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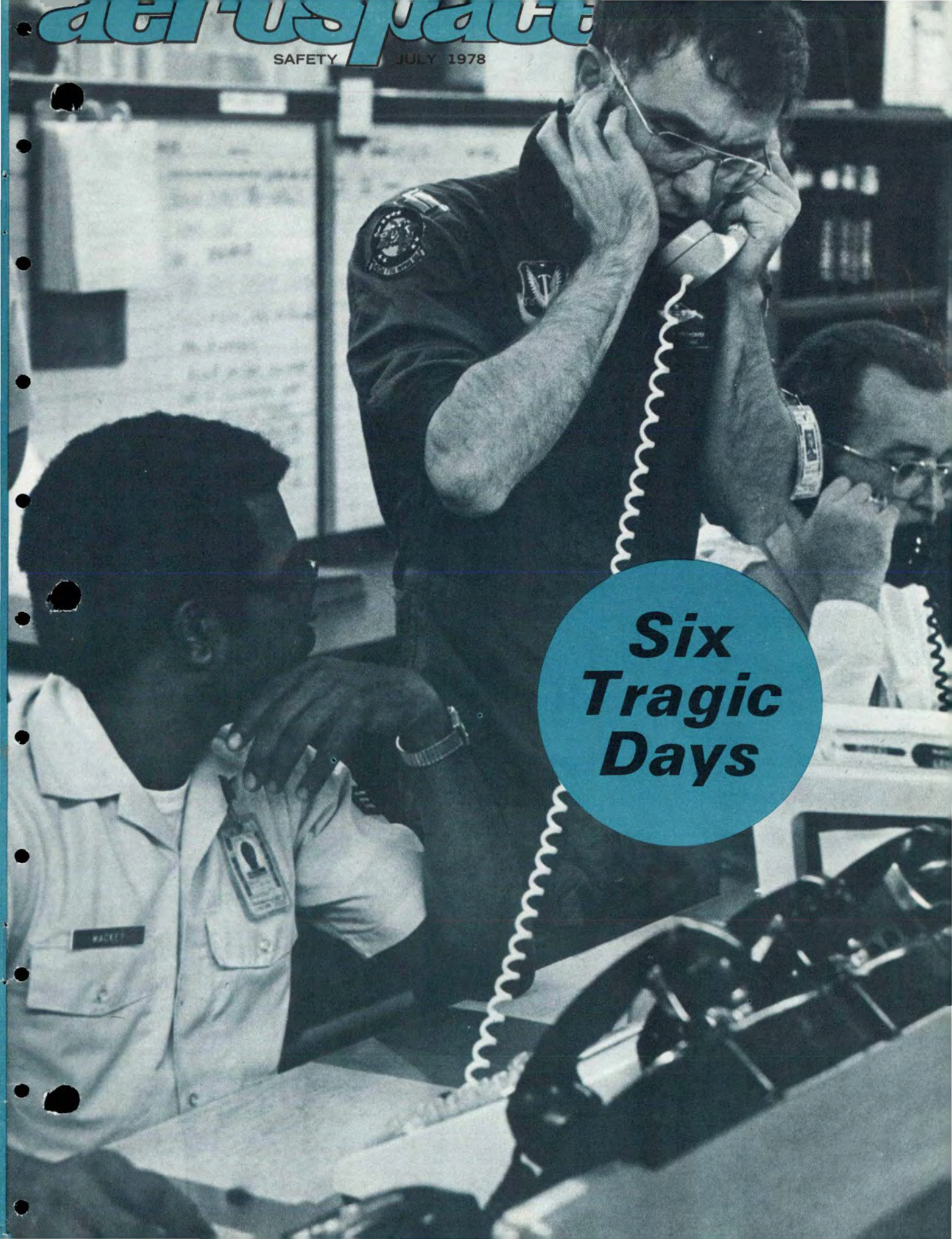
SAFETY JULY 1978



Six Tragic Days

JULY 1978

UNITED STATES AIR FORCE

aerospace SAFETY

THE MISSION - - - - - - SAFELY!

SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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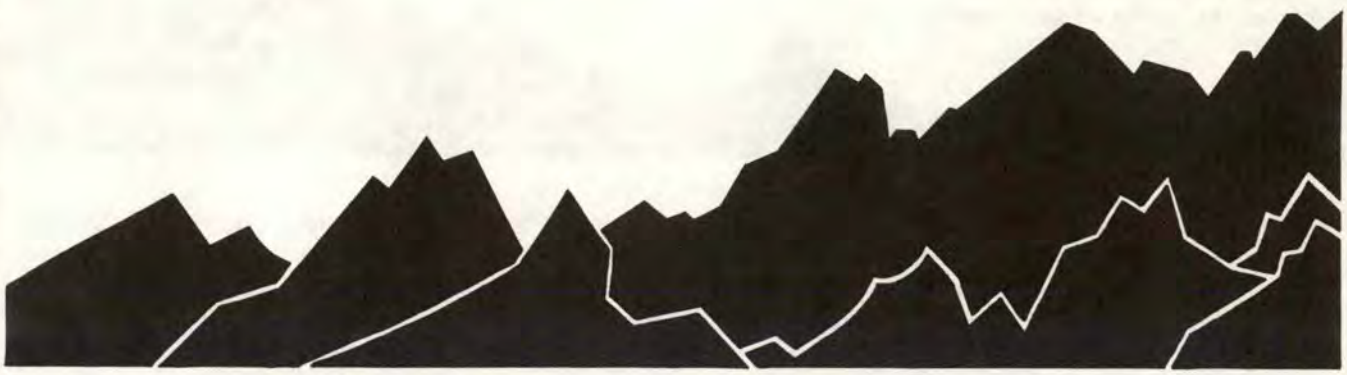
JULY 1978 AFRP 127-2 VOLUME 35 NUMBER 7

a tragic six days



In the southwestern desert is a somewhat triangular mountain range. The highest point of this range towers 8,000 to 9,000 feet above the surrounding desert floor. The long canyon approaches to this peak can appear deceivingly gentle and can leave an impression that the environment is permissive for light, low performance aircraft operations.

During a 6-day period, the mountains claimed four destroyed aircraft, five lives, and six injuries. One of the aircraft and one of the fatalities were civilian. The following is a synopsis of the events of those 6 days.

DAY ONE: An O-2A, call sign Spar 14, took off VFR at 1355 PST, for a planned forward air control mission with a flight of F-4s. Their last radio contact was 11 minutes later. Radar contact was lost 5 minutes after that. When the crew did not check in with the range controller at their planned target time (1445), an intensive air and ground search was begun.

DAY TWO: An air search involving HC-130s, UH-1Ns, HH-53s, O-2s, OV-10s, and civil aircraft continued. Neither the air nor the ground search was successful.

DAY THREE: The search continued with no success.

DAY FOUR: The search continued. That morning, an Air Force lieutenant colonel and his son, in a rented single-engine private aircraft, were scouting for camp grounds in the area. When they failed to return, they were added to the objectives of the search. That evening, photographic interpreters identified a suspect area.

DAY FIVE: An O-2A with two pilots on board was launched to investigate the suspect area. They checked in with the airborne control post at 0759. At 0814, they called, "established in the search area." At 0900 they responded to a routine operations check. At 0910 they failed to respond to an attempted radio contact. At 0930, the airborne command post initiated a radio frequency check. The airborne search was again expanded.

DAY SIX: A ground search party discovered the wreckage of the O-2A lost on Day 5. The crash site was in a canyon at the 8,000-foot level. Both crew members were dead. Two helicopters were directed to the crash site. The pilot of the lost civil aircraft, who had been walking in the snow since the morning of Day 4, saw the activity near the O-2 crash site and walked to it. He stated that his son was in the wreckage of his plane, badly injured. One helicopter evacuated the survivor; the other a UH-1N, continued to search for the light aircraft. That helicopter crashed while flying upslope backtracking the father's trail in the snow.

EPILOGUE: THE CRASH SITE OF THE O-2A LOST ON DAY 1 WAS FOUND LATER IN DAY 6. BOTH CREW MEMBERS WERE DEAD. THE HELICOPTER WRECKAGE WAS FOUND THAT SAME DAY. ALL FIVE PERSONS ON BOARD RECEIVED VARYING DEGREES OF INJURY. THE LIGHT CIVIL AIRCRAFT WAS FOUND 2 DAYS LATER. THE PILOT'S SON DID NOT SURVIVE. THIS EPISODE PROVIDES LESSONS IN MOUNTAIN FLYING AND SEARCH AND RESCUE PROCEDURES AND TECHNIQUES. THESE TWO SUBJECTS ARE COVERED IN THE FOLLOWING ARTICLES.

a tragic six days • part I

Mountain Flying

LT COL ROBERT GARDNER and
MAJOR LAWRENCE WAGY
Directorate of Aerospace Safety

The combination of high terrain and environmental conditions significantly affect light aircraft performance. These conditions, when coupled with deceptively permissive terrain and the urgency of search and rescue, set the stage for this tragedy. The sequence of mishaps during that 6-day period illuminates the hazardous nature of mountain flying in light, low performance aircraft. These hazards can be minimized by a thorough knowledge of proven mountain flying techniques. The following are just a few of the more basic of those techniques.

Weather hazards in mountainous terrain can be extremely localized. Even when your route of flight is forecast to be relatively clear, very localized storms and hazardous winds can exist around mountain ridges, peaks and canyons. Storms and localized precipitation are, in a sense, less hazardous because they are easily seen and avoided. Localized wind hazards on the other hand are subtle and can trap you with little warning. Steady state winds can double their velocity when crossing a mountain ridge (see figure 1). This can have a significant effect on a low performance aircraft's ability to climb and clear the ridge from the downwind side because of turbulence and downdraft. A light aircraft crossing this ridge from the upwind side with minimum altitude clearance can be sucked down by the downdraft and turbulent air into the backside of the ridge.

When crossing a ridge, the flight path should be 45 degrees to the ridgeline (see figure 2). As the ridge is approached, the pilot should expect to see more and more of the terrain on the other side. This means that, unless a severe downdraft is encountered, the aircraft will clear the ridgeline. If it is not apparent that the ridge will be cleared safely, the 45 degree cut would require a shorter turn to abort the attempted crossing.

Flying parallel to the ridgeline on the upwind side will be smooth with updrafts to add to your climb performance. If you must parallel on the downwind side or cross a ridge, keep extra altitude to stay out of downdrafts.

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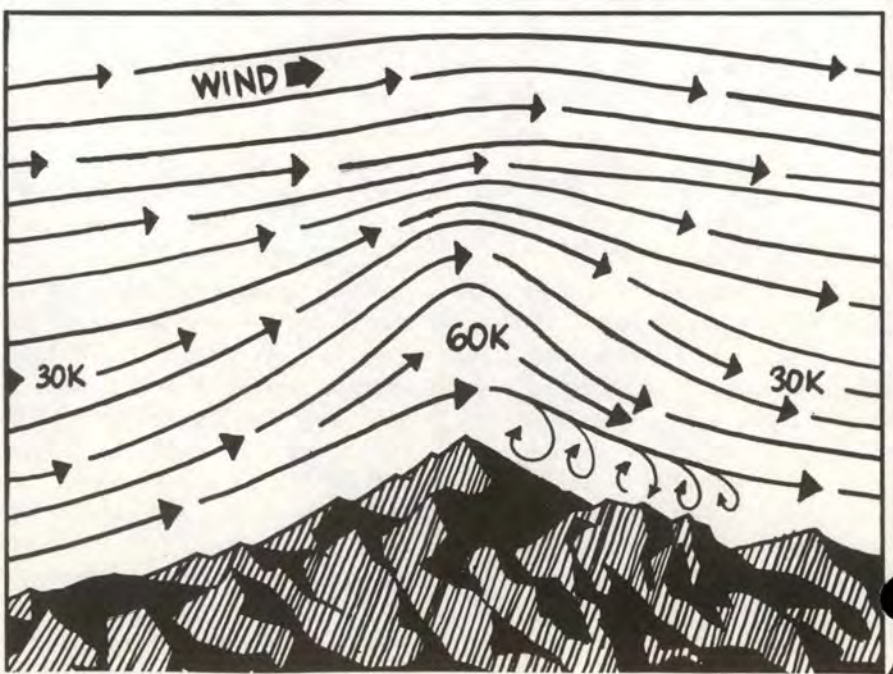
Figure 1. A steady wind speed can double over a ridge.



a tragic six days • part II

The Search For SPAR 14

COLONEL FRANK R. JENKINS
474th Tactical Fighter Wing
Nellis AFB NV

In recent times, most Air Force aircraft, missing over land, have been found within 24 hours. The trend toward larger aircraft, flying completely under radar control and equipped with emergency beacons has eliminated the necessity for large area searches. Well, almost. There are still some Air Force aircraft operating under VFR, at altitudes that make radar tracking intermittent, at best, and with enough fuel to make it to the next state before someone realizes they are overdue. This was the case with Spar 14; it was operating in mountainous terrain below 500 feet AGL. The searchers were aware that both pilots were new to the area, and with over 4 hours of fuel remaining they could have covered a lot of ground.

