrestment gear is installed. However, adequate spacing will be necessary between aircraft on final approach.

In response to the contractor's investigation of wet runway landing characteristics, a survey of opinions of test pilots from the Navy Plant Representative Office at McDonnell was made. Each pilot contacted had over 1000 hours in an F-4, including acceptance flight testing of F/RF-4Cs and Ds at the plant. All these test pilots agree unanimously on the following:

• Landing the F/RF-4C/D (ashore) with anti-skid working, regardless of runway condition, instills greater confidence than does landing the F/RF-4B under the same conditions.

• Braking conditions are poorest during a short interval following commencement of a rain shower.

• Braking conditions are worse during a drizzle or light rain than during heavy showers.

• Braking improves somewhat as aircraft velocity decreases.

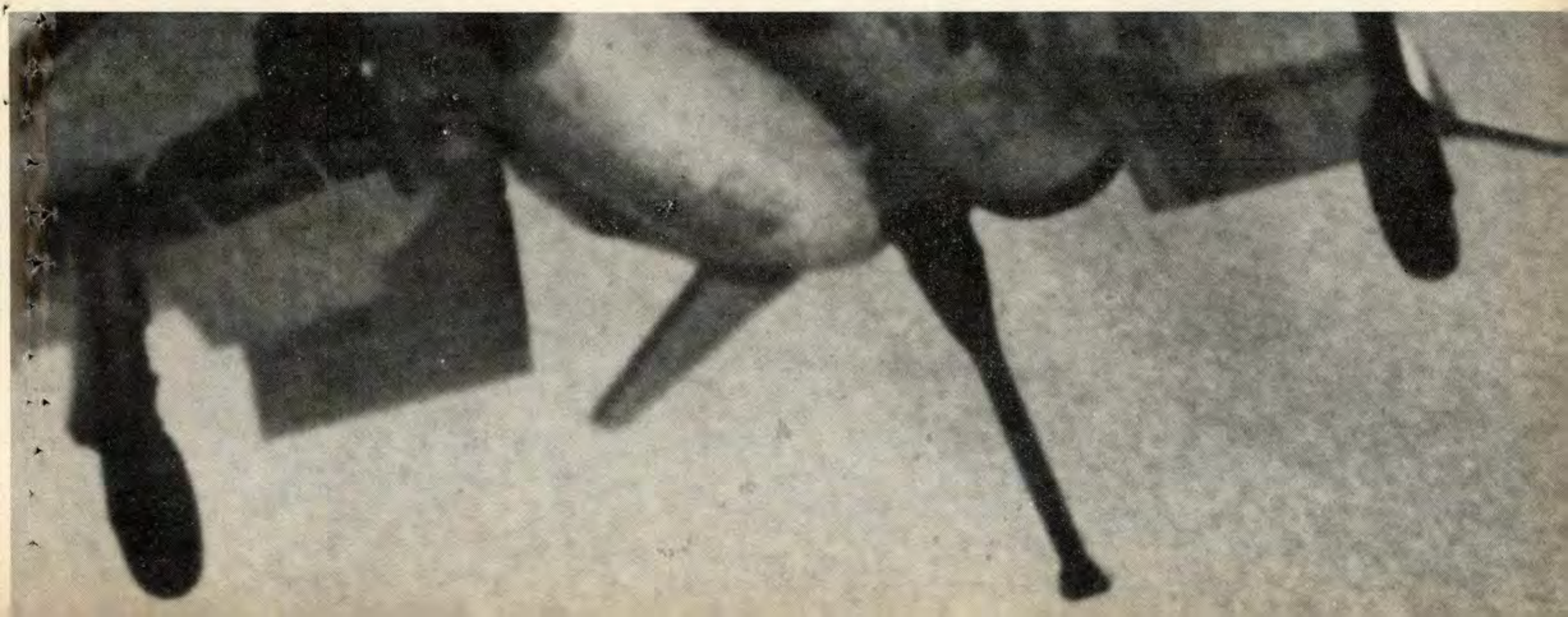
• The most reassuring factor during wet runway landing is the knowledge that the arresting gear is rigged and ready.

