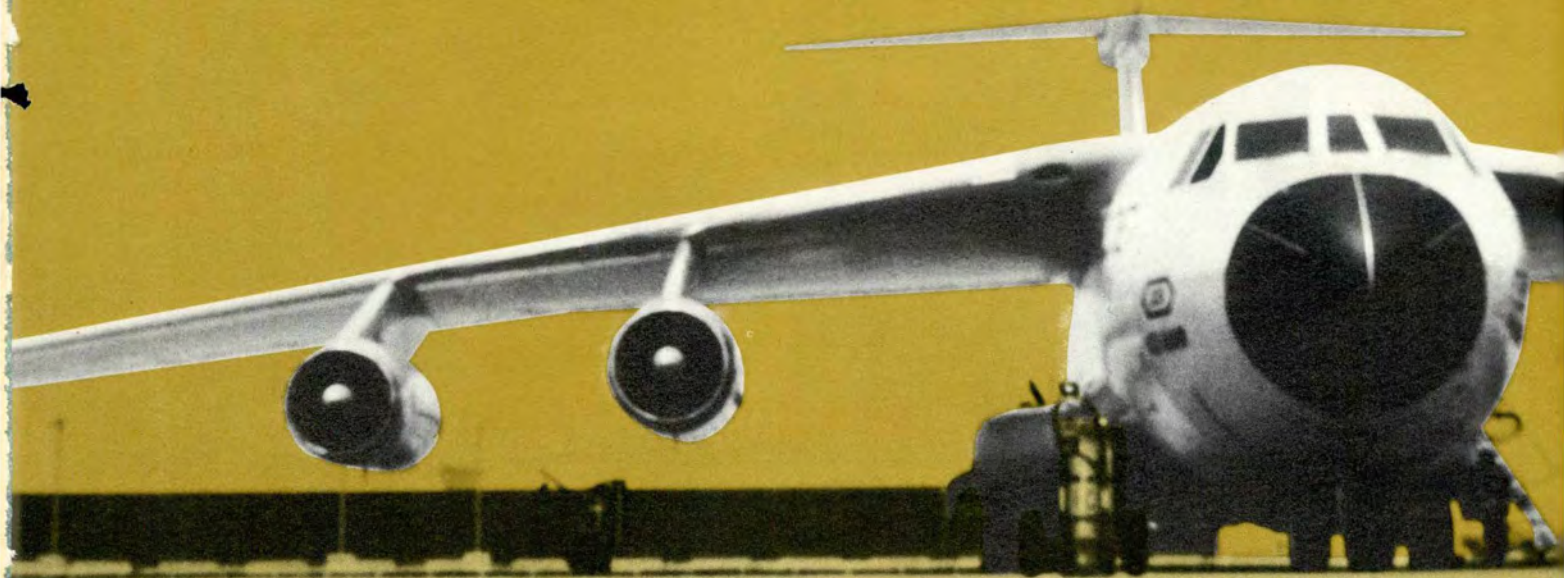
UNITED STATES AIR FORCE • AUGUST 1969

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT



FOD ... its impact on operational readiness

INCIDENT AT CCK

friend from 10,000 miles away comes home

NO SWEAT

don't blow your summer cool

HOW'S YOUR CREW COORDINATION

does the left hand know about the right?

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AUGUST 1969 AFRP 62-1 Volume 25 Number 8

SPECIAL FEATURES

REGULAR FEATURES

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August is a month that is sort of a trial for everybody. Air Force people are on the move, PCS or vacationing with the family. Manning tends to get pretty tight and the heat often dulls incentive.

These scorching hot days are hard on people and equipment. Man was designed to operate best in a narrow temperature range, and August frequently pushes temperatures past the upper limits where we operate best. Understanding this and how to cope with it is mighty important to the success of the Air Force mission. We can't shut down the shop during the height of summer any more than we can when ice, snow and freezing temperatures prevail in February.

"No Sweat," an article beginning on page 6, provides some insight into the physiological effects of heat on the human organism as well as some suggestions on how to cope with heat. Aircrews and support people both can profit from this article.

There are several informative articles in this issue. "FOD—Its Impact on Operational Readiness" contains info for both aircrews and maintenance types. "1-2-3-5—FIVE?" deals basically with checklists and their use. But the article goes into several other areas of concern to aircrews. Recommended. ★

EFFECTIVE MANAGEMENT

The war in Vietnam has re-emphasized the tremendously high cost of accidents. One of the most important lessons learned there is that, in a combat environment, we can still embrace accident prevention—call it safety if you will—and discharge our operational commitments. Our aircraft accident rate in SEA is a good illustration.

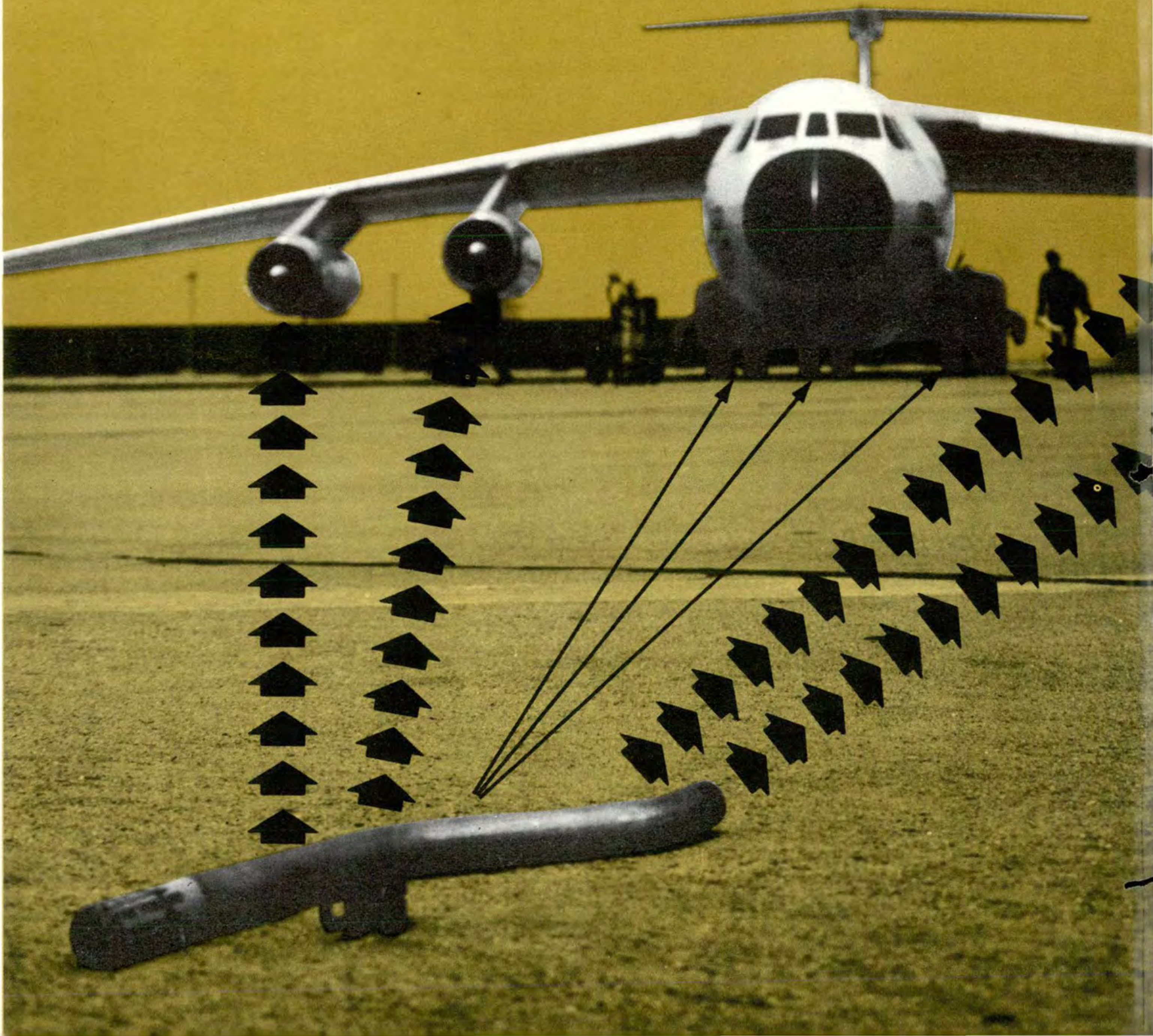
Four years ago, in the summer of 1965, we had a spiraling loss of resources, both human and materiel. The increased tempo of the war accounted for some of it—but we know that many of those losses could have been prevented. Since then the application of sound, proven principles of accident prevention to the combat situation has saved many lives and much materiel. Many of our men who have completed Southeast Asia combat tours owe their lives to this effort. And the savings in equipment on the far end of a 9000 mile pipeline is an added dividend.

Although improved operational facilities and know-how contributed to the safety program, discipline also played an important part. To the military man, discipline wears many faces and his attitude towards safety is a good indicator—a facet as it were—of an individual's judgmental maturity and his *acceptance of discipline*. To some, safety is a distasteful term having a connotation of restriction, of "can't do." On the contrary, safety, properly applied, as a discipline, should mean just the opposite. Safety stands for the application of knowledge, judgment and discipline—qualities that enable us to operate most effectively.

Simply stated, safety begins and ends with sound management practices. For commanders it means putting safety on a business basis by discarding emotional and haphazard approaches and applying scientific management principles to this business of preventing accidents. This means the effective management of all resources—human and materiel—as well as those intangibles, time and space. We are improving our management of people through proper selection, training and placement. But we cannot stop at the management level. Each Air Force man—be he military or civilian—must apply the practice of safety to his tasks in order to preserve the resources, both men and machines, that will insure the forces necessary to carry out the Air Force mission. ★

S. W. WELLS, Lt Gen, USAF
The Inspector General

FOD | It's Impact On Operational Readiness



Foreign Object Damage (FOD) costs the Air Force many millions of dollars a year in damaged and destroyed engines and tires, and contaminated systems. No one knows what the loss really is, since damage causes are subject to interpretation and there is a lack of centralized reporting.

Nevertheless, the cost is great. Consider the factors involved when an engine is damaged by FOD. There is the direct cost of labor required to remove and replace the damaged engine (40 maintenance manhours for the T56 engine, which is not a difficult engine to change).

Then the engine must be packaged and shipped to the depot for repair. Add in the cost of spare engines that must be kept on hand for such events; time spent by maintenance and safety people involved in determining the cause of the damage; manhours for tear-down, inspection and repair.