This led to a massive effort. By the fifth day, the entire search encompassed an area of over 5,000 square miles and over terrain that varied from desert (including portions of Death Valley) to a snow-covered 12,000 foot mountain. Over 50 USAF and CAP aircraft were involved. In addition to aircraft, helicopters and ground search parties were provided by local sheriff's departments. There are lessons to be learned from the search for Spar 14 that can be used when such an effort again becomes necessary.

The responsibility for finding a missing aircraft rests with the nearest installation, so even if none of your base aircraft has less than four engines, you might find that your command post is suddenly deeply involved in looking for a small aircraft for the simple reason that its last known position was in the vicinity of your field and the Aerospace

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Investigators, right, probe wreckage of one of four crashed aircraft.

Mountain Flying continued

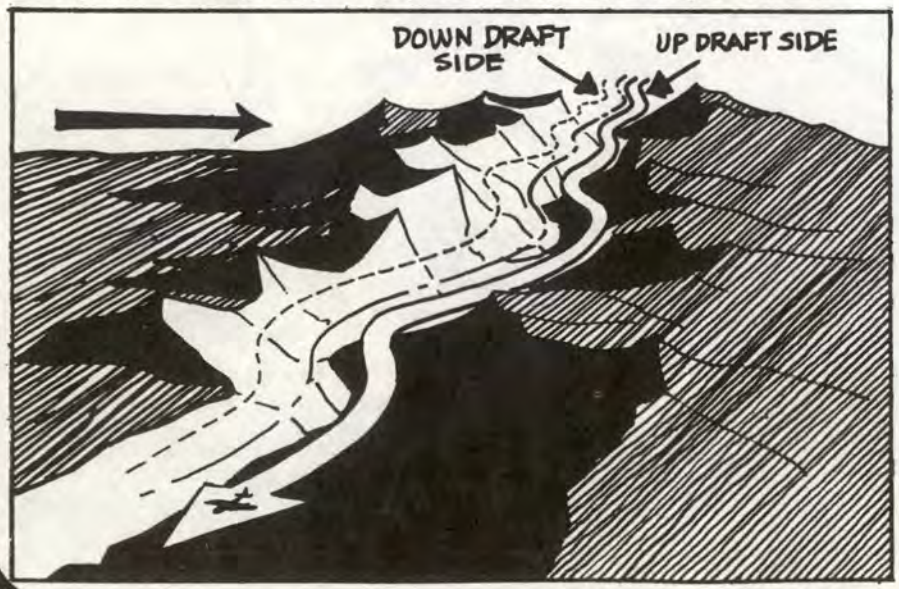
Figure 2. 45° approach to ridge provides pilot several options.

Some pilots use a "rule of thumb" of 1,000 feet clearance with calm wind and another thousand feet for each 10 knots of wind.

When flying through a canyon, fly close to the side of the canyon which affords an upslope wind. This provides additional climb capability and will give you more room to reverse course (into the wind). If low level flight through a canyon is required, fly down the canyon, not up.

Due to the constantly changing conditions of mountain winds, a pilot should be prepared to encounter downdrafts. If you do, don't panic, keep the nose of the aircraft down and maintain your airspeed. The object is to fly out of the downdraft, not to counter it by raising the nose.

Figure 3. In a valley or canyon safest path is on upslope wind side, high end to low end.



Density altitude is the key to performance. For example, even though a ridgeline peaks at 8,000 feet mean sea level, the pressure altitude at the peak could be 8,500 feet on a given day. With an outside air temperature delta of +10 degrees centigrade, the density altitude would be 10,000 feet. The aircraft engine cannot read maps, but can very accurately read density altitude. A light aircraft (not super-charged) with a standard day sea level rate of climb of 500 feet per minute could expect a standard day rate of climb of 155 feet per minute at 8,000 feet MSL. On this particular day, however, a 10,000 foot density altitude would result in a rate of climb of 130 feet per minute. Another factor in engine performance is relative humidity. High relative humidity can result in significant power loss.

Turn rate (more exactly radius of turn) can be critical in mountain flying. It is totally dependent upon bank angle and true airspeed. Using the 8,000-foot ridge example, assume a pilot is climbing a canyon to cross that ridge. He is climbing at 100 kts CAS and is limited by stall speed to 60 degrees of bank. At sea level (standard day) his true airspeed would be 100 kts and his turn radius 500 feet; but with a density altitude of 10,000 feet, his true airspeed would be 117 kts and his turn radius would be 690 feet. If the canyon is 1,200 feet wide and he is flying up the middle, he had better hope he can top the ridge.

Helicopter pilots face the same basic mountain flying problems as the fixed wing pilot.

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Keeping track of search aircraft. More than 50 USAF and CAP aircraft participated in search.

CAP and Air Force participants study map of search area.

A Tragic Six Days • Part II

The Search For Spar 14 continued

Rescue and Recovery Service has requested that your base organize the search. Hopefully, your base will have some sort of established SOP including a checklist to be followed in such cases. But if after the routine things have been done (communications search, ramp check of local airfields, sweep of the area with available aircraft), there is still no sign of the little fellow, you had better call for assistance. Your first call should be to the Air Force Rescue Coordination Center.

The AFRCC at Scott AFB are the pros of the business. They can give you good advice, send you some SAR controllers to help organize the chaos in your command post, dispatch HC-130s and Jolly Green's, obtain Coast Guard assistance, and so on. One of the first units they will send you is the Air Force's own.

Civil Air Patrol There is a CAP Wing organized in every state. These volunteers are well-trained in search techniques, equipped with slow moving light aircraft, and highly experienced (they fly 80% of all inland SAR flying time). Special Air Force funding reimburses them for the gas they burn while on a search, but they provide everything else; the aircraft, pilots, observers, maps and a coordinator to work in your command post. Some other resources you might consider obtaining are:

Photo Reconnaissance Both active and reserve force photo recce aircraft can be called on to look in places where visual observers can't. If they arrive on scene soon enough, aircraft equipped with infra-red sensors may detect the location of the missing aircraft by spotting a hot engine.

Local Law Enforcement Particularly in rural areas, sheriff's departments are well equipped

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Search director, Col Frank Jenkins, studies chart with staff while directing search for missing aircraft.

JP-8 IS COMING

MAJOR PHILIP M. McATEE
Directorate of Aerospace Safety

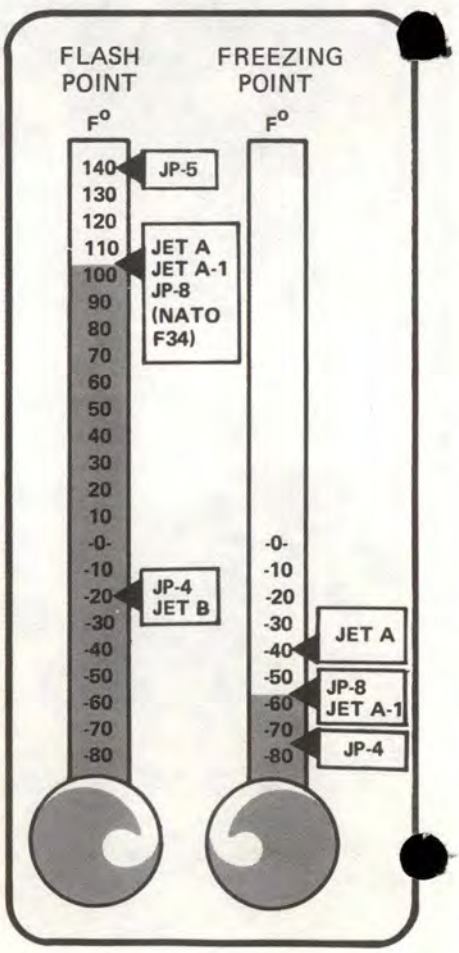
The proposal for the Air Force to convert from JP-4 to JP-8 fuel has been researched and discussed for the past several years. Now the day is coming. Beginning this summer, JP-8 will be introduced in the United Kingdom (U.K.) by the F-111E equipped 20 TFW at RAF Upper Heyford. All other wings in the U.K. will begin using it during 1979.

Why are we switching to JP-8? To see, let's review some background.

When there is an aircraft accident, a high probability for fire exists. Fire is even more common from battle damage. Because of this combat fire danger, Tactical Air Command requested, in 1967, that a fuel be found less susceptible than JP-4 to fire and explosion. Any fuel selected had to be a hydrocarbon fuel with required availability, reasonable cost, and suitable physical and chemical properties, to permit direct utilization in operational aircraft without extensive modifications or serious degradation of aircraft performance.

The majority of candidate fuels such as Jet A and Jet A-1 used by commercial aviation or JP-5 used by the US Navy are kerosene based. JP-4 and Jet B are fuels made by blending naphtha with kerosene. (Original JP-3 fuel was a mixture of gasoline and kerosene, and JP-4 is really just a lower vapor pressure JP-3.) All of these fuels have different characteristics, and both good and bad points.

- JP-4 or Jet B is a wide cut mixture of heavy naphtha and kerosene with a vapor pressure of 2-3 psi, a freezing point of −72° F and a very low flash point of only −20°F. The relatively high vapor pressure and low flash point permits easier light-off at low temperatures, but also



has made JP-4 frequently the cause of post crash fires. With only minor changes, it has been the standard Air Force jet fuel since 1951. JP-5 was adopted by the US Navy in 1952 as their standard fuel due to the need for a less hazardous fuel for shipboard use. It has a minimum flash point of 140° F. Navy aircraft have higher power ignition systems to permit better cold weather starting with the higher flash point fuel. Because of the restrictive specifications, production of JP-5 is limited, and the petroleum industry could not support an Air Force change from JP-4 to JP-5.

- Jet A or Jet A-1 is the standard for commercial airlines. Jet A has a −40°F freezing point with a flash point of 105°F and a vapor pressure of only 0.1 psi. Jet A-1 has the same properties, but a lower freezing point of −58° F. The high freeze point of −40°F for Jet A makes it unsuitable for USAF use and, in fact, most commercial aircraft use Jet A-1 for this same reason.

- JP-8 (NATO F34) is Jet A-1 with anti-ice and anti-corrosion inhibitors added. It is available from all sources that make commercial Jet A-1 fuel including European refineries.

Although safety was the first consideration in finding a substitute for JP-4, other reasons for changing have appeared. As we said, JP-4 is 50 per cent naphtha which is being used more and more for industrial purposes, including the manufacture of synthetic natural gas. This increased demand for naphtha is causing the price to soar, and the cost advantage of JP-4 will soon be gone.