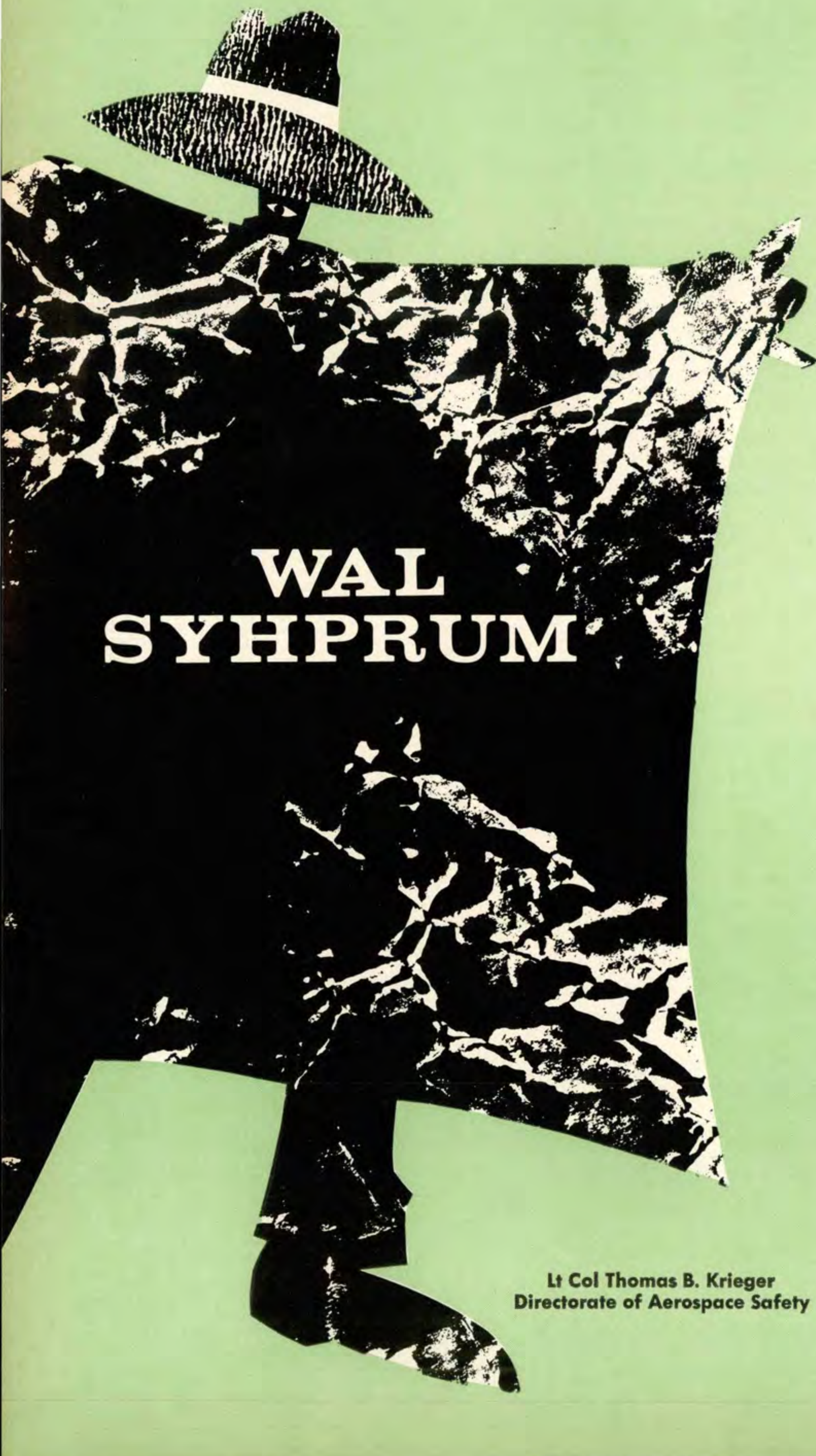
On the subject of use of differential power, some of these Navy pilots reported: "One situation occurred during wet runway conditions where all means of steering — brakes, rudder, spoiler, and nose wheel steering — were ineffective. The drag-chute failed to deploy and a tire was blown on touchdown. Differential thrust was applied at approximately 80 knots and was responsible for yawing the nose of the aircraft enough to allow application of maximum power to get the aircraft airborne before skidding off the side of the runway. On the ensuing landing attempt, differential thrust was again used to control the aircraft down the runway and into a successful BAK gear arrestment.