The impact of FOD goes far beyond these costs that we can measure and assign dollar values to. Commanders are primarily concerned with performing the mission for which they are responsible. Take the case of a commander who possesses 12 aircraft and must launch 10 to successfully complete a mission. If he suddenly has two of these aircraft put out of commission because of FOD, he is rapidly running out of time and other resources needed to successfully complete his task. He may not have the time to fix the FOD and he is without a spare aircraft in the event of an abort.

We can see from this example that FOD can have a large impact on aircraft in-commission rate—a measurement of a unit's potential operational effectiveness. It is a huge task to keep today's aircraft ready to fly. They are very complex, made up of a myriad of components and separate systems. Parts and systems wear out, but you can plan for this to a certain degree. You can stay ahead of the problem by performing periodic maintenance. However, FOD is not a planned event and it disrupts the orderly maintenance flow. It is easy to see that if you are tasked with a mission that has been planned with a narrow margin for maintenance failure, FOD could be the factor determining whether or not the mission is a success.

PILOT FACTOR

FOD is generally thought of as people-caused and the people in mind are maintenance types. But, as with most problems, there are two sides.

What about the other side of the house, the men who operate the flying machines? We can start with the pilots. Yes, even pilots cause a great deal of FOD. Jet engines have been known to ingest railroad tracks! (Well, at least in the form of Captain's insignia). In fact, it happened twice in two months in 1968. Pilots insist on leaving hats where they may be blown out of the cockpit when the canopy is opened. The usual route taken by the hat is direct from the cockpit to the engine intake.

Pilots have to think of possible FOD when operating on or near the ground. Birds are foreign objects and collisions with them have ruined engines, killed pilots, and caused fatal crashes.

On the ground the pilot must keep in mind that he can kick up debris with his engine blast that may damage other aircraft. He also must be familiar with the ease with which an engine can pick up objects through vortex generation. McDonnell Douglas Corporation has conducted tests of this phenomenon. They have shown that a jet engine can pick up relatively large objects: bolts, marbles, pieces of sheet metal and small rocks. If a pilot uses poor techniques during taxiing or assault airfield operations, he may provide an environment for FOD.

The operations officer has control over some situations that can lead to FOD. First of all, if he has a choice he should not expose his aircraft to an environment that could produce FOD. Assault airfields usually have objects that can cut tires or be ingested. In this case FOD may be the price to pay for mission accomplishment. Operations officers and mission commanders must not use this philosophy under training conditions when they have time to clean up potential FOD.

The operations officer has people working directly and indirectly for him who can assist with preventing FOD, for example the launch officer. He is on the flight line to assist the crews where necessary and help get them off the ground on schedule. During this travel on the flight line, he should look for potential FOD.

Working closely with operations is the Aerial Port Squadron. One of their functions is to load aircraft cargo. They can and do cause FOD by not properly preparing a load for shipment. Dirty cargo pallets can contaminate a cargo loading system, which can be critical during aerial delivery operations. If a load jams in the aircraft instead of being extracted, it may cause a fatal crash.

Safety staff officers should treat FOD prevention as an important aspect of their job. If they do not closely monitor their unit's FOD prevention program they will provide a weak link in the program. The safety officer must give the program impetus, and he must have sufficient authority from the commander to carry out his duties.

Maintenance is also in a position to cause or prevent most FOD.

MAINTENANCE AND FOD

Attitude is a key factor and this flows directly down the pipe from the commander through the maintenance officer to his supervisors and finally to the men working on the aircraft.

We often think of FOD occurring on the ramp or runway. However, the line shops, where a great deal of maintenance is accomplished on aircraft components and systems, can cause an FOD problem. Personnel working in these shops have caused hydraulic system contamination through improper procedures. A piece of lint or the adhesive from masking tape can and has caused contamination. Test stands must be kept clean. Here, hydraulic fluid should be handled in the same manner prescribed for servicing systems in the aircraft. When fabricating parts, care should be taken to assure that materials such as rivets and metal chips are cleaned out of the part to prevent FOD. Briefly, people have to realize that if objects and debris are left where they do not belong, they can cause FOD.

The line shops have specialists that trouble-shoot systems on the aircraft. They may perform maintenance without removing a component or they may remove it to the shop. While working on the aircraft they must always be conscious of creating an FOD hazard.

Crew chiefs, men who mother our flying equipment, are important in the prevention of FOD. They must be constantly on the lookout for potential FOD. Responsible for keeping the aircraft in top condition, they must be motivated to check after any maintenance to be sure nothing is left behind that does not belong there. Crew chiefs service or supervise servicing of the hydraulic and oil systems. They have used dirty can openers on hydraulic oil cans. They have "saved" partially full cans to be used again. They must know and use proper procedures to prevent systems contamination.

Then there are the men who work on the engines and propellers. Obviously their procedures and habits are critical in the fight against FOD. Lack of training, supervision or proper attitude has helped these men increase our FOD rate. Almost any copy of *Aerospace Maintenance Safety* magazine will cite evidence of this. Engine mechanics seem to insist on leaving tools where they will cause FOD. Tools are not the only problem. Loose hats, line badges, glasses, combs or anything not buttoned, snapped or fastened can cause a problem. A great deal of FOD has occurred when engines are run for system checkout. This can be attributed to lack of supervision, training and a proper attitude. PEOPLE cause FOD — the foreign object is a victim of circumstance.

PREVENTION PROGRAM

The costs for FOD can be much greater than those so far discussed. How do you place a dollar value on human life? The potential loss of men and equipment shout the importance of FOD prevention programs. Once again, it is the unit commander who must set the ground rules for an effective prevention program.

The requirement to have such a program results not only from loss of men and other resources, but also from AFR 66-33, "Preventing Foreign Object Damage to Aircraft Gas Turbine Engines." This regulation states: "An aggressive and effective FOD Prevention Program will be established at each facility which operates, has field maintenance of, or overhauls aircraft gas turbine engines."

A great deal of emphasis must be placed on flight line activities. Since that is where the aircraft are, that is where most of the FOD will oc-

Examples of items that have ruined engines. FOD, expensive, hazardous and deleterious to mission capability, can be prevented by alert aircrew and maintenance people.

cur. A unit will have to start with clean ramps, taxiways and runways if they expect to show much progress in FOD prevention.

Mechanical sweepers are invaluable when they are of the right type and used correctly in a well developed program. Needless to say, operators of this equipment must be properly trained and supervised in its use.

FOD prevention should be publicized and containers strategically located. These are things the FOD control officer should monitor.

Once an FOD program is set up, it must be monitored. AFM 66-3, "Foreign Object Damage to Gas Turbine Engines," contains an FOD Prevention Checklist. Use of this checklist will give you an idea where a unit stands. It will show trends when used over a period of time. The FOD Control Officer would be responsible for monitoring the program. He should have a maintenance background and an understanding of the FOD problem. He may be assisted by an FOD officer from each maintenance section. They can meet as an FOD Prevention Council. Meetings would be an exchange of information and suggestions for program improvement.

Aircrews must be exposed to the FOD problem. Taxi techniques are perhaps what should be stressed the most. Engines should not overhang dirt or construction areas. Even though the environment of assault runway operations is an FOD hazard, pilots can reduce the possibility of FOD. First, during landing roll, the nose landing gear is kicking up a lot of debris. Engine reversing also kicks up debris. The key factor is to come out of reverse before the debris is pulled forward of the engine intakes. Taxiing should be slow, using low power on the engines. This reduces vortex generation and the amount of debris kicked up by the landing gear.

Good maintenance procedures are needed to prevent FOD. A system for tool accountability is one of the procedures I have in mind. When a man returns from working on an aircraft does he have the same tools that he left with? ("The Million Dollar Pliers," an Air Force movie, SFP 1263, depicts the consequences of leaving tools where they shouldn't be.) A common method used to answer this is a Tool Check-off List. Another procedure is to install dust plugs in the engine intakes while working on the engine or the propeller. This reduces the possibility of anything falling into the engine intake.

Inspections are a backup for quality control and provide feedback for supervisors. Intake inspections are mandatory after engines or propellers have been worked on. It is a "last chance" to find FOD.

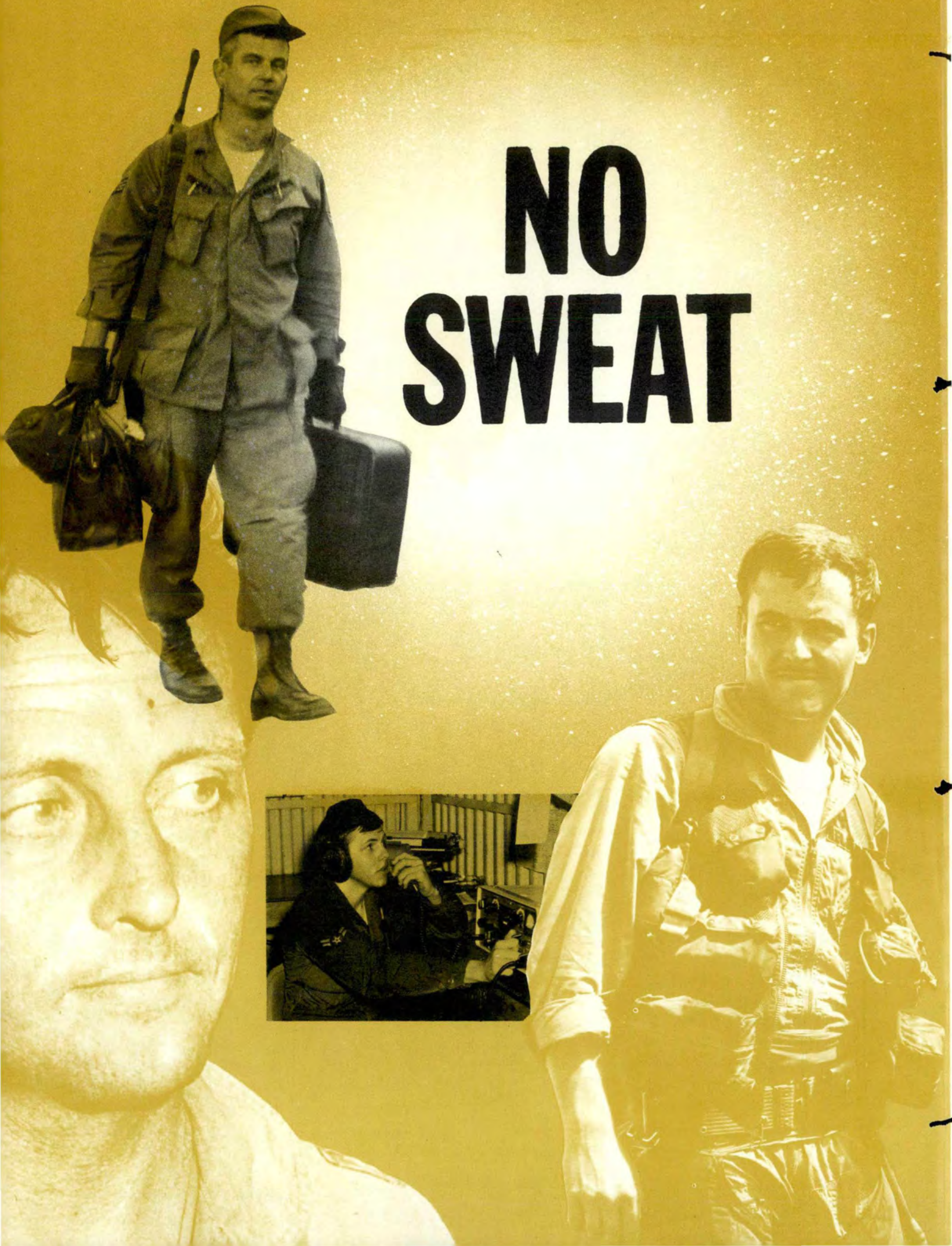
Test equipment used for hydraulics should be clean to avoid system contamination. Critical components should be protected from even the most minute particles. It does little good to wipe a part with a lint filled rag.