Also, both the United Kingdom and France are already using JP-8 (NATO F34) and Italy is converting now. At the present time, only the military uses JP-4 in Europe, and during wartime we would have no back-up source of supply. But with JP-8, commercial jet A-1 fuel is available worldwide. Within NATO, one standard fuel should be adopted for inter operability, and it appears both the nations concerned as well as European manufacturers prefer JP-8.

So, as you can see, JP-8 quickly became the prime candidate for a replacement fuel. It has a much higher flash point than JP-4 (therefore is less susceptible to ground ignition), excellent availability, and is a common alternate fuel for many of our aircraft at the present time.

Like all things in life, all is not gold. Because of the higher flash point and lower vapor pressure (which makes it safer) JP-8 makes cold weather starting more difficult. Since the flash point of JP-8 is midway between JP-4 and JP-5, the properties are also midway between the two. Testing has shown that high altitude relight capability has proven not to be a big problem. At higher altitudes restart times have increased, but with no decrease in restart capability. Ground starting in extremely cold temperatures with JP-8 will be a problem that still needs to be solved.

However, all testing to date has shown few difficulties, and most of our aircraft and engines are already qualified on kerosene fuel as an alternate. Continuing testing will qualify aircraft on JP-8 as primary fuel and recommend necessary modifications that will differ from aircraft-to-aircraft.

Also, for a period of time, we will have both JP-4 and JP-8 being used within Europe. This will require new technical data on performance to cover four possible situations.

- JP-4 trimmed aircraft fueled with JP-4.
- JP-4 trimmed aircraft fueled with JP-8.
- JP-8 trimmed aircraft fueled with JP-8.
- JP-8 trimmed aircraft fueled with JP-4.

After JP-8 is proven operationally feasible at U.K. bases, the European continental bases will convert during the 1980 time frame. The Department of Defense has already directed that all new jet engines must be qualified on both JP-8 and JP-4.

So, the day of JP-8 is here, and with minor changes we won't know the difference. ★

JP-8 jet fuel joins the fleet in F-111s in the U.K. this summer. JP-8 is Jet A-1, standard commercial jet fuel, with anti-ice and anti-corrosive additives.

USAF WIND SHEAR CONFERENCE

CAPTAIN JAMES J. LAWRENCE • Directorate of Aerospace Safety

The concept of low-level wind shear is by no means new to the aviation community. In fact, a quick review of **Aerospace Safety** magazine issues in the early 1960s revealed several fine articles on the phenomenon. Why then, all the recent interest and publicity on a subject that's been around for so long? Aviation safety periodicals have published pages and pages of information on the causes and effects of the wind shear problem. The FAA and NTSB have put out reports with in-depth analyses on the subject. The USAFIFC has developed a wind shear road show briefing that has reached many aircrews. And, finally, the Air Force and major commands saw fit to send representatives to a Wind Shear Conference held in May at Travis AFB.

The answer is inherent in the fact that one even has to ask the question. The magnitude of the hazard caused by a severe loss of head wind or tail wind on an aircraft in landing or takeoff phase is just not understood well enough by USAF aircrews. Those who do understand the hazard are not equipped with the knowledge and training to avoid or cope with the situation.

Addressing these two problems was the charter of the USAF Wind Shear Conference, hosted by the Military Airlift Command and sponsored by the Air Force Inspection and Safety Center. The hazard surely exists and has been highlighted in recent years as a causal factor in several civilian commercial carrier mishaps. Their use of sophisticated flight data recorders has permitted the identification of aircraft performance deficiencies experienced during a wind shear encounter, which placed the aircraft in a situation from which the pilot was not able to recover. Few USAF aircraft are so equipped, but the profiles of several mishaps fit the description of wind shear induced problems.

The Wind Shear Conference attracted standardization, simulator training, ground training, and weather people from the major commands. The purpose was to first establish the hazard in the minds of those who have the greatest ability to get the word to the aircrews. Secondly, discuss the means for creating an Air Force education program, and lastly, to answer some fundamental questions on coping with a wind shear condition.

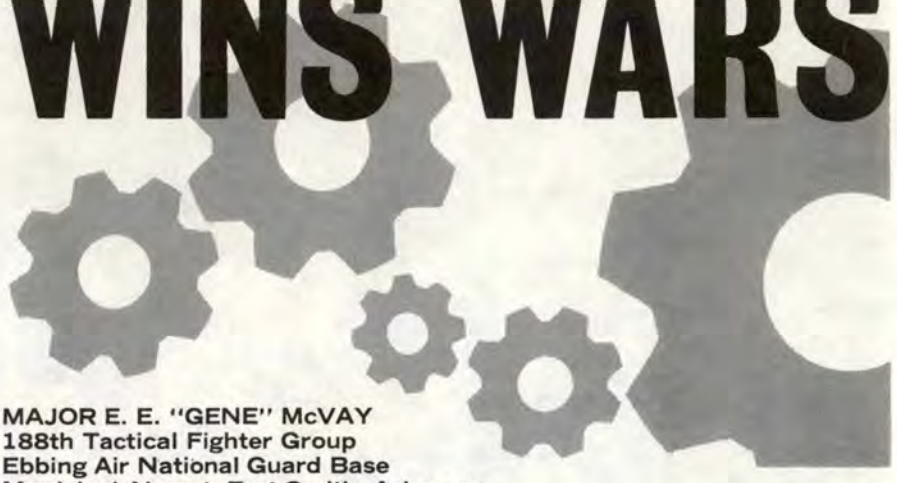
The agenda included presentations by the Federal Aviation Administration, the Air Weather Service, the Instrument Flight Center, and the Inspection and Safety Center as well as the personal experiences of various military and commercial pilots. Once the working group had a good background on the causes and identification of a low-level wind shear encounter,

each participant took a ride in the computer-generated visual display C-5 or C-141 simulator. There, the actual profiles of wind shear-caused mishaps were flown, and in the majority of cases, the results were disastrous. The impact of experiencing the problem supplemented by the visual reinforcement of the crash or near-crash, tends to make one a true believer.

The attendees were also divided into four seminar groups, each responsible for working several problems in their areas of expertise. The goal was not so much to make decisions as it was to enlist command support for, and brain storm the development of a USAF wind shear training program. It appears that a many-sided approach is envisioned, which will include a basic aircrew wind shear education film, wind shear training during UPT, aircraft initial qualifications and upgrades, emphasis during flight evaluations, and wind shear sections in aircraft tech orders. A full media approach with command support appears to be the direction in which best to proceed.

Wind shear, like so many other hazards, has got to be kept in perspective. A DOT study of almost 55,000 aircraft accidents from 1964-1975 revealed only 25 that contained a distinct possibility of wind shear involvement. It is estimated that violent, severely hazardous wind shear will be experienced in only one of five pilot careers. Less severe wind shear, however, is a fairly common occurrence. Like so many other aspects of professional aviating, this hazard must be understood and identifiable so that the USAF pilot can make intelligent decisions to ensure the safety of his or her aircraft. Your local safety officer should be able to supply you with specifics on the causes and dangers of wind shear encounters. ★

DISCIPLINE WINS WARS



MAJOR E. E. "GENE" McVAY
188th Tactical Fighter Group
Ebbing Air National Guard Base
Municipal Airport, Fort Smith, Arkansas

The winning team in college basketball last season had the word "discipline" written on their practice uniforms. Discipline wins ball games and discipline wins wars. Conversely, the lack of discipline can lose wars and cause unnecessary losses during peacetime. One cause in many accidents today is lack of discipline.

The application of discipline is well understood as it relates to cadets and ground soldiers. Even as it relates to children and pets. But what about the combat aircrews? Using good discipline does not indicate weakness, nor does it in any way degrade mission accomplishment. Having the discipline to press the attack or knock it off as necessary is the mark of leadership.

Wingmen or crew members won't attempt irresponsible acts unless they believe they can get away with them. These acts reflect directly on the flight leads and aircraft commanders. If you don't demand discipline, you probably won't get it.

Discipline is not something to impose just on wingmen, however. A recent accident resulted when a flight lead abandoned his flight after they were returning to base with bingo fuel. They were on a red flag mission and in the heat of battle, maybe he forgot for a moment that they were only training. That no one was shooting real bullets and that he could call time out at anytime by simply saying "knock it off." Stating that he had enough fuel for one more pass, the flight lead returned to the target area and possibly attempted to engage in dissimilar air combat against established rules. This breach of discipline cost a life, a valuable airplane, and much mental anguish.

Today's peacetime training is more demanding than ever before. There is less-and-less margin for error as planes go faster and more planes participate in exercises. Accordingly, crews must adhere to strict discipline to accomplish the mission safely. ★

Red Rain

CAPTAIN EUGENE J. CAISSE
Directorate of Aerospace Safety

During the past few years, forest and brush fires have ravaged large areas of the western United States, taking a heavy toll in property and lives. The US Forest Service, along with the various state agencies charged with forest fire control, has recognized the value of aircraft to help spot danger areas and to apply chemical fire retardant. The Forest Service, through a contract system, uses such aircraft as the DC-6, DC-7, C-119, B-17, and several types of helicopters to dump chemicals on hot spots and fire breaks. A common deficiency of these aircraft is that they all use a dispensing system that simply dumps the chemical in one glob. They cannot distribute it evenly over the fire area.

The Air Force, seeing that there must be a better way, has taken the initiative to develop a new technique for applying the chemical fire retardant. One of the Air Force flying units involved in this project is the 146th Tactical Airlift Wing, California Air National Guard. During the past few fire seasons, Colonel Russ Penland and his flight crews have developed techniques in the use of a new type of

dispensing system which was designed especially for the C-130 aircraft.

The new system involves equipment which applies an even spray of fire retardant over a well-defined rectangular area. The Modular Airborne Fire Fighting System (MAFFS) was designed to be installed in a C-130 aircraft in a few hours. It is a completely palletized system of storage tanks and associated ducting with two dispensing nozzles which protrude neatly from the open rear cargo hatch. A loadmaster sits on the pallet and controls the pressurization of the tanks. Unlike the majority of conventional fire fighting aircraft which can dispense a maximum of 2,000 gallons of fire retardant in a deluge, the MAFFS can apply 3,000 gallons evenly over an area 150 feet wide by 1,200 feet long. Since the US Forest Service owns the MAFFS and the Air Force provides the aircraft and crews, both agencies are jointly responsible for training in the use of the equipment and the associated tactics.

Aircrew training is conducted in two phases. All pilots and loadmasters attend an initial ground training class which is conducted by the Forest Service. They learn Forest Service organization, command and control, fire characteristics, wind effects, and tactics. Since they will become part of a highly complex fire fighting team, they must know a great deal about the interaction of all the agencies involved.

Flight training is conducted by the flying units themselves. New crew members fly eight sorties under the direction of squadron instructors and after initial checkout, the crews stay proficient by flying three sorties per year. The training missions, which simulate Forest Service tactics, not only train the flight crews, but also check the MAFFS equipment, which is constantly being modified and improved. Because of the high cost of the fire retardant (about $.90 per gallon), the 146th TAW crews use red-colored water on their training sorties.

Modular airborne fire fighting system allows dispersal of fire retardant evenly over a 1200'x150' area. System can be installed in C-130 in few hours.

When the Forest Service is fighting a fire, it first uses the commercial aircraft from the flying services with which it has contracts. When all of these aircraft are committed to covering fires, the Forest Service can request assistance from the Air Force through Forest Service command agencies. The Airlift Readiness Center at the Pentagon determines which unit will assist the Forest Service, and HQ MAC tasks the unit through normal MAC command and control channels. The unit will usually stage from an airfield close to the fire scene where they may stay for weeks depending upon the extent of the fire.