"The other two situations in which differential thrust steering was used resulted from utility hydraulic failures. Differential steering alone was utilized at 80-90 knots to overcome slight crosswinds and keep the nose of the aircraft aimed at the center of the mid-field arresting gear.

"Differential thrust steering was reported to be very effective; however, its use must be anticipated if it is to be used safely. Initial response is slow but once the effects begin to be felt in the cockpit, the aircraft responds in a fairly positive manner. This type steering, and the rate at which it acts on the aircraft, at both landing rollout speeds and taxi speeds is very similar. An excellent feel for it can be obtained while taxiing with dragchute deployed in a crosswind. However, this is not recommended on a narrow taxiway nor where insufficient distance is available to overcome the acceleration produced."

In summary, it is not easy to always land an F-4 on a wet runway without an "unprofessional" sideskid now and then. In SEA, or any place where runway shoulders are questionably safe and a barrier is available, take all possible action to stay on the runway and HOOK THAT CABLE! ★





WAL SYHPRUM

Lt Col Thomas B. Krieger
Directorate of Aerospace Safety

The more astute (my boss likes that word) student of the English language will immediately recognize the words as Murphy's Law spelled backwards. Murphy's Law is well known, which in itself is bad enough, but in disguise it becomes even more insidious.

The real subject of this article is supervision or, better stated, "the lack of supervision" that can creep into a task without being recognized. Under normal circumstances, everyone knows who his boss is. He is the guy who makes out your report card, pats you on the head, listens to your problems, and occasionally gives you the devil when things don't go right. But when the circumstances are not quite normal, sometimes it becomes difficult to decide who is the boss. When this happens, the accident potential curve turns up and WAL SYHPRUM takes over.

Let's take the hypothetical case of the wreck of the SST (Super Slick Transport) that was crewed by Sgt No Abort. No Abort was proud of his position and determined to live up to his name. I might add that normally he was a meticulous individual, having great pride in his work, exceedingly safety conscious, and a good supervisor. He frequently joked with the other troops by reciting the chain of command from the commander-in-chief down to his immediate supervisor. He really knew who his boss was.

No Abort departed his home station early one morning on an extended cross-country flight. There were two quick stops en route—so quick, in fact, that he had only time enough to service the aircraft before Captain Eager Beaver was back in the seat ready to leap off again. It was a long day. He was really tired and hungry when they arrived at Boon Docks AFB (definitely not included on the Rex Riley Transient Services Award list) in the middle of the night to RON.

One engine had been running a little rough during the last few hours of flight so No Abort decided he had better take a look at it, just to be sure it was okay for an early morning takeoff. Flashlight in hand, he crawled up on the wing and by straddling the nacelle and straining his eyes, he was barely able to see there was actually an engine under the cowling. All by himself, at this point he was both the supervisor and worker. Wisely, he decided his actions were not in the best interest of good maintenance and safety—besides, he couldn't see a darn thing—so he would try to get the aircraft moved into a lighted hangar. Boy, was he tired, and darn near starved to death!

After walking about a mile to the transient alert shack and administering a few sharp jabs to the ribs of Sgt Night Shift to wake him, No Abort told him of his desire to move the aircraft into a hangar. Night Shift informed him that only he and Airman Kan Do were on duty but they would be glad (if they really had to) to help move the aircraft into a hangar, even if they had never towed one before. No Abort would have none of this slipshod operation and so informed Shift. However, he did want the aircraft moved into the hangar so he could check the engine and make his takeoff time. Shift finally agreed to round up a towing crew and do the job. No Abort walked back to the SST and sat down in the pilot's seat, checking with his flashlight to make sure the hydraulic brake pressure gage was up, and decided to rest his eyes while waiting for the towing crew.

Night Shift was stuck with the job of finding a towing crew so he sent Kan Do to the coffee shop to find some volunteers. On arrival at the coffee shop, luck was against Kan Do; he could find no one interested in helping with the job. He thought a cup of coffee might change his luck and sure enough, it did. After about an hour, one of his buddies dropped in, Airman Hot Rod, who was always interested in any job that allowed him to display his driving skill.