With the complex systems on today's aircraft it is not feasible or advisable to memorize steps to take to fix them. This is the reason for using checklists, which will standardize procedures and help guarantee quality. Safety can easily be built into checklists. Steps should be put in checklists that will check for FOD hazards.

FOD prevention is a complex problem requiring imagination and a well ordered program aimed at both aircrews and maintenance people. The rewards to be realized from a successful effort are great—as great as the cost of not preventing this insidious threat.

(This article is an adaption of a longer paper on FOD written by Capt Wharton R. Crawshaw for the Advanced Safety Officers Seminar at the University of Southern California. Ed.) ★

NO SWEAT



Lt Col Robert H. Bonner,
USAF, M.C.,
Directorate of Aerospace Safety

Amazing as it may seem, the extremes of geographical and seasonal temperatures found on this old world's surface range from −90° to +140°F. With our modern Air Force being world-wide in deployment capability, knowledge of the effects of temperature on the aircrew member will increase his comfort and survivability. Since we are presently in a season of high temperatures, we will discuss the effects of heat in this article.

Heat has physiological effects on the human body which increase the overall workload on certain organs. For example, there is an increase in general metabolism with an increase in sweating, respiration, and pulse. The increase in pulse is a result of small blood vessels in the skin dilating in an attempt to get rid of body heat, which causes the heart to beat faster to fill the dilated vessels. Associated with heat effects are lethargy and a decrease in work ability. If the heat stress is more than the body can compensate for, the normal physiologic responses can lead to serious problems. The first thing that happens is a collapse of the circulation, leading to fainting. This is a result of the heart's inability to keep up with the required workload. It also is a result of salt depletion due to increased sweating.

Another problem is heat cramps. These are painful disabling cramps involving muscles of the back, legs, and arms, and are caused by excessive salt loss due to sweating. Heat stroke is the most serious of abnormalities caused by heat. In this condition, the heat dissipating and regulating apparatus located in the brain fails. Regulation of body temperature is no longer possible. As a result, the body temperature continues to rise. As it does, certain vital centers stop and easily could be considered "cooked."

Now, let's see how the body regulates its own temperature. One method is called conduction. This is a direct exchange of heat from the body to the air as a result of the air being cooler than the body. In a hot environment, the reverse occurs; namely, heat from the environment enters the body. Another method is convection. This is a result of wind or air movement surrounding the body which, in effect, reduces the immediate environmental temperature and allows heat from the body to be dissipated into the air. Radiation is a mechanism of heat loss, again where the air is cooler than the body. In hot environments the body will gain heat from the air. The last and perhaps most important mechanism is evaporation; in other words, sweating. When an individual sweats, a heat exchange occurs which allows heat to leave the body and enter the surrounding environment. Sweating is very effective in dry climates. As the humidity of the air increases, the effectiveness of sweating decreases.

It is possible to acclimatize to heat. The acclimatization to hot environments generally is one of adaptation of the blood vessels and heart. The heart learns to compensate for the increased workload as a result of the tremendous blood flow in the skin. Also, the amount of salt that is lost in perspiration decreases so that the body conserves its salt. It usually takes one week or longer for this acclimatization to occur. During this time individuals should reduce their exposure to direct sunlight and should decrease their activities in the hot environment.

Clothing that one wears is important. It should be light weight, preferably cotton; loose fitting to allow air circulation; and a light color, since dark colors increase heat gain due to radiation.

Avoiding prolonged exposure to direct sunlight and strenuous exercise, while increasing fluid intake, can prevent the serious effects of heat and can make acclimatization progress faster. If strenuous exercise is necessary, you should increase your salt intake.

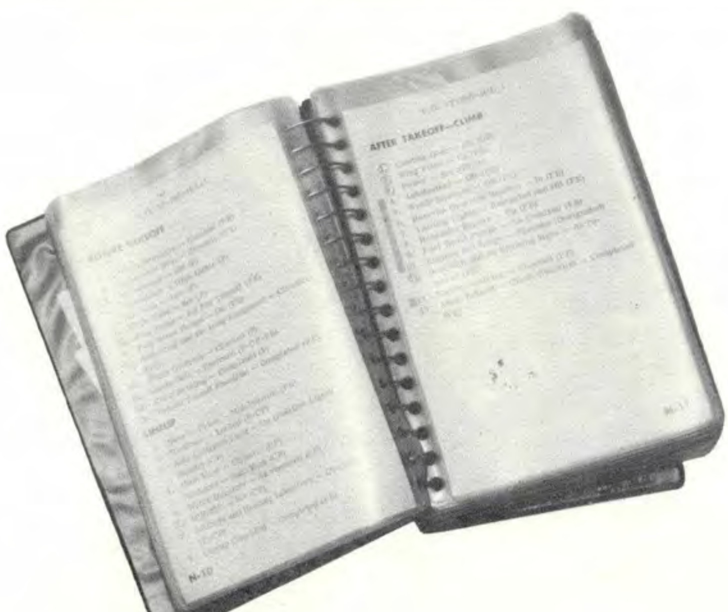
In areas of the world where extremely hot climates exist, there are individuals who are required to sit alert in aircraft. Most of our modern aircraft have excellent air conditioning systems in flight. Unfortunately, unless supported by external ground equipment air conditioning, aircraft on the ground develop extremely high temperatures when exposed to the sun. These temperatures can range from 120° to 140°F. An aircrew member sitting quietly in K-2B flying coveralls has from one to four hours tolerance at these temperatures if the relative humidity is ten per cent. As the relative humidity increases, the aircrew member's tolerance decreases. The net result is fatigue, decreased performance capability, and, if exposed long enough, even fainting. It behooves all of us who fly to be aware of the problems created by heat so that wherever possible we can reduce our activity inside the aircraft to an absolute minimum, open windows to increase air movement, and, if possible, have a source of water available to replenish body fluids that are lost due to sweating.

Summer can be fun; however, the effects of heat on bodies can cause certain problems which may jeopardize our capabilities as safe aircrew members. If we use the simple suggestions listed above, the hazards of heat can be reduced to a minimum. ★

1...2...3...

1. PROPELLERS—RPM 2400
2. WING FLAPS—APPROACH SETTING
3. LANDING LIGHTS—AS REQUIRED
4. LANDING GEAR—DOWN AND LOCKED
5. WATER INJECTION—AS REQUIRED

1. THROTTLE—IDLE (OFF FOR FIRE)
2. SPEED BRAKE—IN
3. DRAG CHUTE—DEPLOY
4. EXTERNAL LOAD—JETTISON (IF NECESSARY)
5. ARRESTING HOOK—RELEASE



All pilots will quickly recognize the lists at left as checklist items for particular activities in aircraft operation. The first example is the Before Landing Checklist for the T-29. The second is for an abort and/or barrier engagement in the F-100D.

Checklists have become a way of life in the Air Force. And there are all kinds. The most elaborate, no doubt, are those used by men who work with nuclear weapons, where each item must be called and responded to under the two-man system. The same philosophy applies to most of the activities in missile complexes and extends into some of our aircraft operations and maintenance.

Nevertheless, accidents occur, parts are installed incorrectly or out of sequence, items are missed in the cockpit which sometimes leads to fatal results. One wonders why. After all, running through a checklist is a very simple procedure. It doesn't take a genius to read the list and check each item as he goes along.

We talked to several people about why incidents and accidents keep turning up in which the cause can be related directly back to someone's failure to check an item that sure enough was on the list. And we

.5......Five???

got a lot of different opinions. Some say it's a matter of carelessness. Others maintain that it's just human nature to occasionally miss an item. Distraction is blamed by some, and they have a lot of ammunition to back them up. Another opinion was that all humans are inherently lazy and that once in a while this catches up with an individual. All of these probably have some validity but they leave us with a kind of helpless feeling. Is the human factor the only one at work?

It is possible for a person to learn a complicated procedure, or one that requires a number of steps. If the items are sequential, one depending on the preceding one, the task is simpler. Some checklists cover this sort of situation. In other cases, items are unrelated, or at least one action does not depend on another. This is more difficult to memorize, just as a list of random numbers is much more difficult to learn than 1-2-3-4.

In general, checklists follow some sort of pattern, although the pattern may not be particularly helpful in assisting mental retention of the various items. Therefore, people who fly or work on aircraft in any capacity must, at times, depend on a checklist in order to insure that all required items are checked. This is an established procedure that we certainly can't argue with. There's no way of knowing how many hundreds of aircraft—and lives—have been saved by insistence on checklist use.

But, like anything else, a checklist can be unnecessarily complicated, which poses a serious problem for aircrews, particularly in aircraft with only one chair. The man occupying this seat may have many items to be checked at various times. When he has adequate time and no pressure on him he can carry on long, detailed checks of the aircraft. But in an emergency, this is not the case. Some emergencies permit the use of published checklists in their resolution. Others do not.

Some emergencies are such that the crew must act instantaneously to avoid disaster. There is no time for getting the book, turning to the correct page and reading the items enumerated thereon. During the few moments he has available the pilot must analyze what the problem is and take the action he thinks necessary to correct the situation or, when he sees that recovering the aircraft is hopeless, abandon it.