Once the unit is in place at the staging base, bright orange paint is applied to the aircraft nose, wing tips, and vertical stabilizer. The unit also paints large orange numbers on the aircraft for identification. The C-130's camouflage paint job makes these aircraft difficult to see, especially through smoke and haze. The orange paint gives very good visibility under these conditions.

A typical mission involves multiple sorties. The close proximity of the staging base to the fire, and the MAFFS' short turn-around time, allow the crews to make many drops each day. A sortie involves two aircraft. The lead airplane is usually a Baron flown by a Forest Service crew. This lead ship spots the drop area for the C-130 and also leads the drop crew safely around wires, snags (large bare trees), and turbulence. As they approach the drop zone, the aircraft fly at 125 feet above ground level and 130 knots. The C-130 spreads its fire retardant evenly over the drop zone, which may be a burning area or a fire break.

One advantage of the MAFFS' ability to apply chemicals evenly lies in the area of rescue. When a fire fighter finds himself trapped by fire and must be rescued, the MAFFS can spray directly over his head, and he will not be injured. This cannot be done with any other system, because they dump the whole load at once.

The MAFFS system is undergoing constant improvement. The operational units are currently being modified so that they can selectively dispense only part of their load. Currently, all of the chemical agent must be applied at one time.

The Air Force's technological advancement of the forest fire fighting business may have come just in time. With the recent heavy rains in our western states creating greater-than-normal foliage, the 146 TAW MAFFS crews may be in very great demand this fire season. ★

During May of this year, we conducted no-notice evaluations of nine installations for the Rex Riley Transient Services Award. This trip was the first step in the revitalization of the entire program. A short summary of the evaluations follows:

Retained Awards:

OFFUTT AFB NE

Continues to be a good place to stop! Beware of heavy traffic periods and servicing of odd-ball types of aircraft; your turn time may be slightly longer. However, the TA folks are definitely trying. Quarters—good, food good during duty hours, machines during non-duty. Ramp space somewhat limited with some tight taxi space at times. Watch the X-winds and gusts between the buildings during landing.

MAXWELL AFB AL

An excellent turn despite shortage of people at times! Conscientious TA with fuel and service usually waiting when you arrive. If you plan to RON, make a reservation if you can to prevent staying in some pretty bleak SOS-type rooms. Transport—excellent; helpful, fast and courteous. Base Ops—well-run and oriented toward service. Best selection of machine food in the US (dubious distinction).

TYNDALL AFB FL

Continues to be a best-kept secret. TA folks are among the best in the AF. Obvious professional attitude provides the best service we saw this trip. Base Ops—efficient and well-run. Quarters and food availability above average. A super place to stop and/or stay!

SCOTT AFB IL

Short runway for some folks, but if you can get in, it's a good stop! Good service, quarters, food, and transport! What else can we say?

SHAW AFB SC

Another best-kept secret! Shaw provided us with an excellent stopover. Base Ops and TA reflect a professional effort at good aircrew service. Despite being busy, they have their act together. Base Ops aircrew facilities are among the best we've seen. Base transport was responsive and quarters were excellent. Food availability good during duty hours, but same old machine jungle if you are on a quick turn.

MYRTLE BEACH AFB SC

Crowded ramp with only a few transients, but an excellent stopover. TA fast and conscientious with obvious concern for good service. Base Ops. billeting, and food service were outstanding. Special note: Base Ops has one of the last "real" snack bars in the AF with super food. As mentioned, the transient ramp space is pretty limited, so it might be worth a call ahead if you're driving a

big machine and/or planning to RON.

NO CIGAR: We're not going to name the places that were removed or not added to the Rex Riley list, but we feel that some general comments might help. If the shoe fits. . . .

• Base X—Although a 24-hr transient services base (not many of these left), this base was definitely **not** transient oriented! The Base Ops complex was dingy with no aircrew lounge (or even a chair) facilities. Flight planning room poorly lighted and missing FLIP publications. Basically a hassle.

• Base Y—Another 24-hr transient services base also not oriented toward strangers. Follow me truck wouldn't come out to meet us! Pax service sent no wheels despite a filed code 7 on board. Base Ops and WX folks seemed to not really have much time for us since we weren't from the home drome or didn't have VIP's on board.

• Base Z—Despite a brand new ops facility, this base also gave extremely poor service to transients. Long fuel delays, noncaring TA folks and phantom Base Ops personnel made a 2-hour turnaround seem like a real effort. General lack of concern.

• Common to X, Y, and Z—Galloping apathy! Anyone who has been flying or riding military aircraft for awhile has seen the base that doesn't really seem to care whether you get good or bad service. No pride in their operation; just folks putting in time.

FOND FAREWELL: This month we are dropping Richards-Gebaur AFB from our list due to their gradual loss of transient facilities related to draw-down and closure. The TA and Ops folks at R.G. have always enjoyed the reputation of providing fast, efficient, and conscientious service. We in the airplane business are sorry to see them go, for good stopping places are hard to find!

Hopefully, the Rex Riley Transient Services Award program is now back on its feet. We intend to visit bases within every 2-year period in order to retain some "currentness" to the award. After an evaluation visit, the installation commander will receive a letter with a copy of the write-up checklist and a new certificate (if applicable). Keep in mind the intent of the program: to prevent mishaps through the improvement of transient aircrew facilities and transient aircraft servicing and maintenance. One bad link in the chain breaks it! For instance, Base Ops and TA can be doing their job, and if billeting doesn't provide a place for the aircrew to get decent crew rest, the evaluation will be unsat! Conversely, the quarters can be great, but if TA gives a bad turn, the award won't go (or stay) at that installation. We are trying to give everyone an honest shake and although we still have some problems with the program, we feel that we're moving in the right direction.

One last pitch! We are limited in the number of evaluations we can give, so we depend on aircrews and installation personnel to furnish us with info. AIRCREWS—if you get a bad or good deal somewhere, let us know. Fill out a transient aircrew form and send us a copy. Installation personnel—if you're not currently on the Rex Riley list and you feel like you have your act together, let us know. We'll try to get by and give you a check! Send all correspondence to: Rex Riley, c/o AFISC/SEDAK, Norton AFB CA 92409. Thanks for your help! ★

THE

REX RILEY
Transient Services Awa

LORING AFB	Limestone, ME
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, S
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
LUKE AFB	Phoenix, AZ
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, G
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
ENGLAND AFB	Alexandria, LA
KADENA AB	Okinawa
ELMENDORF AFB	Anchorage, AL
PETERSON AFB	Colorado Springs
RAMSTEIN AB	Germany
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
TORREJON AB	Spain
TYNDALL AFB	Panama City, FL
OFFUTT AFB	Omaha, NE
NORTON AFB	San Bernardino,
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
CARSWELL AFB	Ft. Worth, TX
HOMESTEAD AFB	Homestead, FL
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City,
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND

TANK TALK

Gear up . . . flaps up . . . and you suddenly see the right and left fire warning lights staring you in the face, followed by two overheat lights. The end of the world? you say. Well, not necessarily. It's certainly justification for that moment of panic or queasy feeling in the pit of one's stomach that everyone encounters at one time or another. While a double fire light could be caused by many things, records reveal that one F-4 is lost every 12-18 months on takeoff due to a leaking external centerline fuel tank. The Dash One even has a discussion comment to this effect after the bold face emergency procedures for fire on takeoff: "A leaking centerline fuel tank may cause dual engine fire/overheat indications."

The sequence of events for such emergencies varies from incident to incident; but usually, once the gear is retracted, the centerline tank pressurizes automatically, any leak present starts leaking under pressure, and the fuel being sprayed out is ignited by the afterburners on takeoff. The fire warning lights normally illuminate within seconds and are often followed by overheat lights.

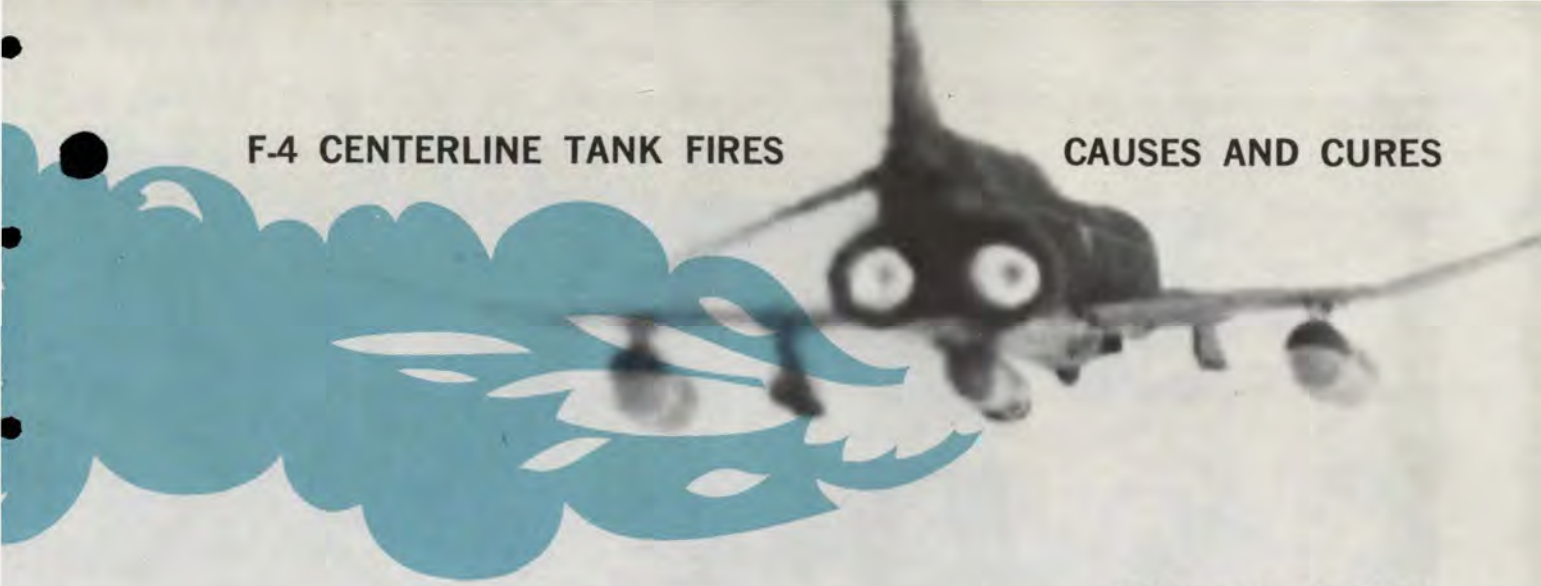
The solution, of course, is simple and spelled out in the second bold face step for fire on takeoff, "External Load-Jettison." With the fuel source removed, the fire will normally be terminated, and a successful recovery can be accomplished. Many crews have followed these procedures and experienced only minor damage, so one might be inclined to ask, "What's the problem?" The emergency is defined, covered in the Dash One and corrective bold face action outlined. Unfortunately, statistics show that five F-4 type aircraft have been lost in the past seven years due to centerline tank fires on takeoff. While no two centerline tank fire incidents were exactly the same in the five major accidents, there were certain similarities:

- The crews did not take actions to jettison the centerline tanks.
- The fires continued, and the crews subsequently lost control of the aircraft and ejected.

There are, of course, some circumstances in which jettisoning of the external fuel tanks would not be feasible, e.g., during takeoff over populated areas. Even under conditions where the tanks cannot be jettisoned, all is not lost. A recent Interim Safety Supplement to the F-4 Dash One directs that the air refueling switch be placed to extend, thereby depressurizing the external centerline fuel tank and cutting off the fuel source and terminating the fire. It should be pointed out, however, that no Air Force crew has, as yet, used this procedure to combat a centerline tank fire. In fact, there is evidence to indicate that once a leaking tank becomes pressurized and the fuel is ignited, a blowtorch effect occurs which produces intense heat and will burn through the tank itself. Once tank burn-through occurs and the burn out area enlarges, pressurization is no longer a concern. The fire can continue to burn within the tank, and the fuel may continue to be sucked into the engine bay areas by negative pressures at certain throttle settings. It is obvious that once the fire has reached this point, depressurizing the centerline tanks will do little good.