With Night Shift and Kan Do on the fenders of the towing vehicle, Airman Hot Rod floorboarded the accelerator and proceeded to the SST, with the tow bar banging and clanging behind. Pangs of conscience bothered Night Shift as he thought of the towing checklist left behind in the shack, which led him to shout, "Does anyone have a whistle in his pocket?" Kan Do gave him the "thumbs up" sign and shouted in return, "Sure is a nice night."

On arrival at the aircraft, Hot Rod gave the "shave and a haircut" signal on the horn to announce their presence and hookup was made. Kan Do had difficulty getting the tow bar locking pin to seat; in fact, it just would not fully engage. Seated or not, it would probably work, besides it was a good feeling to do a job and not have the Sarge looking over your shoulder. While the hookup was in progress, Night Shift was standing near the cockpit window engaged in a conversation with No Abort, who was wiping his eyes and inquiring if Shift happened to have a sandwich in his pocket.

Hot Rod was getting impatient with the delay and yelled, "Let's get this thing moving." Kan Do replied, "Go!" With this, Hod Rod reverted to his school days when every muscle in his body would tense upon the starting line of the 100 yards dash waiting for that magic word "Go!" The accelerator of the towing vehicle was again floorboarded but there was disappointment when the tires didn't squeal at the start. However, the aircraft was in motion and it didn't take long to get it rolling fast enough to leave Night Shift trotting far in the rear of the left wing. Kan Do also had difficulty in keeping up with the aircraft, so with a burst of speed he caught up to the towing vehicle and jumped back on his fender perch.

Just a short recap at this point, while the SST is moving down the ramp and is still in one piece:

- Sgt No Abort is riding the brakes which have bled off all hydraulic pressure during the wait for the tow crew.
- Sgt Night Shift is running along in back of the aircraft.
- Airman Kan Do is saving shoe leather and energy, by riding on the fender of tow vehicle.
- Airman Hot Rod is getting maximum performance out of the tow vehicle but cannot understand why the darn thing is so slow.

The towing operation progressed smoothly until halfway around a sharp right turn into the hangar, when the tow bar disconnected. The rest of this fantasy I leave to your imagination. But my imagination tells me No Abort suddenly lost both his appetite and that tired feeling, and as the sickening sound of crinkling metal filled the air, began to wonder just who the devil was in charge of this mess.

The wreck of the SST was a fantasy of obvious errors, but just how close does it come to reality? The story could have stopped at any point that a little supervision was exercised. A supervisor, of any job, has a duty to make himself known to his subordinates and control the operation for which he is responsible. If a situation develops where there is a question as to who is boss, the accident potential soars. These situations can develop, especially when you are put into a strange environment or when the circumstances are not those under which you normally work. Guard against the unusual. When supervision breaks down at any point, it has a way of compounding itself until errors are no longer recognized and WAL SYHPRUM takes over! ★


USAF
U.S. AIR FORCE

KC-135 FLIGHT CONTROL SYSTEM INVESTIGATION

PHASE II REPORT

Lt Col J. D. Oliver, Jr.
Directorate of Aerospace Safety

A command level conference held at Headquarters OCAMA on 16 March 1965 established further actions to be taken during Phase II of the investigation of certain KC-135 major accidents. The following is a report on what has taken place since that meeting.

One action authorized by AFLC, SAC, MAC and OCAMA representatives was an expanded study program to include an analysis of the flight control systems to determine if there were any significant discrepancies that would contribute to loss of control of the aircraft. The scope of the Phase II investigation included Flight Computer Analysis, Performance Analysis of Accidents, Controllability Flight Tests, Power Rudder Investigation, Environmental Evaluation of Hydraulic System, Analysis of Weight and Balance Procedures, Evaluation of the Airspeed System, Analysis of the "Q" Spring System, and Flight Handbook Notations.