Depending on the situation, this may all take place within a very few seconds, or may take several minutes. In either event the best thing the pilot has going for him is his knowledge of the aircraft and its systems and an abbreviated mental checklist covering only essential items. For it is this knowledge which permits analysis of the problem and the best solution in the shortest time.

As valuable as checklists are, they are not a substitute for knowledge of the equipment. This is self-evident, but we mention it because accidents occur as the result of checklist items being missed. As long as there are checklists, occasionally items will be missed. This happens frequently with non-critical items. But when an item that is really critical is missed, the pilot's salvation may very well depend upon his knowledge of the machine, which will tell him what is wrong and what can be done about it. Hence, the bit about checklists not being a sub for smarts.

Now, you may get the idea that we're knocking the use of checklists. Not so! In fact, the author wouldn't risk a grocery run for more than two items without a list. Nor would a friend who had that ignominious experience of landing sans gear ever, ever, allow a distraction in the pattern to interrupt his before landing check without breaking out and starting over.

The checklist is a way of life for both aircrews and maintenance people. Diligent use of checklists saves lives, prevents damage and loss of equipment.

Others haven't been as lucky. Their missed item was fatal.

Ordinarily this is not the case; items missed don't usually cause accidents. But they do often enough to deserve our concern and attention. For example:

- Two C-47s groundlooped within a couple of months when the pilots missed locking the tailwheel for takeoff.
- A B-57 landed gear-up.
- Ditto a C-123B.
- Same for a C-123K—the pilot performed the checklist from memory, forgot the gear.
- A KC-135A, gear up, believe it or not.
- Pilot did not insure canopy of F-104 was locked. Canopy came off, engine ingested parts, aircraft crashed.

This brief list provides some idea of the cost of failure to use a checklist or missing an item on the list. What's the answer? For one thing, we liked the approach taken by the AFSC stan/eval division at Eglin AFB in a proposal to standardize procedures for handling critical emergencies. This proposal was described in an article, "Banish the Bold Face Blues," by Lt Col Michael Filliman in *Aerospace Safety*, Oct 1967.

Second, is the need for continuously improving training so that the pilot will have as thorough a knowledge of his aircraft and its performance characteristics as possible.

In addition to improved, refined checklists and knowledge of the equipment there are planning and practice. From what we've seen, practice varies from unit to unit and among individuals. Some units require only the minimum. Combine this with an individual who is satisfied to not exceed the minimum and we have a person who, logically, has a minimum chance in a critical situation.

One area that is particularly dangerous is ground egress from a burning aircraft. A one-hour briefing every six months hardly prepares a fighter pilot for this eventuality unless he has taken it upon himself to practice frequently. The lazy ones may not do this. We would place our bets on the man who is a member of a unit that requires frequent practice and puts a stop-watch on him during practice (the timing should be mainly for the purpose of letting the individual know how fast he is).

One more observation before we knock this off. This started out to be a brief item on checklists and their use. But as examples were studied and other cases came to mind, a bigger picture began to emerge. So finally what we seem to be arriving at is that safe and efficient aircraft operation depends to a great extent on three factors:

- Good tech data (including checklists) and the proper use thereof by all concerned.
- Knowledge and skill in the operation and maintenance of the equipment in use.
- A plan for emergencies fixed as firmly as possible in each pilot's mind, and practice in the execution of the plan.

All of these depend upon the other and the package adds up to pilot insurance. How much can we put you down for? ★

the I.P.I.S. approach

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

FLIGHT PROCEDURE CLARIFICATION

The procedure for inbound course interception using a course indicator and RMI is often misinterpreted. The misinterpretation is caused by the wording of a sentence in AFM 51-37, *Instrument Flying* (page 11-6, line 5—"Turn the aircraft in the shorter direction to place the heading indicator (CDI) in the upper half of the instrument pointer toward the course deviation case." Many pilots interpret this to mean that the initial turn should be in the shorter direction to *first* place the heading pointer in the upper half of the instrument case. This is incorrect. The objective is to turn in the shorter direction *toward the CDI*. The shorter direction would cause the aircraft to turn the least number of degrees to be headed perpendicularly to the desired course. The turn should be continued to place the heading pointer in the upper half of the instrument case, which precludes an intercept angle in excess of 90 degrees.

If the initial turn is made away from the CDI, it will not always be possible to intercept the desired course prior to station passage. This situation could easily occur when the interception was attempted close to the station. The procedure will work in all situations if the initial turn is made toward the CDI and continued to place the heading pointer in the upper half of the instrument case.

FLIP PROCEDURE CHANGE

The May 1968 IPIS Approach article answered a question concerning Automatic Terminal Information Service (ATIS). In November, the ATIS procedure was changed. Prior to November, the pilot was required, upon initial contact with the controller, to state that the ATIS message had been received. Controllers will automatically consider that pilots have listened to the ATIS broadcast and received all the information the message contains, *unless the pilot makes a specific request*.

The ATIS frequencies may now be found in the FLIP IFR Supplement as well as on FLIP Enroute High/Low Altitude charts. It would also be very convenient if they were listed with the other voice frequencies in the top left corner of the terminal approach charts.

IFF/SIF

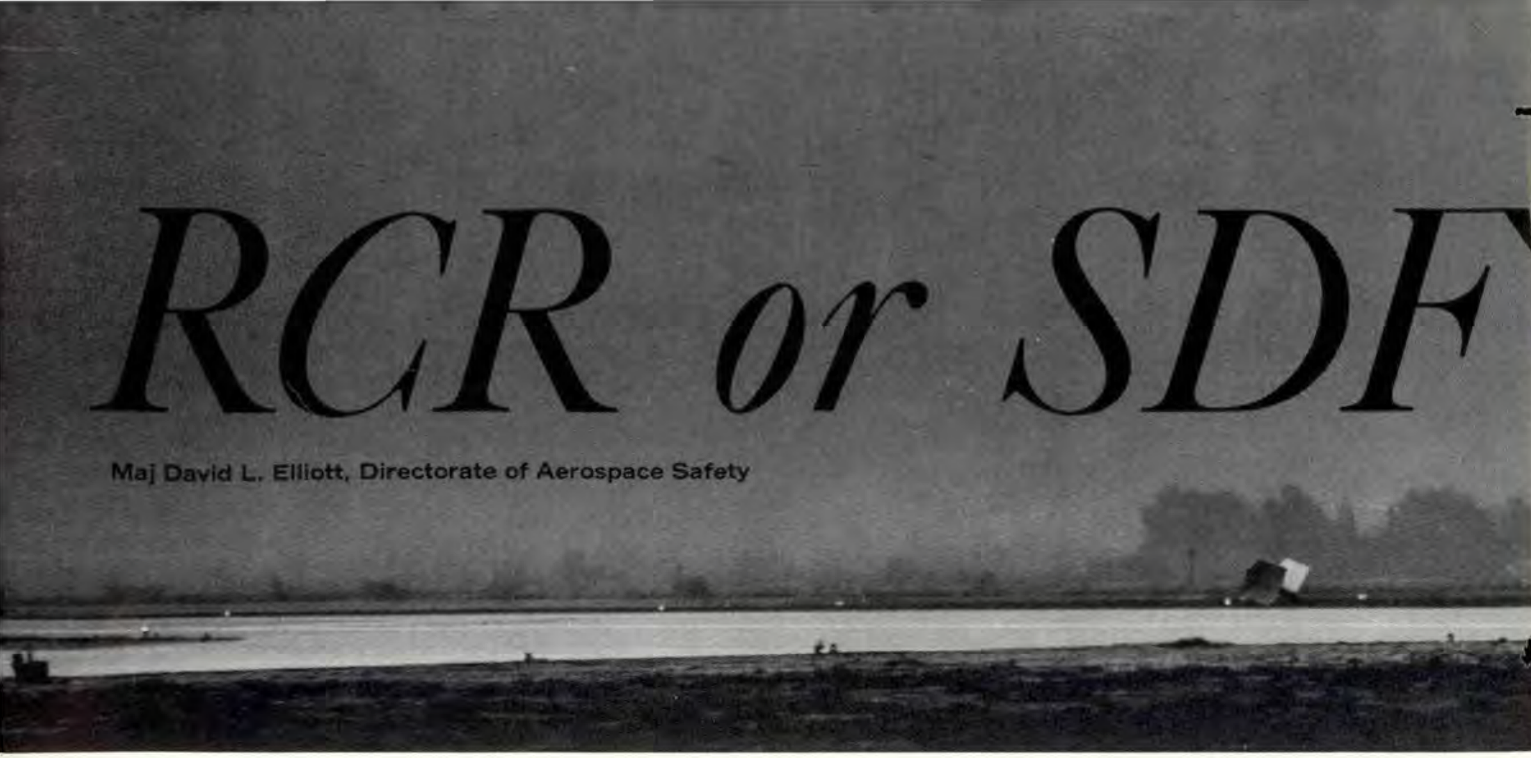
Q Why does FLIP require that Mode 3 Code 7700 be selected when implementing emergency IFF/SIF procedures?

A The Air Force pilot must select the EMERGENCY position of the IFF master selector switch and squawk Mode 3 Code 7700 to alert both military and civilian traffic control radar. Mode 3 Code 7700 was designated the civil emergency squawk because of the inability of civil radar to interrogate the military EMERGENCY position squawk.

The military airborne transponder was designed to provide a three-mode capability, with an additional feature for an emergency squawk. Modes 1 and 2 were designated for tactical purposes and Mode 3 was reserved for air traffic control. Military ground radar is capable of interrogating all three modes as well as the EMERGENCY position squawk.

Civil airborne transponders provide a single mode capability and do not have the additional EMERGENCY position feature. Civil air traffic control radar does not have a capability for interrogating Modes 1, 2 or the military EMERGENCY position squawk. Since civil radar is limited to Mode 3 (civil Mode A) operation, a single code was designated the standard civil air traffic control emergency squawk. Most civil air traffic control radars have the capability to automatically identify Mode 3 Code 7700 as an emergency squawk.

Air Force transponders are being modified so that Code 7700 is automatically squawked when the EMERGENCY position on the IFF is selected—*provided the Mode 3 toggle switch is "in"*. Unless you know you have a modified set, select EMERGENCY, Mode 3 *and* Code 7700. ★



RCR or SDF

Maj David L. Elliott, Directorate of Aerospace Safety

For the past several years the Air Force has used the James Braking Decelerometer (JBD) for obtaining runway condition readings (RCR). Combined NASA and USAF tests have recently proved this system not completely satisfactory. It was determined that the JBD system was particularly poor for obtaining accurate coefficients of friction for wet or flooded runways, and in almost all cases actual conditions were worse than the obtained RCR readings. NASA researchers theorize that there are several reasons for this inaccuracy. Probably most important is the lack of a positive relationship between the braking ability of an RCR vehicle (with a wide variety of weights, tires, braking systems and drivers) and the braking ability of an airplane.