The importance of F-4 aircrews recognizing and correctly identifying the emergency early cannot be over-emphasized. The intense fire generated by the pressurized fuel

F-4 CENTERLINE TANK FIRES CAUSES AND CURES



LT COL TOM PHILPOTT
Twelfth Air Force, Bergstrom AFB TX

escaping from a centerline tank is often concentrated in the Aero 27 rack area. Photo 1 shows an Aero 27 rack that was exposed to a centerline tank fire for less than 20 seconds. The outer covering of the wiring cable has been burnt off, and wiring leading to the cartridge initiators has started to melt.

If experience is an indicator, one of two things will happen: the jettison cartridge will fire, jettisoning the centerline tank due to the burning initiator wiring shorting out, or the excessive heat build-up, or the wiring to the initiator cartridges will burn through and prevent the centerline tank from jettisoning even if the jettisoning button is subsequently depressed by the aircrew. In the first case, where the tank jettisons due to the fire, all may end well. With the centerline tank jettisoned and the fire source removed, the fire will be terminated. This has occurred in previous centerline tank fires. In the second case, all may not turn out quite as well. In fact, in the cases where the aircrews either did not or could not jettison the centerline tanks, the F-4 was lost. In some cases the Aero 27 rack ejection cartridges were found fused but not fired even though the F-4 crashed and had burned for several hours. Again, it becomes obvious that the aircrew needs to be alert, recognize and identify the problem, and make a timely decision to jettison the external centerline tank. Unfortunately, the bold face for fire on takeoff, "External Load-Jettison," is qualified with the words (if necessary).

Several aircraft commanders have commented on the fire on takeoff emergency: "As long as I have control and power, I intend to fly the aircraft and get some altitude and worry about jettisoning the tanks later." While no one can argue with the wisdom of flying the aircraft and getting a little altitude, it must be pointed out that jettisoning the tanks later may be too late.

Another area of similarity in the five most recent major centerline tank fire accidents was that maintenance personnel had not completed the external centerline tank installation checklist. Specifically, the tank operational check, including the fuel transfer and pressure check, had not been performed. There is little doubt that, had the centerline pressure check been accomplished, the leaking centerline tanks would have been identified. Again, one might ask, "What's the problem?" Tech orders and checklist clearly outline the proper procedures. Perhaps the statement given by the crew chief of the last F-4 lost due to a centerline tank fire contains the answer. "There's nothing to loading centerline tanks. We've been doing it since year one. It was one of the first jobs I did on the line."

The old adage that familiarity breeds contempt or, in this case, complacency, indeed contains a grain of truth. Unfortunately, in addition to complacency in loading centerline tanks, there also appears to be several widely held misconceptions concerning operational checks of the external centerline tanks. The following comments made by crew chiefs on performing operational checks appear to be typical. "After I hang a tank I just open the centerline tank fuel shutoff valve and let a few gallons run into the centerline tank. I know it checks the tanks because I've found a lot of leaks this way and I don't have to waste time waiting for the fuel truck or doing an engine run for the regular centerline tank oper-

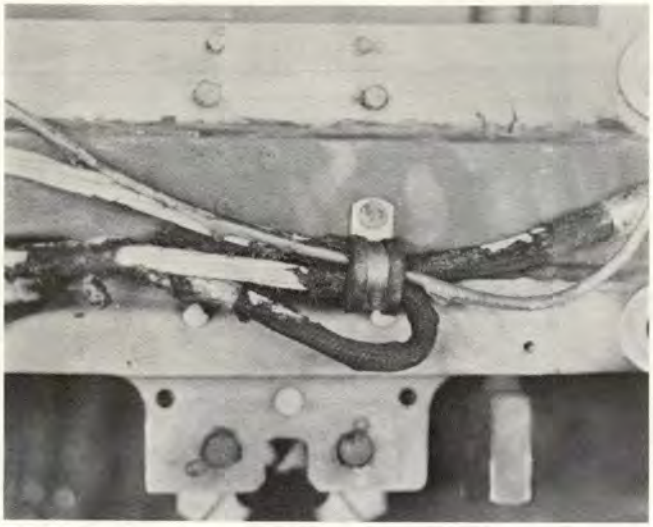


Figure 1
Aero 27 rack exposed to a second centerline tank fire showing charred wiring bundle.

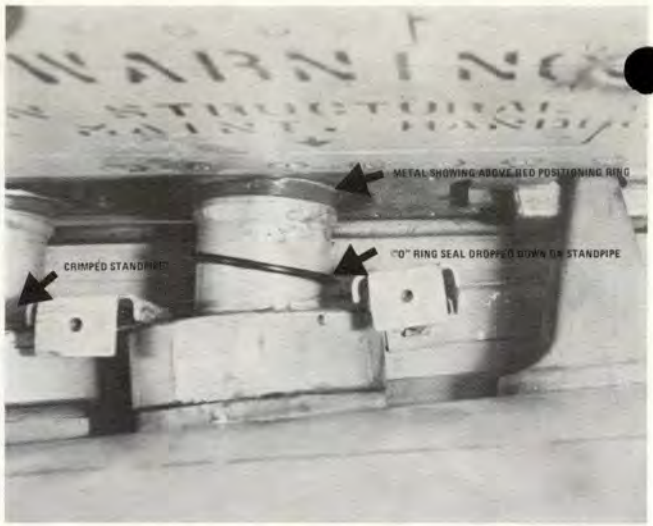


Figure 2
Centerline tank improperly installed with crimped standpipe. "O" ring seal out of place and red band placed too low in aircraft fuel quick disconnect.

ations check. If the tank didn't leak with fuel coming in, it won't leak going out."

Not a bad rationale unless you consider the fact that fuel, gravity feeding from the fuselage tanks into the external centerline tank, will not necessarily identify all leaks. Many leaks will not become apparent until the centerline tank is pressurized to the normal operating pressure of 16 psi.

Another comment frequently made by many crew chiefs is: "I don't worry about the centerline tank operations check because we use single point hydrant refueling which pumps fuel under a pressure of 55 psi. If the centerline tank doesn't leak with 55 psi it isn't going to leak. So why should I bother with an operation check which only pressurizes the tank to 16 psi."

Again, the rationale sounds good until all factors are considered. First, while fuel from the single point refueling hydrant enters the aircraft at 55 psi, it branches into several fuel manifolds which substantially reduces the pressure in any one fuel line. Depending upon the particular point in the refueling cycle there may be only 5 to 6 psi in the centerline tank fuel line. Many centerline tank leaks will not become apparent during refueling and can be identified only when the operational fuel transfer and pressure check is performed. Also, while both methods previously mentioned might catch some fuel leaks, they do not check whether fuel can be transferred. Obviously, too important a step to omit.

Is this a widespread problem? Apparently so, as all of the aircraft lost due to centerline tank fires have been from different wings. In a 60-day period one F-4 wing experienced two centerline tank fires, and one transient aircraft landed with the centerline tank improperly installed and not feeding. While maintenance personnel in several wings have implemented training programs with an increased emphasis on proper centerline tank installation, it is a problem area which obviously will require continuing and on-going emphasis if it is to be solved. It goes without saying that a little extra attention to the external tanks during inspections would also be in order.

Of course, a double fire warning light on takeoff does not necessarily have to be a centerline tank fire; but it should be one of the first things that a prudent aircrew considers. However, it cannot be overemphasized that once the crew determines that the emergency is a possible centerline tank fire, a timely decision to jettison the external tanks or extend the in-flight refueling receptacle is absolutely mandatory, if the aircraft is to be recovered safely. ★

Normal tail cone section with tail cone of a centerline tank showing effects of tank burn through from a centerline tank fire. The aircraft subsequently crashed.

OPS TOPICS

"IFC APPROACH"

The "IFC Approach," a series of articles on instrument flying featured in *Aerospace Safety*, has ended with the deactivation of the USAF Instrument Flight Center. *But* there's good news with the bad. The series will continue sometime next fall courtesy of Air Force Communications Service. To get a feel for *your* needs, AFCS needs your suggestions and questions. Their address is HQ AFCS/FF, Scott AFB, IL 62225. AUTOVON numbers for specific activities are: TERPs: 638-5431, FLIP: 638-5479, ATC Procedures: 638-5462.

THE EJECTION STORY

During the month of May, there were 4 ejections with 3 survivors and 1 fatality. The fatality apparently was caused by the effects of a high-speed ejection. There was also a midair collision between two ejection-seat-equipped aircraft from which neither pilot tried to eject. Both pilots were killed.

EJECTION MISHAPS

	Ejections	*Fatalities*	*% Survived*
Jan-Apr 1978	26	7	73
May 1978	4	1	75
TOTAL	30	8	73

NON-EJECTION MISHAPS

	No. Crewmen	*Fatalities*	*% Survived*
Jan-Apr 1978	11	6	45
May 1978	2	2	0
TOTAL	13	8	38

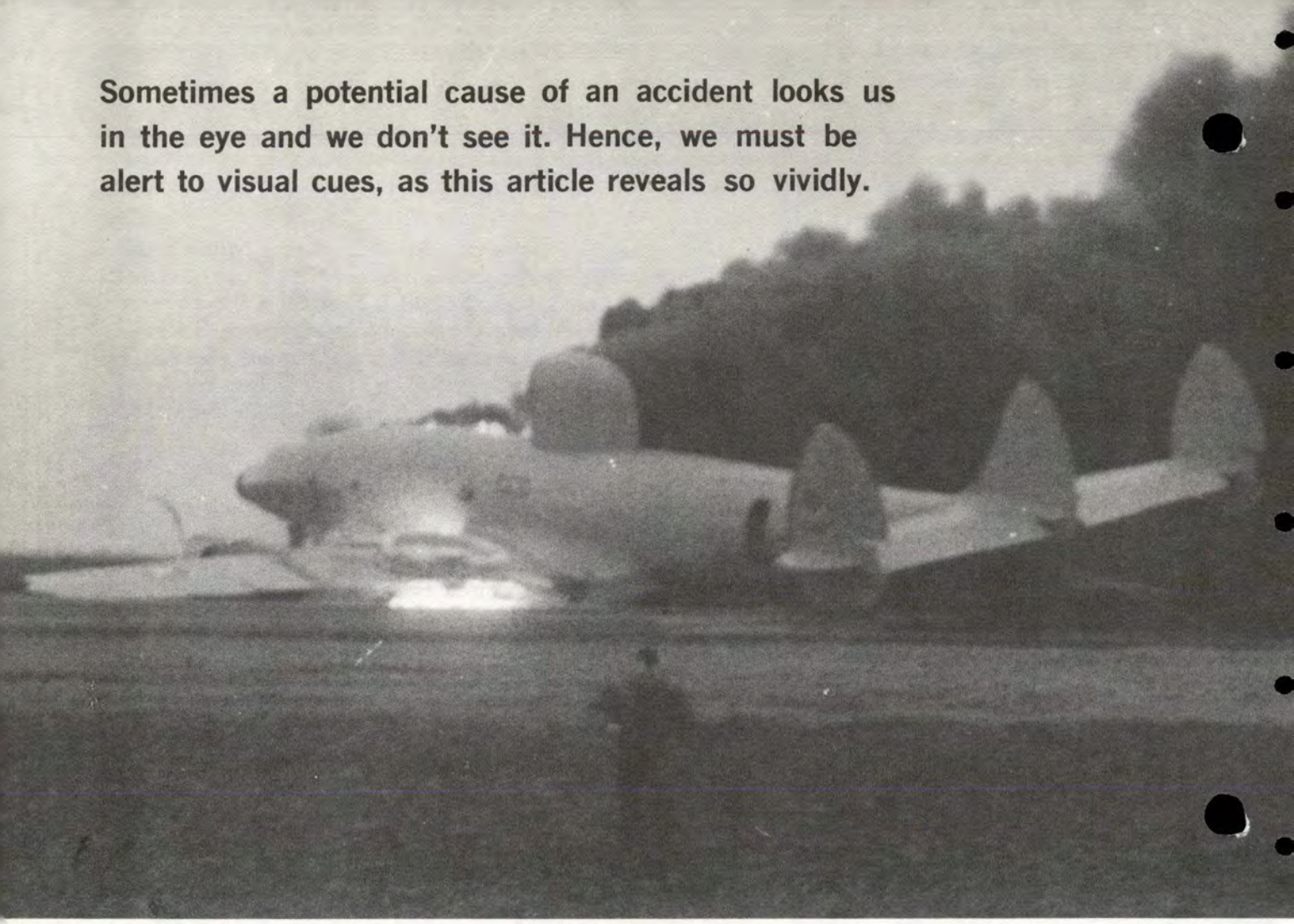
Four of the non-ejection survivors, through April, were from two landing mishaps which resulted in destroyed aircraft. The other was a lucky pilot whose aircraft struck the ground and the impact threw the seat high enough for it to act like it had ejected. He got a good chute and survived. The aircraft did not.