The purpose of the flight path computer study was to define any possible control inputs and reduced thrust conditions which would duplicate the flight paths of the aircraft involved in two accidents. Analysis of one of the accidents revealed no single failure would duplicate the flight conditions. A dual malfunction of either multiple thrust loss or a combination of thrust loss, control malfunctions, and improper pilot actions would have been necessary to duplicate the aircraft flight path. While it was agreed that exceeding structural limitations caused separation of engines in the second accident, a study was made of other factors that could have contributed. The only failures considered relative to this accident were those associated with loss of feel in the rudder control system. If the pilot attempted heading changes, loss of feel could possibly lead to a series of improperly phased rudder inputs. Improperly phased rudder inputs can excite Dutch Roll to serious proportions. The simulator studies showed that it was highly improbable that a single failure or crew error caused either of the accidents.

Flight tests were performed at Edwards AFB in a KC-135A from the SAC fleet. A total of 83 flights and 179 flight hours were required to complete the test objectives. No major problem areas of aircraft handling characteristics or system design were uncovered during the tests.

Some engineering change proposals (ECP) to increase system efficiency and dependability were approved during the course of the tests. These included: (1) ECP 316—the power rudder shut-off valve is being relocated "down stream" in the hydraulic system to allow immediate reversion to manual rudder during all phases of flight; (2) ECP 319 – the polyethylene tube in the "Q" spring system is provided with a rubber hose splice to alleviate "clamp-up" and temperature caused stress concentrations; (3) The power rudder hydraulic control valve "spool to sleeve" diametric clearance will be increased to make the valve more tolerant to contamination.

Other changes recommended or developed during the investigation are presently under study. These are: A flight test recommendation to remove the engine fire warning lights from the light dimming circuit; ECP 339 – modification of the power rudder pressure mode control switch to limit actuation by flaps alone in lieu of both flaps and airspeed to lessen the severity of a possible hardover rudder at low airspeeds; ECP 341 – installation of an automatic hydraulic system priority valve in the right hydraulic system to insure the hydraulic demand of the power rudder is satisfied before the air refueling pumps.

The investigation disclosed no major flight control design discrepancies or adverse flight handling characteristics of the aircraft. KC-135 flight control design, flight handling characteristics and over-all flight performance, including high gross weight capabilities and emergency operation procedures, were reconfirmed throughout the tests and are considered to be reliable. ★

AEROBITS

THE FIGHTER HIT JET WASH during roundout. The left wing dropped, the nose rose slightly and the bird fell to the runway. The hard touchdown caused about 100 man hours worth of damage and should cause all fighter pilots to review the techniques which will preclude similar mishaps. These techniques are to maintain high RPM, adequate airspeed and proper spacing. Don't forget that calm wind conditions accentuate jet wash dangers.

TIMELY REPORTING OF IN-FLIGHT AIRCRAFT EMERGENCIES. "Response by ground (helicopter) emergency rescue forces is proportional to the forewarning received." The F-102 declared an emergency and was making a landing with primary hydraulic system failure. This required immediate scramble of the HH-43B local base rescue helicopter. In the haste to get airborne with the fire suppression kit, the pilot inadvertently took off with the APU cable still attached to the helicopter. Scratch one helicopter for rescue coverage because of substantial crash damage. The '102 landed without incident.

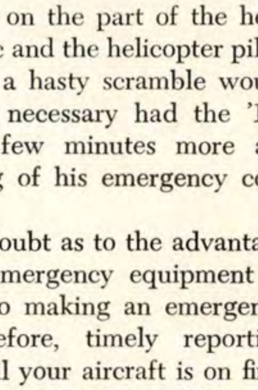
In this accident the cause was clearly personnel error on the part of the helicopter mechanic and the helicopter pilot. However, such a hasty scramble would not have been necessary had the '102 pilot given a few minutes more advanced warning of his emergency condition.

There is no doubt as to the advantage of having all emergency equipment in position prior to making an emergency landing. Therefore, timely reporting (don't wait until your aircraft is on final approach or low on fuel) of inflight aircraft emergencies is imperative.

Lt Col Robert E. Englebretson
Directorate of Aerospace Safety

THE MARSHALLER, standing in the right front position of the aircraft, indicated that the right wing had sufficient clearance from the wing of the next aircraft, and the student pilot continued to move forward out of the parking spot. The initial turn was too shallow so the signal was given to sharpen it up. After the student had applied more power to execute the maneuver, the instructor pilot became concerned that the jet blast from his aircraft would blow a nearby B-4 maintenance stand into the fuselage of the aircraft to the right. He retarded the throttles, applied brakes and told the student to stop. Although no impact was felt, 50 manhours were required to repair the wingtip of the aircraft.