The JBD is an accelerometer that measures transverse G and is placed in the RCR vehicle in such a way as to record G when the brakes are applied. Since the maximum braking force possible will occur just prior to the tires skidding, the brakes would be applied abruptly until a full skid developed and then released. This would register a figure on the JBD that represents the maximum braking force possible, and would be the current RCR. This figure would be applied to the specific aircraft performance charts to obtain the ground roll distance. The maximum braking ability of any airplane or automobile is about 28 ft/sec/sec. Thus, the RCR scale of 0 to 28 is an expression of stopping ability.

It sounds good, but it doesn't always work out. The JBD system cannot determine *dynamic* hydroplaning, because the speeds at which the runway condition readings are obtained are not high enough to create the necessary hydrodynamic force on the vehicle tires to cause this phenomenon. In addition, the variations in auto tires are not representative enough to be within acceptable tolerance for measuring runway friction.

When all the data were compiled from the 1967-1968 runway grooving tests at Wallops Island, it was found that a direct relationship existed in stopping distances of three completely different vehicles; the F-4 Phantom, the Convair 990 and a NASA Plymouth station wagon with special diagonal braking. Diagonal braking consists of one unbraked front tire for steering and one for braking, one rear tire rolling for directional stability and one for braking.

One-half the brakes gives only one-half the braking ability; however, Mr Walter Horne of NASA said the stopping relationship remains the same and directional control is much improved. This stopping distance relationship existed on all surfaces checked, and also persisted when the conditions of the runways were changed. For example, if the wet runway conditions were such that the stopping distance of the F-4 was twice that on a dry runway, it was also twice the dry runway stopping distance for the Convair 990 and the diagonal braking Plymouth.

Armed thus, NASA and USAF have begun a new test called "Com-

bat Traction." Some of the questions it'll try to answer are: Do all dry concrete or asphalt runways have the same coefficient of friction when applied to an aircraft tire? Is there actually a direct stopping distance relationship in all vehicles under similar conditions or were the 990, F-4 and diagonal braking Plymouth data just coincidence? Further objectives of the test will be to determine the optimum runway surface for Air Force use.

NASA Langley Research Center and USAF have obtained a C-141 and a diagonal braking Ford. The Ford will be instrumented and will give accurate speed readings and deceleration forces measured in one-tenth G. Speed and G will be recorded on a graph. In addition, the instruments will measure actual stopping distances. A bicycle wheel will be attached to the rear bumper. This wheel will drive a calibrated speedometer that is mounted on the dash of the car, directly in front of the driver. Each time the wheel rotates one complete revolution with the brakes applied, a cam on the hub of the wheel will record a count. The tires of the test Ford will be made from one rubber composition and will have a smooth tread.

If the tests work out as hoped, RCR readings will probably be more like stopping distance factors. There are several advantages in using a stopping distance factor over the RCR. One will be the ability to detect a dynamic hydroplaning condition. Mr Horne visualized these runway checks being taken at speeds up to 80 miles per hour. This is the real value of the diagonal braking vehicle. Even when a dynamic hydroplaning condition exists, a good degree of control of the vehicle remains and a valid reading is still obtainable. Further, when a stopping measurement is taken from a relatively high speed, say 80 mph, the vehicle is covering a much longer area on the runway for getting values than when the driver is obtaining an RCR reading.

Stopping distance factors would be obtained by first measuring the stopping distance of the diagonal braking vehicle on a dry runway. This measurement will be obtained by locking the two braking wheels at a specific speed and holding to a complete stop. This will become a stopping distance factor of one. Readings taken from wet, flooded, slush covered or icy runways will be taken in the same way from precisely the same speed. The new stopping distance figure will be divided by the dry runway stopping distance to obtain a stopping distance factor. Then instead of going to a chart in the TO or checklist to apply the RCR, you'd receive something like "Stopping Distance Factor —1.5." This would mean that a dry runway computed landing roll of 4000 feet would be 1.5 x 4000 feet or 6000 feet.

For the time being, we have to use the RCR. The thing to remember is that judgment is necessary when using the system. If the tech order for your airplane says the wet runway RCR is 14—and if the runway is obviously wet and the reported RCR is 20—use 14 for your computations. You may be able to stop sooner than computed by using the 14, but then you may not. ★

THE F-106 CAME IN FOR A NORMAL VFR LANDING with final approach airspeed at 175 knots and 2000 pounds of fuel on board. The pilot applied back stick pressure for flare and almost immediately attempted to release the pressure to correct for landing attitude. Nothing happened—the stick wouldn't move forward. Luckily he was close to the ground and a safe touchdown was made at 145 knots. The nose couldn't be lowered with pitch trim either. Inspection revealed a flashlight jammed between the elevator and aileron idler assembly bellcrank and the bulkhead in the lower aft electronics compartment.

Personnel working around aircraft *must* account for all equipment after the job is done—that most certainly includes flashlights, even though we don't usually consider them tools. Impress it on your troops: everything that's taken out to a bird must be accounted for when the job is done.

THE C-131 HAD ITS OIL COOLER doors, loop antenna, wingtips, leading edges of the horizontal stabilizer, and air intake for the air compressor damaged to the tune of 100 manhours necessary for repair. Cruising at 12,000 feet with a true airspeed of 200 knots and in stratiform clouds with no turbulence, the crew saw lightning flashes coming from darker clouds ahead. They asked the center for a report on storm intensity. The aircrew was told that center radar could not pick up anything significant because of the distance involved but that several aircraft had deviated to the right of course because of thunderstorms. The pilot turned immediately but he was too late—30 seconds of heavy hail took its toll.

This aircraft did not have weather radar aboard; if yours doesn't, be extra cautious. Remember that lightning is present during the most active part of thunderstorm life, and is often a tipoff to the possibility of heavy hail.

REX RILEY'S
CROSS COUNTRY NOTES

NICOTINE FIT. I had many violent cravings for the weed before I got some smarts a few years back and quit. No, I'm not going to start preaching, but here's how being a slave to the old coffin nails can end it all or scare hell out of a fellow at the very least.

A couple of months ago an EB-66 took off and climbed to 30,000 feet with the cockpit pressurized to fifteen thousand. One of the crewmembers, taking his initial orientation flight, just couldn't stand it any longer—after all, he hadn't had a smoke for over an hour. He moved from his seat to the aisle and plugged into the oxygen extension hose, rashly assuming that it was connected to an oxygen source at the other end. While kneeling in the aisle, he disconnected his mask and began smoking.

Twenty minutes later he returned to his seat and the aircraft suddenly depressurized. Everyone on the crew switched to 100 per cent oxygen except the man who had just enjoyed a high altitude smoke. The navigator noticed that this fellow was having trouble, left his seat and hooked him up to 100 per cent oxygen. After about 40 seconds he fully regained his faculties. The navigator estimated that the orientee had been completely unconscious for about 15 seconds.

The pilot aborted the mission and returned to home plate so the hypoxia victim could be examined by a flight surgeon. After a short consultation the doctor released him.

Pilots must brief all non-crewmembers on oxygen procedures, radio and intercom switches and all important controls at their stations. The life that's lost could be your responsibility.

INADVERTENT EJECTIONS. There have been several inadvertent ejections on the ground in the F-4. In the most recent the backseater had Lady Luck riding with him all the way. The crew had returned from a combat mission and were taxiing to the ramp when the seat fired just as the canopy raised to the full up position. The chute was deployed but not inflated. He jerked the risers, the chute inflated and he hit the ground. Witnesses estimated chute inflation at 8-10 feet above the ground. A sprained ankle was the only injury. Talk about presence of mind—this man had it.

Ejection apparently was due to a film pack jamming in the linkage in such a way that raising the canopy fired the initiator, ejecting the seat.

A somewhat similar, but not so drastic, case occurred in March when a camera fell on the rear cockpit initiator arm actuating lever which caused the initiator to fire and blow off the canopy. This occurred in flight.

Both of these incidents were caused by extraneous objects in the cockpit striking exposed linkage.

The purpose of these briefs is to call to the attention of aircrews items that affect their operations and well being. So it would seem to be in order to remind crews not to have loose objects bouncing around the cockpit. So be it. But in the instances related, the objects were legitimately in the cockpit.

There is practically no room in the F-4, especially in the back seat, for stowing anything. The crews were using their G-suit pockets for essential items, but the dual restraint system of the H-7 seat places straps around the individual's legs right at the G-suit pocket, so use of the pocket is out.

This leads us to the conclusion that protection of critical hardware would be a more sensible approach to solving this problem than berating crews for allowing loose objects to be in the cockpit. And, whether or not these objects should have been there, pilots on occasion are going to have items with them that could cause the same result, or the maintenance people might leave something (like a flashlight) in the cockpit. Both air and ground crews must be constantly aware of their responsibilities in eliminating loose objects from aircraft. If you come up with a good idea for stowing those essential items share it with others through command and technical channels.

ONE NIGHT, A FEW WEEKS AGO, a friend of mine was returning to home base with a T-29 full of passengers. There was no moon over the desert but visibility was unlimited in the clear, dry air, and the pilots were keeping a constant lookout for other aircraft. The left seater turned and spoke to his cohort for about two minutes, then started scanning the sky again. As he reached the extremity of his scan to the left, a rotating beacon, flanked by port and starboard wing lights, was bearing down on him at the same altitude with what seemed to be a very fast rate of closure. He hit

the autopilot disconnect button located on the yoke, pulled rapidly back and banked sharply to the right. The other bird, a VFR twin-engine aircraft of unknown type, passed underneath and dangerously close.

A check with center revealed that they weren't painting the "bogey" and he wasn't on a flight plan. He was VFR, lookout-here-I-come traffic, flying at the wrong altitude through the middle of a heavily traveled airway.

It is on those clear nights, when you can see from here to there and back again, that crewmembers have to be especially watchful. The other guy may be enjoying the scenery, but you can't afford the luxury. ★

Incident At C

The following article was published in the monthly Flying Safety *magazine of the Chinese Air Force, Republic of China. Its translated version was submitted by the author, Maj Chung-Huan Fang, Flying Safety Officer for the 3d Tac Ftr Wg, Chinese Air Force. The article describes an emergency faced by a USAF pilot, Lt Col R. M. Loeffler.*

Col Loeffler has been the Team Chief of the MAAG Advisory Team, for the 3d Tac Ftr Wg, for over three years. His reputation as a good will ambassador is unsurpassed. All the members of the Wing, especially the aircrews, acknowledge that Col Loeffler is: "A Friend From Ten Thousand Miles Away."