Overall, the message that is evident from these figures is that the chances of surviving a destroyed aircraft mishap are a lot better if you use the ejection seat in time for it to save you!—Mr. Rudolph C. Delgado, Directorate of Aerospace Safety.

WEAK PROCEDURES= NEAR MIDAIR

A B-52 was following prescribed strategic training route (STR) procedures. A fighter crew, however, failed to maintain route timing and arrived at their I.P. well in advance of the scheduled time. They also failed to abort the route as required when the timing error became apparent. This error was compounded when the crew misinterpreted the STR radio call "cleared on range and frequency." This call merely constitutes acknowledgement of the initial call-in. However, on tactical ranges, similar phraseology is used to clear aircraft into the target area; and it was interpreted in that manner by the fighter crew. A lack of knowledge of STR procedures on the part of the crew is apparent. Confusing radio phraseology also existed. Have it together before you enter a route, range or area. Procedures and timing are established to provide separation and prevent mishaps. ★

Sometimes a potential cause of an accident looks us in the eye and we don't see it. Hence, we must be alert to visual cues, as this article reveals so vividly.



HEED THE VISUAL CUE

CUE

CUE

CUE

CUE

CAPTAIN JAMES T. WEBB • Air Forces Iceland

Thank heaven it was a taxi accident! It was an overcast morning when the crew completed preflight of their EC-121, airborne warning and control aircraft. Everything checked out okay, and the 17 crewmembers piled into their aircraft for what was to be a routine training mission. The engines were started, and the copilot called the tower for taxi clearance. Tower cleared the aircraft to taxi and the chocks were pulled. Things were going exceptionally smooth this morning, with plenty of time to taxi, for it was 20 minutes before the scheduled 0900 takeoff time. With her full fuel load, the aircraft lumbered down the long parallel taxiway as the crew prepared for takeoff.

Suddenly and, almost instantaneously, the aircraft fell off toward its left side as though the left main landing gear had disappeared. The number two and then number one props began to whack at the taxiway. The left tip tank dug into the taxiway apron and the aircraft started to rotate rapidly to the left. The pilot quickly reversed number three and four throttles and applied right brake in an effort to stop the aircraft and prevent further rotation. Simultaneously, the copilot joined the pilot on the right brake and then tried the emergency brake system as the aircraft continued rotating 120 degrees while sliding to a stop. When the left wing fell to the ground, the right wing and wingtip fuel tank (with its 2 tons of fuel) whipped upward in a violent motion. As the aircraft rotated left, the right tip tank snapped off, ruptured, and was caught under the rear fuselage spreading a bed of fuel for the aircraft when it stopped. Fed by ruptured fuel lines, fire in the left wheelwell was already out-of-control when the aircraft came to rest. A 23-knot wind fanned the fire from the left back toward the fuselage and the 17 souls inside. When the aircraft stopped, a total of about 8 seconds had elapsed from the initial drop.

Seeing reflection of flames off the number two engine shroud, the pilot ordered the flight engineer to cut all mixtures and rang the emergency alarm bell. The crewmembers in the aft cabin were already keyed for action. The rear crew door was opened, the egress rope thrown out, and they began scurrying out the door. Some used the rope and some, the more impetuous ones, elected to jump to the ground. One individual opened the left overwing hatch but was greeted with flames blocking the exit. He then opened the right overwing hatch and saw flames already coming up over the wing's leading edge. He and a close friend dashed through this exit and departed off the right wing's trailing edge.

After cutting the mixtures, the flight engineer opened the forward crew exit door only to see a cloud of black smoke billowing from directly below. The pilot, copilot, and engineer noted the path to the rear exit was still clear. The pilot ordered them out via that exit. They assembled upwind and took a head count which confirmed everyone clear of the burning craft. The entire evacuation took less than 30 seconds with only two minimal injuries. One individual had his gloves off to adjust his camera when the mishap occurred and obtained rope burns on his hands when he slid down the egress rope. Another slipped while going off the right wing and bruised his leg.

The fire trucks were on the scene immediately but were unable to suppress the massive fire. The crew were examined at the hospital and released. They spent the next few hours rehashing the events during the evacuation and giving thanks and praise for the egress training they received prior to the accident. Their professional, systematic actions, and their knowledge of what to do and how to do it before the need presented itself were instrumental in their escape from an aircraft being engulfed in flames. Their

Just a taxi accident? Fortunately all aboard escaped, but aircraft was destroyed by fire when left main gear failed.

HEED THE VISUAL CUE continued

training and "heads-up" thinking resulted in avoiding a near catastrophe.

Avoiding a near catastrophe? Catastrophe is similar to beauty—it's in the eye of the beholder. And if you're the commander of a unit beholding one of your $2,500,000 aircraft burning to the ground, things aren't exactly beautiful! In fact, until you find out what happened, the catastrophe may be just beginning.

But there is still "no excuse"—so how about a reason? The gear failure was caused by a single, small nick in the surface of the landing gear's upper cylinder. The nick was only 0.6 inches long and 0.015 inches deep but the corrosion in the base metal grew until the cylinder could no longer take the stress from normal operations. The corrosive process was like a hidden time-bomb, slowly growing, slowly ticking off time, until it exploded causing catastrophic failure of the complete gear assembly.

During the accident investigation, it was determined that this nick was on the gear when installed on the aircraft just 1 month prior to the accident. Obviously, no one could have seen the corrosion under the nick, but the nick itself would have been clearly discernible by anyone inspecting the gear during overhaul, packing, uncrating, installation, and routine walk-around inspections. Yet, of all the people having "intimate relations" with this gear, no one noticed the nick until it was pointed out by a depot representative during the investigation. It then stood out like a cherry on a Las Vegas slot machine. Why?

Fractured cylinder that finally failed from corrosion under small nick shown in lower right photo. Tiny nick, just .6" long and .015" deep, escaped observation.

Eyesight wasn't the problem. Everyone involved had adequate vision to read the print in the tech data and make sure there were no requirements for checking for mechanical defects on the non-chromed surfaces of the strut. The lack of tech data was part of the problem, but vision was obviously not a factor. So why wasn't the nick detected?

The answer is in the understanding of the phenomenon called perception. Perception involves not only focusing one's attention on the *cue,* the nick in this case, but also attaching a degree of value to the *cue* to make it significant. The addition of a specific check to the tech data should solve the problem of directing attention to such defects. But how do you get someone to attach the appropriate, significant value? Perhaps the question can be partially answered by reinforcing one's value system through education.

The photograph left shows the nick on the gear strut. If you can imagine the cylinder all in one piece, the nick might not mean much to you—not significant. However, associate the nick with the fractured cylinder shown in the photo left. Does the nick have any significance now?

If your work involves inspection of aircraft components—it should have significance! Whether you fly the birds, maintain them, or support them in any way, YOUR JOB IS VITALLY IMPORTANT. Your attention to the condition of aircraft components from landing gears to the smallest electrical diode is important. Your identification of the seemingly most insignificant defect could mean the saving of invaluable life.

That 5¢ nick could have millions of dollars worth of corrosion under it and many souls riding on it. ★

A Tragic Six Days • Part I

Mountain Flying continued

However, because they normally work closer to the terrain and at lower airspeeds, the effects of turbulence, downdrafts and wind direction can be even more hazardous. As with fixed wing aircraft, determining the effects of altitude and temperature on helicopter performance should be a part of your preflight planning. But remembering that significant variations can exist between forecast and actual remote area weather, performance computations must be verified. For instance, an actual aircraft performance check could be accomplished well clear of terrain but at the intended working altitude. Wind velocity and direction are also factors affecting helicopter lifting performance. When a helicopter is operated at or near its service ceiling, a downdraft of 100 feet per minute or more may establish a descent of such magnitude that it cannot be arrested even after the helicopter has cleared the downdrafts.

Turbulence, gusts, and high altitude increase the potential for blade stall and can drastically decrease stall onset speed. An increase in rotor rpm will improve gust response, provide a smoother ride, and decrease susceptibility to blade stall. In addition to severely restricting hover capability, high altitude and/or high temperature operations greatly enhance the chances for power settling, and main and tailrotor droop.

Fixed and rotary wing aircraft can be safely flown at high altitudes, but pilots must anticipate problems and be prepared to cope with them.

A rule for mountain pilots to **live** by: "Always remain in a position that will allow you to **turn** and **fly** downhill." ★

A Tragic Six Days • Part II

The Search For Spar 14 continued

and experienced in both air and ground searches.

Local Media It pays to advertise! Request that citizens report any unusual sightings, noise, etc.

Other Military Units Nearby bases will stand ready to assist but usually will not formally offer their aircraft or people since they don't wish to bother the searchers. They believe that if they are needed, they will be called on. It's up to the base responsible for the search to call on them. Aircraft belonging to other services should not be overlooked, particularly the Army with their numerous helicopters.