Crowded ramp conditions at this base necessitate careful positioning of parked aircraft and both of these were cocked to the right. This caused the moving aircraft to pull closer to the parked machine on its right before a left turn could be



established. If aircraft are centered on the parking line and if they taxi with the nose wheels tracing the taxi lines, there is more than 25 feet clearance between the aircraft. Other factors contributing to this incident were (1) the increased turning radius of approximately six feet that results from the arc of a swept wing aircraft, (2) the initially slow rate of turn by a student pilot on his second flight in an aircraft, (3) indication by the aircraft marshaller that there was sufficient clearance between aircraft, (4) the distraction of the pilot caused by a maintenance stand parked near his right wingtip, and (5) the habit pattern established by taxiing many times from the same parking spots without difficulty.

Because of this incident no one will taxi from these parking spots unless wing walkers are present between aircraft. If there is any doubt, a crewmember will go out and check the clearance distance. Maintenance personnel will discontinue the practice of leaving AGE equipment in the vicinity of parked aircraft. A new parking plan is being developed which will increase the distance between aircraft.

We can all profit by carefully examining the above cause factors, contributing factors and remedial actions. Of course, optimum remedy is to spread the birds out so that no special precaution is required. When this isn't possible, we have to fall back on the old, tried and proven safeguards.

THUNDERSTORM TERMINOLOGY. Some time ago Colonel H. C. Norman, Commander of the 182 Tactical Fighter Group, ANG, wrote recommending that terminology used in Section II, DD175-1, be changed. This is the section of the flight weather clearance used by the forecaster to denote thunderstorm activity.

Colonel Norman devised a brief test which he gave to each pilot in the group to determine how they interpreted such terms as *isolated, numerous,* etc. The variations in answers had a wide range. Hence the Colonel's recommendation that the probability be stated in percentages which could be interpreted in only one way.

We bucked the idea to Air Weather Service and got the following answer from Colonel Lowell Stiles, Hq AWS.

"At the time a copy of the ANG 182 Tactical Fighter Group letter of 22 Jul 1966 reached this Headquarters, we were preparing a proposed revision to DD Form 175-1. As a direct result of that letter, we are recommending that the specific thunderstorm forecast percentages be included on the form, in addition to the terms already widely used. You may be interested in perusing our proposed revision of the Form 175-1.

"Just as AFR 60-16 is tied closely to FAA Regulations, AWS weather support to flight activity is tied closely to the national practices of the Weather Bureau. This is to assure that Air Force pilots enjoy minimum confusion when receiving weather service from AWS, FAA, or Weather Bureau personnel or facilities. For this reason we use the thunderstorm coverage terminology in question. Our terms are defined in AWSM 55-8, Weather Warnings.

"Appreciating the value of education, we will take internal action to prompt our forecasters to advertise the specific meanings of these thunderstorm terms during flying safety meetings, instrument school lectures, weather briefings, and in articles for the various safety publications.

"In event you correspond further with the ANG 182 Tactical Fighter Group, extend our appreciation for being safety-conscious about terminology that, if misunderstood at the wrong time, might lead to a compromising situation." ★

Fallout
LETTERS TO THE EDITOR

TWO-WHEEL VEHICLE SAFETY

SSgt H. A. Cook's letter ("Two For . . ." in FALLOUT, January issue) was read with interest. His observation regarding autos pulling out onto a through road from a side street in front of two-wheel vehicles is an interesting and thought-provoking one. However, I feel he missed the point as to the reason why. Let's face it: two-wheel vehicles just are not seen by other drivers.

A few years ago at an airplane patch in south Texas we had a sizeable number of collisions involving two-wheel vehicles and cars and trucks. The other driver invariably claimed he did not see the scooter/cycle. We urged our two-wheel vehicle operators to operate with lights on during the day. The following months saw an abrupt decline in this type of mishap. I can't claim that the use of lights was responsible—perhaps our drivers became more defensive—but I'd suggest that anyone riding a scooter or cycle operate with headlights on and see for himself whether the incidence of near-misses does not lessen.