In his duties, Col Loeffler not only flies with the 3d Tac Ftr Wg during various training missions, but performs the majority of all the F-104G test flights. It was during one of these test flights that Col Loeffler experienced an inflight emergency and his successful handling of the emergency is the basis of our story.

CK

On 22 October 1968, Lt Col Loeffler was scheduled to test fly an F-104G after completion of an engine change. Preflight, engine start, and taxi were normal. During run-up check Col Loeffler noticed that engine acceleration to 100 per cent RPM seemed slower than normal, yet within limits. With no other indications of engine malfunction, Col Loeffler elected to take off. Climbout was satisfactory as were all other engine checks.

At 35,000 afterburner was selected in preparation for Vmax flight. Acceleration was progressing on schedule. Time check from .9 mach to 1.7 mach had been satisfactory. However, as the aircraft reached 1.8 mach, there was an abrupt and significant loss of thrust. Col Loeffler first thought that the afterburner had blown out; however, a check of engine instruments showed a more serious degradation of thrust. RPM was 82 per cent and EGT was approximately 250° C. Col Loeffler, still unable to determine the nature of the engine problem, nevertheless, went through an airstart procedure. This was unsuccessful.

Unless he could gain more thrust, Col Loeffler realized he was faced with a bailout or forced landing. He was 20 miles from home base, Ching Chuan Kang, almost midway between there and another Chinese airfield, Hsin Chu. Although heading towards Hsin Chu, Col Loeffler knew that the facilities at home base were much better. Utilizing the remaining speed and altitude from his high mach flight, he turned toward CCK, judging that he could glide back to CCK and attempt a forced landing if all conditions were satisfactory.

During descent three more attempts were made to regain thrust by going through airstart and stall clearing procedures; however, to no avail. At this point, Col Loeffler was committing himself to a deadstick landing if the critical "low key" could be reached. If not, he would be in a good position for bailout.

During the descent from 35,000 feet, RPM had slowly been decaying and was now 77 per cent. Altitude was 22,000 feet and position was four miles from the field. A call had been previously made to the tower indicating that a possible forced landing was in the making. Too high for a straight-in approach and too low for a high key, the all important low key was now sought. Realizing he would be too high for the low key, Col Loeffler put down takeoff flaps and made two steep turns to lose excess altitude. Low key was reached still slightly high so speed brakes were extended. On base leg altitude was 7000-8000 feet, airspeed was decreased to 275 kts IAS. Judging that he was at the proper altitude, he then retracted the speedbrakes and continued the approach.

On final approach, Col Loeffler considered that he was still too high and selected his speedbrakes to the extend position. However, at this time the RPM had dropped too low to keep the generators on the line and the speedbrakes failed to extend. Since it was too late to take any other action, Col Loeffler now devoted full attention to the landing. Flare was completed, gear lowered manually and throttle stop-cocked. Touchdown point was about 3000 feet down the 12,000 foot runway. The drag chute was deployed, but the airspeed was too high and the chute failed. Without power brakes and without nosewheel steering for directional control, Col Loeffler was having difficulty in maintaining the aircraft on the runway. As brakes were applied the aircraft would veer towards the side of the runway, because one brake had become partially ineffective. Carefully judging the remaining runway distance, Col Loeffler skillfully used his brakes in a manner that kept the aircraft centered and yet slowed it sufficiently so that when it reached the end of the runway the aircraft had almost come to a complete stop. Deciding not to take any further risk, Col Loeffler lowered the tailhook and engaged the BAK 9 to bring the aircraft to a full stop.

An immediate investigation into the engine problem was conducted. The engine was removed and it was found that the compressor discharge pressure line had failed, causing the main fuel control to close to a position approximately halfway between idle and shut-off. Two days later Col Loeffler successfully flight tested the aircraft and released it for flight.

In November 1968, General Lai, Ming-Tang, Commander-in-Chief of the CAF presented Col Loeffler a letter of appreciation and a plaque in recognition of his outstanding feat and distinguished achievement in saving the CAF a valuable fighter aircraft. ★

ABOUT THE AUTHOR

Major Fang was born on November 20, 1935, in Kwangtung. He has been in the Chinese Air Force for over 13 years. He graduated from the Chinese Air Force Academy in May of 1949, is a graduate of the Jet Qualification Course, Randolph AFB, Class 60A, attended the Advanced Interceptor School at Perrin AFB in February 1961 and graduated in the class 61A. Prior to becoming the Wing Flying Safety Officer, Major Fang was assigned to 7th Ftr Sq, 3d Tac Ftr Gp, flying the Starfighter. He is highly experienced in jet fighter operations with over 2300 hours single engine jet time and 300 hours in the F-104G.

Maj Vernon B. Kelly
320 Bomb Wg, Mather AFB, CA

Scene One: A western CONUS AF Base . . . a snowy night in January.

Action: The pilot was performing a published approach penetration into his destination base. Presumably the cockpit contained a minimum of two experienced pilots, one navigator, mapping radar, Doppler, three altimeters, and three approach plates for the penetration being performed. Each of the approach plates plainly stated: "Complete penetration turn at or above 8000 within 25 NM." The aircrew was in radio contact with approach control until a few seconds before the accident. In level flight and at normal airspeed, the aircraft struck a 6000 foot mountain below the 5000 foot level, some 29 miles from the base. The aircraft crashed 25 miles from the VOR, well right of course.

Result: Total destruction of the aircraft and fatal injuries to all the occupants. Probable cause was listed as "crew factor." A probable contributing cause was "crew confusion." The entire sequence of events will never be known. However, it is obvious that one crewmember descended the aircraft to an unsafe altitude while two other crewmembers permitted him to do so.

Scene Two: A rainy fall day . . . another western CONUS AF Base.

Action: The aircrew was receiving an annual flight check with a standardization evaluator aboard. The pilot was flying a radar traffic pattern under GCA control.

GCA directed: ". . . turn left to 060; maintain 2000 feet."

The copilot replied, "Roger, 060, 2000 feet."

The pilot banked the aircraft gently to a heading of 160 at precisely 2000 feet, and the aircraft obediently carried its cargo of human frailty toward high terrain southeast of the base.

For two minutes there was silence in the cockpit. GCA was silent. Another 30 seconds passed before the disgusted flight evaluator called attention to the discrepancy and the error was corrected.

Result: Not only did the pilot fail the flight check, but the copilot and navigator were required to undergo inflight corrective action training and another flight check. The rest of the crewmembers failed their flight checks because of poor crew coordination. To sum it up, the pilot had made a mistake which the other crewmembers should have noted and corrected. The crew coordination concept has been around for quite a while. As a matter of

HOW'S YOUR CREW COORDINATION?

fact, it was being employed back when many of today's flyers hadn't as yet even seen an aircraft. In recent years, however, the phrase "crew coordination" has taken on added meaning and become a part of the everyday conversation among aircrews and their evaluators. The reason for this is that cooperation and teamwork have been rightfully recognized as essential to the safe conduct of all inflight operations involving more than one crewmember. In the future, as aerospace systems become increasingly complex, we can expect the crew coordination concept to have even greater importance.

Just what is crew coordination? We might say that it's the cooperation which results in the safe and effective completion of any action concerning more than one crewmember. The definition, however, is unimportant; what really matters is that we *understand* its mechanics and applications, for crew coordination is not dependent upon actions alone. It requires complete familiarity with one's own crew position, duties, and responsibilities; and it requires a liberal working knowledge of the other crewmembers' duties. If we add to this a dash of enthusiasm and a measure of alertness, we have the basic ingredients of good crew coordination.

A sincere interest on the part of each individual in the problems and responsibilities of his fellow crewmembers will result in a significant improvement of the overall effort. Then, if experience is tempered with self-discipline rather than complacency, each crewman's anticipation of mission requirements will become almost automatic, and the resulting teamwork will seemingly require very little conscious effort.

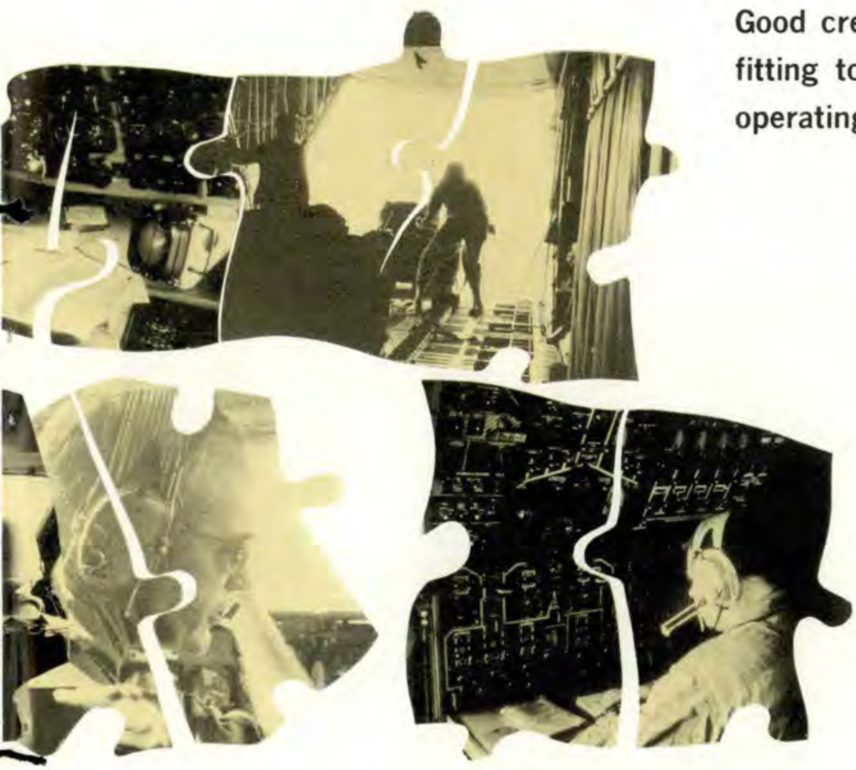
In order to insure the proper application of crew coordination in the successful accomplishment of a mission, the following factors must be known:

1. What crew actions are required.
2. Who will perform them.
3. In what sequence will they be performed.
4. What should be done if another crewmember "drops the ball."