COMMAND AND CONTROL

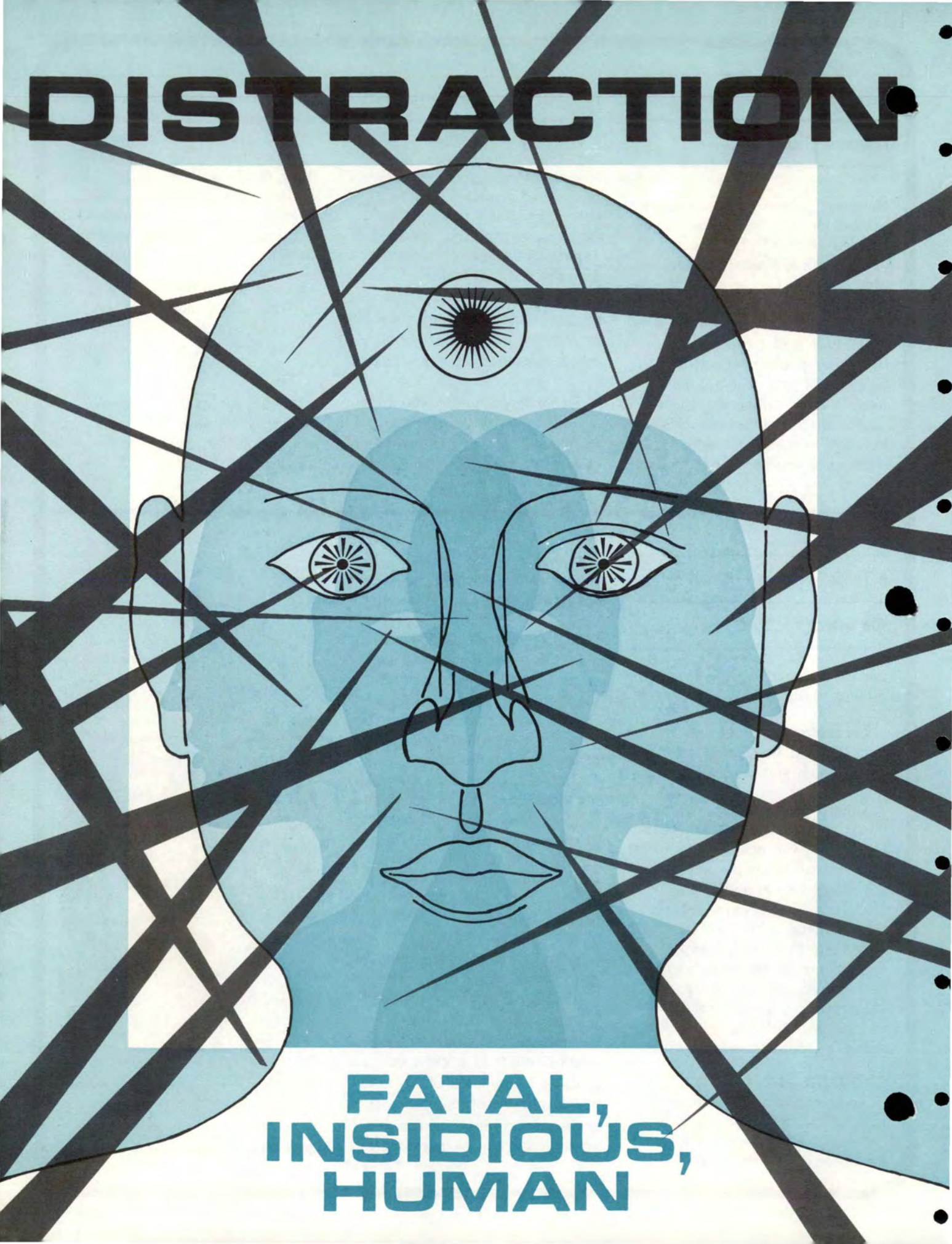
An extensive search effort may be too much for the base command post personnel to handle. After the initial, routine steps are taken and prior to the arrival of outside assistance, a SAR staff should be formed, headed by a SAR Mission Coordinator (SMC). This staff assigns search areas, briefs and debriefs search crews, handles message traffic, flight follows the search aircraft and serves as the focal point for te entire SAR effort. Continuity of personnel is important; a search is not a routine operation for most USAF bases; many procedures have to be improvised to fit the situation and a search strategy has to be formulated and pursued. A staff that stays with the effort is in a better position to do this.

Search Area One method of dividing the search area is the national grid system developed for use by the CAP. Under this system, each sectional aeronautical chart is broken up into grids of 15 minutes of latitude by 15 minutes of longitude. The grids are numbered, and each search crew can be assigned one

continued on page 28

Snowmobiles facilitated search in snow-covered mountains.

DISTRACTION



FATAL, INSIDIOUS, HUMAN

Things which need our attention usually do not arrive at convenient intervals, but, rather, at irregular and ill-chosen times. So, when two items of information arrive at the brain at the same time, one of these items must wait until the other is processed.

MAJOR THOMAS R. ALLOCCA • Directorate of Aerospace Safety

"... A breakdown in crew coordination and discipline (and safety) was induced by several distracting events such as the requirement to make numerous radio transmissions during the descent and approach phase of flight and the necessity to complete a large number of checklist items during a critical phase of flight . . . ." This passage has been extracted from a cargo aircraft mishap report in which 15 people perished and the aircraft was destroyed.

This is not an isolated incident. Distraction has also been identified as being a significant contributor to bomber, trainer, and fighter mishaps. In one of these accidents, the crew decided to contact the command post during a night instrument approach in deteriorating weather. The "distracting" effect of this call was judged to be instrumental in the sequence of events leading to the accident. The argument here is not with command post transmissions—which provide an increased level of management control and safety by keeping supervisors aware of mission progress —but with the oft-times fatal effects of distraction.

In reviewing the reports which describe such mishaps, this finding seems "intuitively" clear: That the crew was unaware of the tragic effects of distraction. Unaware because distraction has a decidedly insidious, human quality. Central to any discussion of this very human problem are the psychological concepts of a single decision channel, short term memory store and stress.

Air Force crew members are neat guys. But, regardless of how neat you are, you can't do two things at one time. I know you think you can—so do I—but studies prove you (or anyone else) can't. Why? Because of man's single-decision channel.

The concept of a human single-decision channel is well-established. Laboratory results show that when two items of information arrive at the brain at the same time, one of these items must wait until the other is processed. The brain is not the only sensory organ so affected; when different messages arrive at the ears at the same time, we act on one and do virtually nothing with the other. It really doesn't matter how the message is received, we can, in fact, attend to only one thing at a time, and it is this central channel which limits our ability to process information.

Now when we combine this single-decision business with another "sad" fact of life, problems can result.

Things which need our attention usually do not arrive at convenient intervals, but rather at irregular and ill-chosen times. So, when two items of information arrive at the brain at the same time, one of these items must wait until the other is processed. Sure, you say, I know all this, that's why I can rank-order those things which should be done first; then I get to the other "less-important" problems. Maybe you can, maybe you can't. But, I think that, given the right set of circumstances, we can all fall victim to distraction's fatal claws. To wit: The first-ever fatal accident of one of the wide-bodied jets—a Lockheed 1011 of Eastern Airlines—occurred near Miami, Florida, in 1972. It's an often-told story, one in which the crew became so preoccupied (distracted) with a potential emergency that they completely neglected what should have been their primary task—to safely fly an airworthy aircraft.

Akin to man's limited capacity for processing and acting upon information is the concept of a short-term memory store.

When two items of information arrive at the same time, we put one in a short-term "memory store" while we process the other. It has been shown, however, that items awaiting action in such a store are quite likely to be forgotten. This is particularly true for the "older" pilot: studies indicate that if he is given simultaneously, say, both a new clearance and a relatively more important piece of information—perhaps the proximity of another aircraft—he may have forgotten

DISTRACTION continued

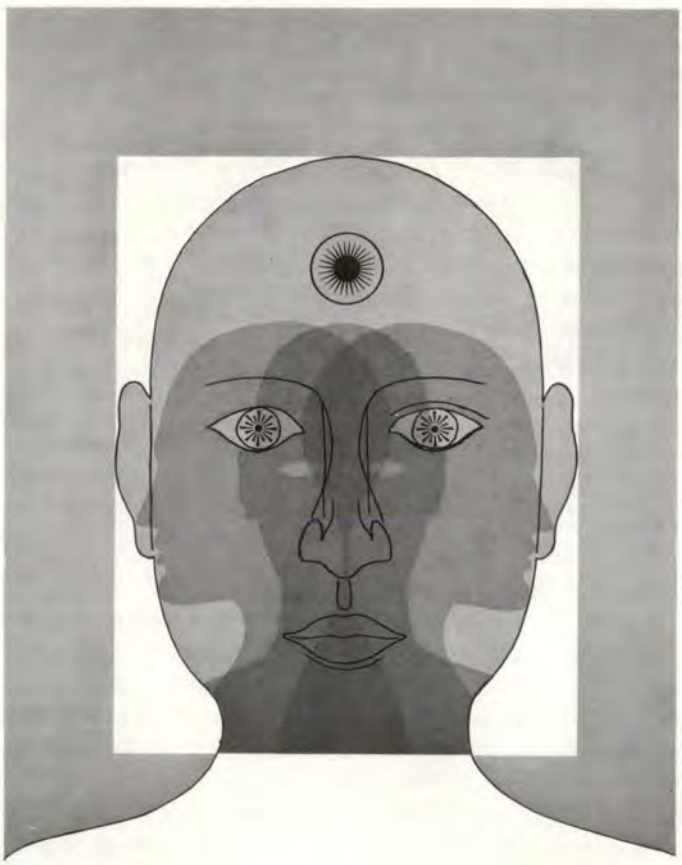
The pace and stress of modern living has made us all too familiar with situations in which we are required to attend to too many inputs.

the first piece of data by the time he has processed the "priority" message.

Another item worthy of mention is the concept of psychological or "life" stresses.

A crew member may say that he never allows his work and his "outside" life to mix; such a statement, however, is only partly true. We're 24-hour-a-day people, and things that happen throughout the day—or on preceding days—will continue to occupy places in our mind, albeit not necessarily at the conscious level. Events which happen in one segment of life can influence, in a negative way, what happens in other segments.

Say you've just had a disagreement with the squadron operations officer and it's been bugging you. You're going to take the effects of that quarrel into the next day's flight. And worse—far worse—that crushing comeback you were trying to think of at the time of the disagreement may stay with you and crowd your mental processes to the exclusion of other, more important tasks.



These situational factors, or life events, tax a person's capacity to cope. The pace and stress of modern living has made us all too familiar with situations in which we are required to attend to too many inputs. Among a number of such events, researchers include things like "changes in family member's health," "mortgage over $10,000," and "wife stops work." An accumulation of events, often quite ordinary in today's society, can occur in the most "normal" of individuals. At such times, we may well be in danger of forgetting or omitting pieces of information at critical times, or at any time, for that matter, in flight.

Single decision channels, short term memory stores, psychological stresses . . . why am I laying this "shrink" talk on you, the Air Force flying public? Because these "shrink" talk items are the principal ingredients of distraction—and distraction, as we have demonstrated, can have a fatal effect on flight operations. Okay, you say, you're sold on the argument that distraction is a contributor to flight mishaps. Now, you ask, what can I do about it? Plenty. A complete listing would require a textbook, so let's *briefly* discuss administrative radio transmissions, ATC problems and the psychological stresses.

Administrative radio calls are an integral part of modern flight operations. These calls perform a variety of essential management functions and have been a major contributor to the efficiency with which we operate today. But, the example mentioned earlier indicates

At such times, we may well be in danger of forgetting or omitting pieces of information at critical times, or at any time, for that matter, in flight.

that, in some cases, programs conceived with the best of intentions can be counter-productive. What can you and your supervisors do?

- Evaluate the necessity to make administrative calls during critical flight periods.

- Have a crew member, other than the pilot team, make administrative calls.

- If you think you're required to make too many nonessential (administrative) calls, mention it to your supervisor.

The point is this: It bodes ill to be calling the command post or maintenance control during a night instrument approach, when flying the aircraft must be granted first priority.

Air Traffic Control instructions . . . another area of vital importance to a distraction discussion.

We have a number of examples in our mishap files of accidents which occurred because of confusion on the part of the Air Traffic Controller or aircrew. And, given today's busy air environment, it is inevitable that sometime during your flying days, you will be issued ambiguous ATC instructions during a critical flight period. What can you do to minimize the distracting effect of such transmissions?

Comprehensive and exacting mission planning will work wonders. The entire crew should know the approach to be flown: Such items as the initial approach fix, inbound course and decision height should all be thoroughly reviewed. In addition to thorough mission planning, strict adherence to radio discipline will help to ease the ATC "problem."

When we make nonessential, ambiguous, or non-standard radio calls we introduce an element of complexity into the ATC system—a system which has as its cornerstone the themes of simplicity and standardization. Review your radio procedures, evaluate your radio discipline . . . if your call sign is "FOX 61" do you occasionally drop the "FOX" and trasmit "61" in acknowledging ATC messages? Think of the potential problem which can be created if there's a "DUCK 61" in the same area and he does the same thing. Such practices introduce a hazard which may disrupt a routine flight—not necessarily our own.