Incidentally, a new change in New York State traffic laws forbids motorcyclists passing on the right or traveling between lanes of traffic. Also, effective 1 January, New York requires the wearing of an approved helmet, and use of goggles if a windscreen is not installed.

In spite of all efforts through legislation and education of the motoring public, the two-wheel vehicle operator can best avoid trouble by knowing his machine and its limitations and capabilities, obeying local traffic laws and last, but not least, using "common sense."

Carl F. Pommer
Ground Safety Officer
4624 AB Sq (ADC) Hancock Fld
Syracuse, New York 13225

THE AEROSOL BOMB

I should like to reprint the article "Beware the Aerosol Bomb," (October 1966) by SMSgt Edward M. Parr. If permission is granted, approximately 200 copies of the article would be reprinted in its entirety and distributed locally to all personnel in VS-28. Appropriate credit acknowledgment to your magazine would be included in the reprint.

LCDR T. W. Entwistle USN
Air Anti-Submarine Sq 28
FPO New York 09501

Glad to oblige.

DIG, DISTILL AND SURVIVE

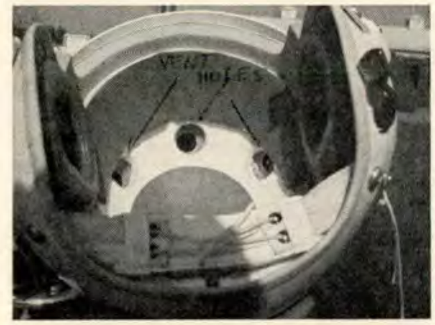
I found a very good article on page 7 of the July, 1966 issue, titled "Dig, Distill and Survive." In the diagram at the end of the article a flying helmet is shown to catch the water. Unless one looks closely he would not see the bag or ration can over the earphones. If an aircrew member uses his helmet by itself the water would run right out the top (which is the bottom of the container in the diagram), since the HGU-2AP and HGU-2A/P helmets currently in use, have vent holes in the top front. Consequently, if the helmet is to be used as a water container, these holes should be plugged. Also, *remove* the helmet pads, for they'll soak up much of the water.

Do you think you should print a clear, enlarged diagram of this solar still again, or perhaps run a short article in the Personal Equipment Notes?

I am the Life Support/Personal Equipment Officer of the 363 TRW and regard AEROSPACE SAFETY Magazine highly. Inclosed is a picture of an HGU-2AP helmet showing the drain holes that should be plugged, if the helmet is to be used as a container.

Keep up the good work.

Capt Earl A. Kelly
Hq 363 TRW, DCOT-P
Shaw AFB, South Carolina 29152



Captain Kelly points out a potential problem involving the use of an HGU-2A/P helmet to catch water while creating a desert survival still. As he points out, the helmet by itself cannot be used because of the vent holes and other leak sources. Some other means of catching water must be installed in the helmet. The water bag in the SRU-16/P minimum survival kit would be a starter. Remember, if you need a desert still, then you had best make sure that every bit of water generated is saved for consumption.

AVAST, YE SWABS —

This is a somewhat late response to your October 1966 article entitled "Avast, Ye Swabs! We've Been Torpedoed." As you mentioned, the Admiral's pilot did goof! If he was flying the same SID the T-33 was flying, he should have also been outbound on the 137-degree radial. Or, if not flying an outbound course of 137 degrees, he was obviously eastbound in some direction since the T-33 was flying a course of 137 degrees and from the description of the strike, the T-Bird hit him at about a 45-degree angle. VFR altitudes eastbound are the *odd* altitudes plus 500′, therefore the U-11 should have been leveled off *not* at 4500 but at 3500′ or some other appropriate VFR altitude since the Navy bird was operating VFR.

We up here in the north country enjoy AEROSPACE SAFETY very much. We don't have much contact with ATC, MAC or TAC, so the articles do provide us with some insight into what the pilots in other commands and other (smaller) birds are doing. Flying is flying, and it seems that the same or similar mistakes occur in some incidents, whether the bird is large or small, fast or slow, if a pilot was responsible in some way.

I doubt very much if this is the first or even the one-hundred and first letter to reach you in response to your challenge. But if you still have that 0-1 recommendation available, I'd be glad to take it and fill in my name.

Thanks again for the fine magazine and the outstanding articles it contains.