How do you rate? Are you, on each and every flight, thoroughly familiar with the applicable NOTAMs, special notices, departure routes, altitudes, obstructions, traffic patterns, approach procedures, missed approach procedures, weather forecasts, route of flight, and mission requirements? If the answer is yes, crew coordination should be a simple task.

Your insistence upon properly coordinated crew activity may someday help prevent a mission or a flight check from ending in failure. More importantly, it will help you to avoid such once-in-a-lifetime mistakes as trying to cross a 6000 foot mountain at 5000 feet. ★

(Courtesy of *The NAVIGATOR*)



Good crew coordination results in all the pieces fitting together to form a close fitting, smooth operating team.

OLD SNEA

Disorientation continues to be a subtle menace that sneaks up on a pilot and does its dirty work when he least expects it. Frequently it accompanies other problems—or results from them—when the pilot is busy coping with some emergency.

Seldom do pilots deliberately set up a situation where disorientation is almost inevitable, but the following account of an accident indicates that this was the case. Briefly this is what happened.

A FAC took off in an O-1 on a pre-dawn mission with visibility estimated at one-fourth to one-half mile in ground fog. Rather than use bean bag runway lights, he had a sergeant place a jeep at one end of the runway with its lights pointing toward the aircraft. The pilot started takeoff from what he estimated to be 1500 feet from the departure end. He said he thought the roll was unusually long, but he got airborne and passed the jeep at an altitude he estimated at 25 to 50 feet. The aircraft seemed tail heavy and he felt that it was not developing full power. The aircraft hit the ground about 400 feet past the end of the runway. Both the pilot and observer were uninjured.

Now to fill in some of the gaps.

Facility: This SEA field has a 3400 foot runway made of hard clay and crushed rock. There are no runway lights but bean bags were available.

Weather: Visibility has been stated. The wind was calm. There were no weather forecasting facilities but a base 20 miles away reported temperature of 25°C and dew point 23°C.

The aircraft: The engine checked okay during runup with a 60-70 rpm drop on each mag—normal for the engine. After the accident the

KY

engine ran perfectly and all evidence indicated it was performing normally during the takeoff.

Systems: All systems apparently were working satisfactorily.

The pilot: Although his total flying time was not high, he was consistently rated as an excellent pilot and FAC. He had been in the theater for about seven months, had flown about 600 hours as a FAC and had been flying nearly every day. He had been at this field for a week and was making his first night takeoff there. He was in good health.

What was it that caused an excellent pilot flying a normally operating aircraft of a type with which he was thoroughly familiar to crash on takeoff? The mechanics of this accident are rather clear. This was not an instrument takeoff despite the darkness, poor visibility and makeshift lighting. The pilot took off with his head out of the cockpit, looking for a visible cue and flying by the seat of his pants.

Recently a civilian private pilot with a total of 80-odd hours flying time took off in fog and killed himself and his family. This we might attribute to ignorance. From professional pilots we expect better.

The board found pilot factor to be the primary cause in that he did not transition to instruments, became spatially disoriented and allowed the aircraft to get into a nose-high stalled attitude which he didn't recognize.

So chalk up another for that sneaky old menace, spatial disorientation. But let's not stack the odds in his favor. ★

Close-up shows damage to aircraft. Photo below shows position of aircraft in relation to runway.

Engine and fuselage. Prop, carburetor air screen and scoop were replaced. Engine ran satisfactorily during check.

What is the answer?

Maj Everett E. Ruble, Directorate of Aerospace Safety

A recent accident is one of many that appear to be indicating a trend toward pilots disregarding published minimums, decision heights and/or minimum descent altitude. The resulting accidents are usually determined to be caused by one of two factors: an attempt to accomplish the mission without regard for safety, or get-home-itis. Both have caused accidents in the past and, unless something is done to reverse this trend now, one of these will be the cause factor of accidents in the future.

Regardless of the type of aircraft you are now flying, there is a lesson to be learned from the accident to be described.

The mission was routine resupply, and after the crew accomplished the preflight planning and filing, the aircraft departed. Weather was to be marginal on their return, forecast to be 200 overcast and visibility one-half mile with fog. The flight was uneventful until their arrival at home base. They called approach control and were advised that the field was below minimums and forecast to remain that way for several hours. The pilot elected to hold for a possible break in the weather. Some time later the command post was contacted and a check made on alternate weather. The decision was made to continue holding.

Approximately 30 minutes later the tower made an erroneous weather transmission which indicated the weather was improving. The ceiling transmitted to the aircraft was above minimums and visibility was within one-eighth mile of approach minimums. An approach was started.

In the process of vectoring the aircraft down to a GCA pattern, RAPCON issued another weather observation indicating the weather was still below minimums. However, the pilot elected to continue the approach, until the aircraft flew into the ground short of the runway. The aircraft was destroyed and all crewmembers and passengers incurred fatal injuries.

It was determined that the erroneous weather sequence led the pilot to believe that an improvement in the weather had commenced. Even though the pilot was again advised that the field was still below minimums, he elected to continue the approach and stated that he would give the forecaster a pilot report on the weather. When asked if he would land if the field was in sight at minimums, his reply was "Affirmative."

Supervision and crew factors: The designated pilot in command was not at the controls at the time of the accident. For some reason he had relinquished command to an instructor pilot so that a third pilot could make the approach and landing to regain currency. The third pilot had not made a landing in the last 45 days and had flown 22 hours in the last 90 days.

This was perhaps a good case of get-home-itis in that the IP in the right seat had been requested by the Red Cross to return home and he was to depart on emergency leave the day following this flight. The noncurrent pilot in the left seat had just returned from an emergency leave and was to depart the station PCS. Preoccupation with personal problems, get-home-itis, and possible excessive motivation to complete this flight could have influenced the crew's decision to attempt an approach during adverse weather conditions.

Violations: The aircraft commander violated AFM 60-16 by allowing the aircraft to commence an approach with the weather reported below minimums. He also violated a command regulation which required the pilot in command to occupy one of the pilot seats during landing, and violated the same regulation by allowing an unqualified pilot to make an instrument approach under adverse weather conditions.

The instructor pilot violated a command regulation by allowing the unqualified pilot to make the approach in hazardous conditions.

One of the many recommendations made by the investigation board was that flying personnel not be scheduled to occupy a primary aircrew position after notification of an emergency leave, until a medical clearance is obtained from a Flight Surgeon.

Many factors are involved in this accident. Many recommendations and corrective actions will result after the investigation is completed. Whatever they may be, they will not be as effective as personal discipline and common sense. This accident should not have happened, but it did. ★

THE MARK OF Z

Lt Col Robert A. Preciado, Directorate of Aerospace Safety

Back in the days when I considered myself a master of the "rat race" in my little Zip 4, I used to joke about putting the mark of Zorro on the posterior of a jock foolish enough to challenge me to an aerial duel! I never really did it to my complete satisfaction. Now I have been upstaged.

The mark of Zorro (a series of quick swishes with the blade leaving a distinct Z on your opponent's rear end) can now be seen on a poor unsuspecting student pilot. Here's how it happened.

The student was on the landing flare in an F-104. A TF-104 with two IPs aboard was also on the flare. *Same runway yet!* (Don't ask "how come?", just read on.)

STUDENT: "I judged I was approximately three, maybe one, foot in the air and had my speed brakes extended already. I awaited touchdown. I hear this sound from the rear, (swish, swish, swish, maybe?) and my aircraft was thrown onto the ground on one wheel. It skipped along . . . I couldn't control it . . . aircraft movement from one wheel to the other seemed to increase, so I went around. . . ."

FRONT SEAT IP: ". . . he rolled out nicely (rear seat IP making the landing), in fact, perfectly lined up . . . I said, 'Dump your nose.' When he dumped the nose about 50 feet in the air, I saw another nose cone right in the middle of my pitot boom . . . I was surprised to say the least . . . I said, 'I got it' . . . added throttle, pulled back on the stick because I thought we would be sitting right on top of him. I couldn't figure why we hadn't already hit him. The nose was getting larger underneath me . . . it tells me he's going faster than we are because he was coming out from under us. I heard a loud burst of noise and he pops up in front of us . . . his tail went up our right side. When I saw this happening, I knew I couldn't climb as fast as he, so I retarded throttle and came back further on the stick. When this happened, I'm wobbling around in his wash and he's getting above. Somehow I got the nose back. I went over to the right side of him . . . I am in his wash and I can't tell if I'm stalled or just flailing around.

"We progressed pretty close to the ground. I was stalled completely then on that side and my aircraft started swinging back toward him from the right side. I added full right rudder, and the cross-controls were getting to the point that I didn't really know what to do with it. I said, 'I can't get away from him,' and he was cheering me on in

ORRO!

Nose section of one F-104 after midair on final approach and damage to tank fin from probe—Z-Z-Z.

Damage to underside and tail section. Only a miracle prevented serious accident, possible loss of crews.

the back seat telling me to stay with it and things like that.

"I went by him again and I know my pitot boom hit him somewhere. . . . I thought, lower the nose because when I started swinging back toward him I was out of control. I put the stick full forward that time and I must have rapped him with the pitot boom on the right side. I thought I lost it at that time and then I was in the wash real bad. We were almost dead even with him. Our nose was on his right side at this time and I was overtaking him. There was one quick swish back and forth. Then I had no control at all and I got a tremendous steep attitude. . . . The aircraft swished toward him again. I dumped the nose again to try to miss his tail. I felt a contact, and I saw (our) nose depart the aircraft. When it departed, I got a violent yaw to the left . . . I thought my tip tank would hit him. When he departed us, we found ourselves in a real bad attitude. We had a high angle of attack, the left wing was down, the throttle retarded to I don't know what.

"I put the throttle full forward, rolled everything to the right . . . I didn't know that I drug the right tip but I knew I was dragging the rear end. I lit the burner—went pretty close to mobile—either to the right or right over it. The aircraft lifted almost straight up—and we went around . . . ."

Whew! Both aircraft landed safely. How about that, sport fans! This tale is presented not to point out corrective actions or to sermonize, but because I found it the most interesting and exciting incident report I have come across in a long time. Making the mark of Zorro with a pitot boom is no longer an ambition of mine! ★

AEROBITS

WRONG BUTTON. The F-100 pilot tried to crowd too many things into one action. During engine start he pushed the start button and jettisoned both external fuel tanks. He accomplished this by trying to start the clock at the same time he was trying to start the engine. His little finger missed the clock button and hit the emergency jettison button. Of course, this was *pilot factor,* but the drop tank safety pins had been removed prior to engine start, *maintenance factor*.

AIRCRAFT SAVED BY CONTROLLERS. Although pilots and controllers sometimes have their differences, we've got to hand it to those people in the towers and radar vans for their fine support.