1/Lt Dennis W. Montgomery
46th Bomb sq
Grand Fork AFB, N.Dak. 58201

☆ U. S. GOVERNMENT PRINTING OFFICE 1967 251-214/6

WELL DONE

MAJOR JOHN K. NEELY
CAPTAIN JOHN T. GRANGE

4515 COMBAT CREW TRAINING SQUADRON, LUKE AFB, ARIZONA

Major John K. Neely was the instructor pilot in an F-100F night formation checkout and air-to-air refueling mission. After completion of the mission, a TACAN penetration to home base was performed in a formation of two, with Major Neely and Captain John T. Grange flying the wing position. During rollout on final approach, Captain Grange asked Major Neely if he were on the controls. Major Neely replied that he was not; at this time the aircraft was approximately 200 feet in the air and at the field boundary, short of the runway. Captain Grange stated that something was wrong with the aircraft and that he was taking it around. Major Neely assumed control of the aircraft and analyzed that the flight control was binding and back stick pressure was ineffective. He placed the aircraft in a right bank, then applied top rudder to bring the nose up, and began to trim the aircraft. The combination of the three techniques leveled the aircraft 50 feet above the ground and to the right side of the runway. The aircraft responded to the trim movements during the go-around.

A check of the hydraulic pressure gage indicated both flight control system pressures normal. At the end of the field boundary, a turn to cross-wind was initiated. Bailout altitude was reached and Major Neely told Captain Grange to be ready to eject if it became necessary. On downwind, Major Neely told Captain Grange to recheck the yaw damper off and to pull the auto-pilot circuit breaker. An emergency was declared and a large precautionary landing pattern was flown. Final airspeed was held at 190-200 knots and at one-half mile out on final, full back trim was used. The approach was continued until the aircraft was over the overrun. At a speed of 175 knots and approximately 25 feet in the air, Major Neely retracted the flaps, which raised the nose, and the aircraft settled to the runway.

The three very timely actions by Major Neely and Captain Grange in analyzing the problem and using correct control techniques at low altitude, made it possible to avert an aircraft accident and possible loss of life to both pilots. WELL DONE! ★

TINA AND HER TIMELY TIPS

There was an aircrewman from Wheeling,
Who had a peculiar feeling.
He plowed up the ground,
For miles all around
When he approached through a very low ceiling.

IF YOU FEEL PECULIAR, SEE YOUR FLIGHT SURGEON — DON'T MEDICATE YOURSELF.

March 1967

SUNDAY	DAY	DAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Last Quarter 3rd	New Moon 10th / First Quarter 19th	Full Moon 25th	**1** SAFETY FIRST	**2**	**3** Happy Hour Pilot crashes on takeoff —found he was overloaded. 1964	**4** Col I. B. Barnstorm pioneer pilot, retires. Seat of pants worn out. 1961
5 USSR claims China isn't all it's cracked up to be. 1964	**6** Maj. H. E. Greedy has preflight check bounce. 1949	**7** come eleven	**8** Don't let your letdown let you down . . . USE YOUR CHECKLIST.	**9** First Missile Dogfight— Hound Dog and Bullpup—1963.	**10** 2Lt Irene Goodyear gives birth to bouncing baby boy. 1956	**11** Pegasus Day Party
12	**13** A3C Alfred Kilroy convicted, sentenced to clean 1,007,279 latrine walls. 1949	**14** LOOK ALIVE ACT SAFELY	**15** Beware the Ides of March . . . USE THE T.O.	**16** James Madison's Birthday. 1751	**17** St. Patrick's Day	**18**
19 Palm Sunday	**20**	**21** First Day of Spring	**22** Second Day of Spring	**23** Spring has Sprung	**24** Good Friday	**25** Little Often Annie 976 years old today.
26 EASTER SUNDAY	**27** Fred O. Dingle, jet mechanic, invents waste named after his initials. 1949	**28** Lt "Speedy" Zapmaster loses race to RR crossing by a nose. 1965	**29** Burial Rites "Speedy" Zapmaster's nose. 1965	**30**	**31** Not So Good Friday.	

HAVE ANY AEROSPACE ANNIVERSARIES? Send them to: Tiny Tina, 1002 IG Gp (AFIAS-E1), Norton AFB, Calif. 92409