AFCS recently provided some figures on the operation at one base and we're passing them along to aircrews. The unit is the 1972d Communications Squadron at DaNang. The men there are credited with 104 aircraft saves involving 25 different types.

DaNang is a pretty busy place—846,649 air traffic control operations during 1968. On one occasion a sergeant in the RAPCON guided 11 Navy aircraft to safe landings. They were low on fuel and the carrier was shut down by weather. Another time 19 aircraft, low on fuel, were landed in 26 minutes, although one runway was closed when the second aircraft in blew a tire.

The controllers at DaNang have a few additional duties not found stateside. They have assisted in directing artillery and air strikes against enemy positions they could see from the tower when the base was under attack. Also they have acted as spotters, alerting the base to incoming rocket and mortar rounds. Well Done!

NOSE GEAR FAILURE. A recent F-102 incident at Udorn RTAFB dramatically pointed out the hazard that we all probably know about but have not adequately considered. In this particular case, an F-102 pilot landed without nose gear. The nose was lowered to the runway at about 120 knots with no gear. No directional control problems were incurred and at about 30 to 40 knots the BAK-12 barrier was engaged by the pitot boom. The barrier cable slipped up over the radome and was stopped by the IR dome. If engagement of this cable had occurred at a higher speed, there is every reason to believe that the cable would have wound up in the cockpit with the pilot. Pilots flying the F-4, F-111, F-104, F-105, F-106, F-101, F-102, F-5, T-33, B-57 and T-38 should be aware that the BAK-12 or 9 cable could easily be scooped up over the nose and into the cockpit if they attempt to land without a nose gear.

Maj David L. Elliott
Directorate of Aerospace Safety

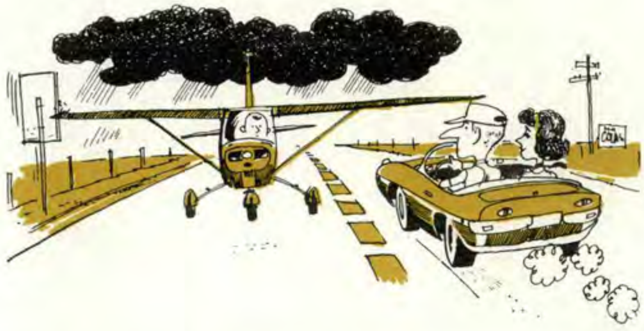
FARs IN VOLUMES. The FAA has begun reissuing its Federal Aviation Regulations in a volume system, rather than by separate parts as is done now. Each FAR Part will be designated as a portion of a volume, and there will be 11 volumes in all.

Distribution of the volumes will be by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, who will set the price for each volume.

Implementation of the new volume system will require approximately 12 months. As each volume is issued, an availability notice will be mailed to all persons now receiving the FARs. In the meantime, the present publication system will remain in effect.

The new groupings will be as follows:

- Volume I—FAR Part 1.
- Volume II—FAR Parts 11, 13, 15, 21, 37, 39, 45, 47, 49, 183, 185, 187 and 189.
- Volume III—FAR Parts 23 and 25.
- Volume IV—FAR Parts 27, 29, 31, 33 and 35.
- Volume V—FAR Parts 43, 145 and 149.
- Volume VI—FAR Parts 91, 93, 99, 101, 103 and 105.
- Volume VII—FAR Parts 121, 123, 127 and 129.
- Volume VIII—FAR Parts 133, 135 and 137.
- Volume IX—FAR Parts 61, 63, 65, 67, 141, 143 and 147.
- Volume X—FAR Parts 151, 153, 155, 159, 165, and 167.
- Volume XI—FAR Parts 71, 73, 75, 77, 95, 97, 157, 169 and 171.



AERO CLUB. The pilot with a private ticket in his pocket and 75 hours in his log book was on a cross-country in an aero club C-172. He was VFR, of course, but the weather began to get a bit sticky and finally, he said, closed in on him. He decided to land on a highway and did so successfully, except that a road sign nicked a wingtip.

Here's an incident aero club safety officers can use at their next meeting. This relatively inexperienced pilot showed good sense in landing when he realized that he couldn't hack the weather. Even smarter would have been execution of that classic maneuver known as the 180 degree turn. This is a theme we can't overemphasize to inexperienced pilots.

COMBINED EFFORT. Civil Engineer personnel of the 632d Combat Support Group, Binh Thuy Air Base, RVN, combined their skills to convert this F-6 tanker into a foam spreader that is able to foam a strip 25 feet wide for the entire length of the runway in 15 minutes. Sheet metal workers and plumbers constructed and installed the foam tank and folding spray bars in the rear of the tanker. ★

MAIL CALL

"THE TECHNICAL ORDER SYSTEM"

The above titled article appeared in the April 1969 edition of *Aerospace Safety*.

I found the article to be both timely and informative. Timely because we are living in an age where knowledge and use of Technical Publications are essential due to the complexity of our weapon systems and informative because the author spells out some of the key points of the Air Force TO system that every member of the Air Force team should know in order that they might function efficiently and effectively in their individual specialties toward the accomplishment of the Air Force mission.

However, although I enjoyed the article and welcome any attempt at placing emphasis on a subject as important and badly in need of attention as this subject is in the Air Force today, I have to point out a few items of great importance that the author missed and correct a few mistakes he made. First, the author failed to mention the methods used for updating publications such as changes, revisions, and supplements and no mention was made of safety or operational supplements which are designed to save lives of people and equipment. I stress this point because it is apparent the author himself or the people concerned with quality control of such articles for your magazine are not as familiar with the process of updating and the need for using current publications as they should be or such mistakes as listing fifty categories of Technical Orders when TO 0-1-01, the Numerical Index and Requirement Tables, has listed 51 categories for the past six months at least, and suggesting that people review AFR 66-7 which was replaced by AFR 8-2 on 20 March 1968, 13 months prior to the publication of this article. These mistakes would not have been made if the author had followed his own advice and consulted the book.

The author considered TO 0-2-1 as one of the most valuable Tech Orders in the system. I believe he erred here. Back a few years ago, I would have agreed with him when this TO contained a lot of valuable information, but since the conception of the NI and RT system, this TO has diminished to the point that any Air Force member who is worth his salt has no use whatsoever for this Technical Order. It might be of some help to a novice, but a professional would never have any use for it.

I think more emphasis should have been placed on the use of the NI and RT and its supplements which are the necessary tools required along with 110 card system which is necessary to make the Air Force Technical Order System function in order to keep any limited type file which the majority of Air Force units have current.

A bit more emphasis on the LOAP list as the greatest tool any supervisor or assigned personnel could ever use or be familiar with. It's the greatest thing since the invention of the day off.

By the way, the preface pages of the NI and RT for any category contains the same information that 0-2-1 contains and it's in a more appropriate place, exactly where it's needed. I instruct approximately 50 students a month in a FAM Course on Technical Orders and I recommend three basic premises:

1. READ THE TITLE PAGE

   a. Ref to safety and operation supplements, dates, replacement notes.

   b. This might save their lives (Safety Supplements) and prevent them from paying for Air Force equipment (Operational Supplements).

2. CHECK THE "A" PAGE: Ref any page they are going to use in the TO to insure it's the latest page.

3. READ THE PREFACE PAGES: If the Air Force prints it, it must mean something. Answers to what symbols, warning, cautions, and notes mean can be found here. Another life and equipment saver.

The author should have mentioned the Air Force TO improvement system and stressed that TOs are only as good as the people that use them. AFTO 22s and 847s are the keys to better TOs.

A reader and believer in the need for articles and magazines like yours.

SSgt Richard C. Constantine
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Williams AFB AZ 85224

"PROCEDURE CHANGERS"

I read your article "1 + 25 to Almost Home" in the March issue of Aerospace Safety with great interest. The author tells a familiar story of professional flying which came to an abrupt end due to one mistake. We all know that this can happen to all of us who fly and perhaps many of us have had a few close calls which impressed this very thought on us. I will certainly agree that the responsibility for safety rests firmly on the pilot's shoulders. However, perhaps a few articles should be directed to those staff agencies who are continually changing the procedures and facilities which we as pilots use. To the layman pilot it appears that many of these changes have no real value. Witness how many times the holding pattern entry procedures have changed in the last ten years. We are now using procedures nearly identical to the ones used in 1956.

In summary, I would like to see some safety articles directed to agencies who generate these many changes. I believe that it would help restore confidence that has been lost through the montage of change that we have lived through. Can we really blame the pilot for all situations that result from confusion in the system? The pilot catches "it" from all angles. How about passing some of the Aerospace Safety guilt ink on the "procedure changers?" Perhaps they don't realize what problems they create!

Maj Bert L. Jenks
3389 Pilot Tng Sq
Keesler AFB MS

Changes for the sake of change alone are most certainly difficult to justify. ED. ★

☆ U. S. GOVERNMENT PRINTING OFFICE 1969 341-220/12

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major
Ben D. Bowles

Major
Richard E. Sheffield

99th Strategic Reconnaissance Squadron, Beale AFB, California

On 29 July 1968 Major Ben D. Bowles, Aircraft Commander, and Major Richard E. Sheffield, Reconnaissance Systems Officer, were flying an SR-71 on a routine combat crew training mission from Beale AFB, California. After completing an aerial refueling, they experienced a violent explosion in the right engine at mach 2.88 and 68,000 feet while accelerating to a higher cruise speed and altitude. Simultaneously with the explosion, the right engine fire warning light illuminated. Major Bowles immediately performed the engine fire checklist; however, the fire light remained on and the fire was confirmed through the use of periscope and rear view mirrors.

At great personal risk to themselves, the crew elected to remain with the disabled aircraft and attempt an emergency landing. The fire light extinguished for a few seconds when the fuel shut-off switch was activated, then came on for the remainder of the flight. Even though severe flight control difficulties were encountered because of extensive airframe damage and the loss of the right engine, they succeeded in decelerating from speed and altitude.

As a result of the superior flying skill and excellent crew coordination displayed by these two aviators, this highly sophisticated, classified, and extremely valuable aircraft was safely landed at an alternate airfield without further damage. WELL DONE. ★


MISS LIFE SUPPORT SAYS . . .
STOP FLAILING ABOUT...
DURING EJECTION
IT HAS BEEN PROVEN!
*
ADDITIONAL WEIGHT/BULK IN LOWER POCKETS INCREASES FLAIL INJURY POTENTIAL DURING EJECTION
Our thanks to pretty Miss Pam Warren for being our Miss Life Support this month.