The potentially disruptive effect of psychological stresses should also be evaluated for their potential effects on flight operations.

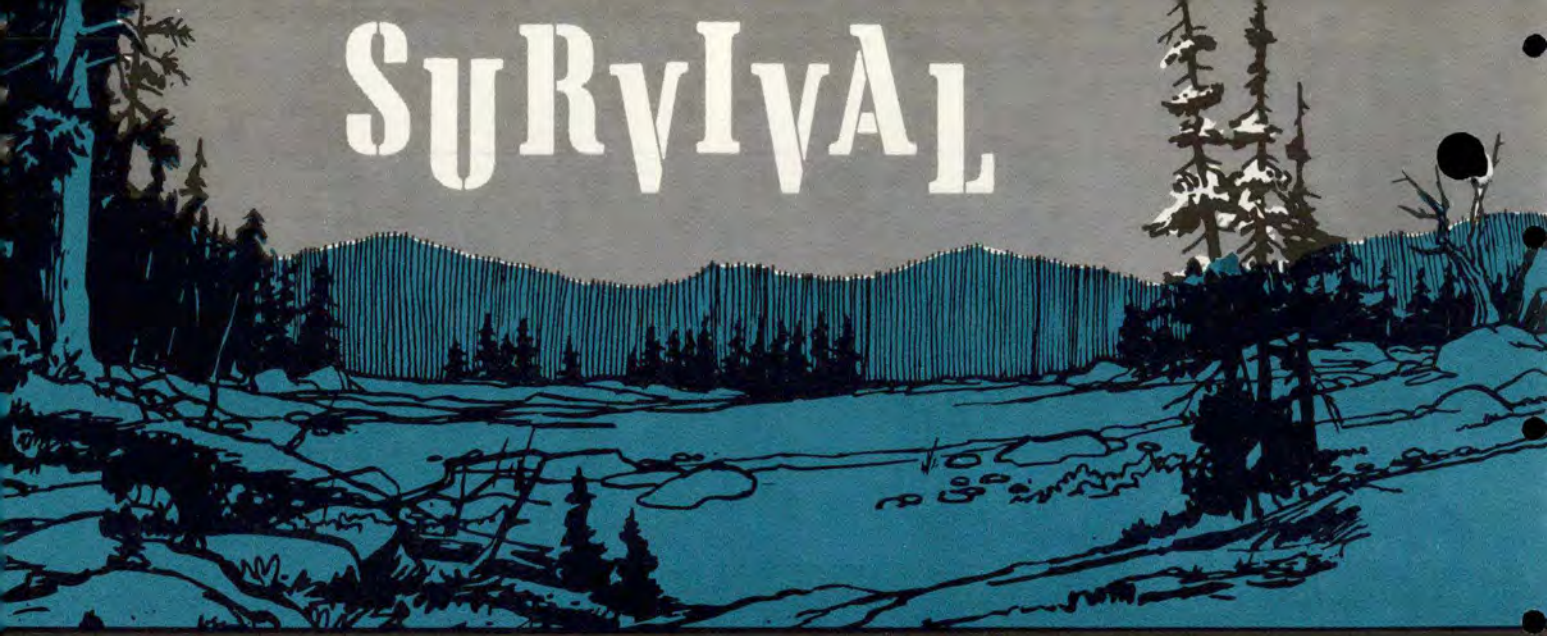
I'll not provide a "short course" on Freudian Psychoanalysis, but you—and your supervisors—should be aware of the problems which psychological stresses can create. Be aware of them and your ability to handle the "problems" which life throws at all of us. I'm not suggesting that each squadron run a "Gestapo-type" network to pry into the lives of its crew members. I am suggesting that we owe it to ourselves—and the Air Force—to know when our ability to perform effectively is lessened. When we become aware of a "reduced" ability, I think you'll agree that it's best to take steps to ensure that it doesn't affect our flight duties. The goal is to not take personal problems into the cockpit. Sometimes a discussion with a friend can alleviate tensions. In extreme cases, request for excusal from the flight may be warranted. But, no matter how you handle it—don't ignore it.

I'll conclude this discussion with the reminder that aviation is a human activity and that mistakes are a normal feature of human activity. This article has discussed one "uniquely-human" kind of mistake—the one which arises from distraction.

The list of distraction "fixes" outlined in this discussion has obviously been brief; suffice it to say that humans can be easily distracted. And whether it's a single-decision channel problem, short-term memory store limitation or psychological hang-up, if distraction occurs during a night instrument approach in weather . . . well, trouble may result.

"Preoccupied with a malfunction of the aircraft's electrical system . . . the crew ignored their primary task of ensuring adequate terrain clearance . . . 12 people received fatal injuries. . . ." Will we ever eliminate this kind of finding from our mishap reports? Perhaps. Perhaps not.

But I believe that by being alert to distraction's potential consequences, the chances are minimized that it will affect flight operations. And if we do that—minimize its effect—we more effectively accomplish the flying task . . . and, when we effectively accomplish the flying task, the odds are better that we will safely accomplish it. ★



The Five P's

CAPTAIN HOWARD R. ALLAN
Training Development Branch, 3636th Combat Crew Training Wing (ATC), Fairchild AFB WA

Do you remember when Milo Minderbinder of "Catch 22" fame replaced all the bandages in the first aid kits with I.O.U.'s? Yosarian was quite upset when he discovered the switch at a critical moment.

A similar incident happened to us some years ago while flying the now-retired C-123 "Queen of the Fleet." If you will permit a war story—the tale has a valuable lesson.

We were flying from a small field on the eastern border of Zaire across the vast African jungle into Kisangani (formerly Stanleyville), a city on the Congo River. To make a long story longer, our 2-hour flight was now 2 and one-half hours long and still no Kisangani. We were lost! Navaids in Zaire are few and far between, and our own instruments were suspect. As we cruised over the foreboding jungle the thought of running out of gas and going down in that inhospitable rain forest became closer to reality.

Trying to think ahead, we had the flight engineer open the survival sled. I won't say that sled was old, but I think it was original equipment on our 20-year-old bird. For an airplane flying exclusively over jungle, we found in the kit such things as a 20-man raft, sea marker dye, and a solar still. But the real tear-jerker was the UHF survival radio. Oh, it worked all right, but the only *other* UHF in all of Zaire was installed in the *front* of our airplane. I immediately volunteered to be the unit life support officer.

Take care of injuries; take inventory of your gear and then make a plan.

At last we come to the moral of the story: *Know your equipment.* As soon as you finish this article, RUN—DO NOT WALK—to your life support shop. Have them show you what's in your kit. Survival kits aren't all the same, you know. At last count there were more than 100 different ones in our Air Force. If you have changed aircraft recently, better have a look at your new life-saving equpiment. It could be your margin of safety. Can you work your particular radio? In the dark? Do you still know how to tell the night end of the MK 13 flare? A few years ago a downed airman sat on his vacuum packed sleeping bag ignorant of its real use—he was down in Greenland, at night.

Can you operate the solar still? Do you intend to rely 100 per cent on it for your water? Better check

your kit first. You might not have [illegible]. The stills are being removed [illegible]n the kits as their shelf life expires.

Look at *all* the equipment. Are you planning to read the directions when the time comes to use it? Learn to use it *now* in the warm comfort of your life support shop. If you have ever tried to assemble a child's "Zoom machine" on Christmas Eve, you know how exasperating directions can be. Darkness, cold, or eye injury can make prior preparation worth a thousand words (to adapt an old Chinese Proverb).

Now study the contents. Has your Uncle Sugar thought of all your needs? Instructors at the USAF Survival School recommend a personal survival kit to be carried on your person. Not only does it tailor your equipment to your unique requirements, but it adds a [illegible]kup in case you lose your gov[illegible]ment issue kit. It has happened.

As a very minimum, you should carry a fire starter (flint, matches), signaling device (whistle, mirror), means of procuring food (snare-wire, fishing equipment), and first aid equipment (don't forget your personal medicines such as allergy pills, aspirin, or insect repellent).

Some optional items may come in handy depending on your circumstances. Consider a sharpening stone, wire saw, chapstick, aluminum foil, extra compass, food items to your personal taste (candy, bouillon, soup, tea, coffee, dehydrated meat). Another good idea is extra socks, gloves, and a scarf.

Now that leads me to your friendly 922, Life Support Technician. Here is a man with valuable knowledge. Make him share it with you. He'll be glad to show you all [illegible]ins and outs of your equipment. [illegible]d finally, remember the five P's: *Prior Planning Prevents Poor Performance.* ★

Your personal survival items may be all you end up with depending on your ejection, bail-out, or crash landing situation. Spend some time thinking ahead. When you get there, it's too late to stock up.

An ordinary signal mirror could be your best ticket out of a survival situation.

The URT-33 personnel locator beacon (above left) should be broadcasting your position as you float down. The RT-10 (above right) is currently being replaced by either the PRC-90 (dual channel) or the URC-64 (multi-channel).

The "gyrojet" flares (right) and MK-13 day/night flare (above right). Care needs to be exercised during use to ensure your situation doesn't worsen (fire or injury).

A Tragic Six Days • Part II

The Search For Spar 14

continued from page 21

or more grids, or a portion of a grid.

Flying Safety One important point concerning the search effort is the relationship that exists between the SMC and the search aircraft. It should be fully understood that the aircrews are not relieved of flight restrictions imposed by their parent unit while participating in the search. (The SMC requests the support of these aircraft, but in no sense "directs" them.) Also, it is up to the crew of the search aircraft to determine if the search requirements are within the capability of their aircrew and aircraft considering terrain, weather, etc.

SAR command post was busy during intense search for missing aircraft.

Airborne Command and Control An on-scene command and control aircraft can be invaluable to the SMC both as a radio relay and to log search aircraft in and out of the areas. The HC-130s are, of course, ideal for this role. The crews are trained to serve as on-scene commander during the rescue phase, they have a flare capability that can be used to aid ground search parties at night, and their para-rescuemen can come in handy. Another aircraft that can greatly assist the SMC when a large number of search aircraft is involved is the E-3A AWACS. When the search for Spar 14 entered its fifth day, and 50 aircraft were involved, an AWACS was requested to monitor the search patterns by tracking the search aircraft to determine if there were any holes in their search patterns. Coincident with its arrival on station, the searchers began finding the downed aircraft, so an evaluation of its search monitoring could not be made. However, the AWACS crew was able to provide vectors to rescue aircraft, and generally assist the HC-130 that was serving as on-scene commander.

Wreckage is extremely hard to see on brush-covered slope. In many searches several aircraft have flown directly over wreckage without spotting it.

There is no "best" way for a base to conduct a search effort. The terrain, climate, type of search vehicles available and even the season of the year will determine the optimum search strategy. It is usually advisable to completely cover the search area at different times of the day, to take advantage of varying sun angles. At any rate, an organized, methodical repetitious and redundant search effort stands the greatest chance for success.

But the most important characteristic of any search effort is perseverance. When Spar 14 was finally found, it was only 7 miles from its last known radar position. The badly twisted and burnt wreckage was in a ravine on the side of a mountain that had been "thoroughly" searched for 5 days. Perseverance paid off.

ABOUT THE AUTHOR

Colonel Jenkins is the Assistant Deputy Commander for Operations, 474th Tactical Fighter Wing, Nellis AFB, Nevada. He was commissioned through the AFROTC program in 1957. Following completion of UPT and F-86F gunnery school, he served a tour as an Instructor Pilot at Laredo AFB, Texas. He flew a combat tour in the B-26 at Bien Hoa, RVN and then was assigned to Hurlburt Field, Florida, as an A-1E pilot. Another combat tour (F-105D, Takhli) was followed by staff duty at HQ PACAF and the Air Staff. He is a distinguished graduate of the Air War College class of 1977. ★

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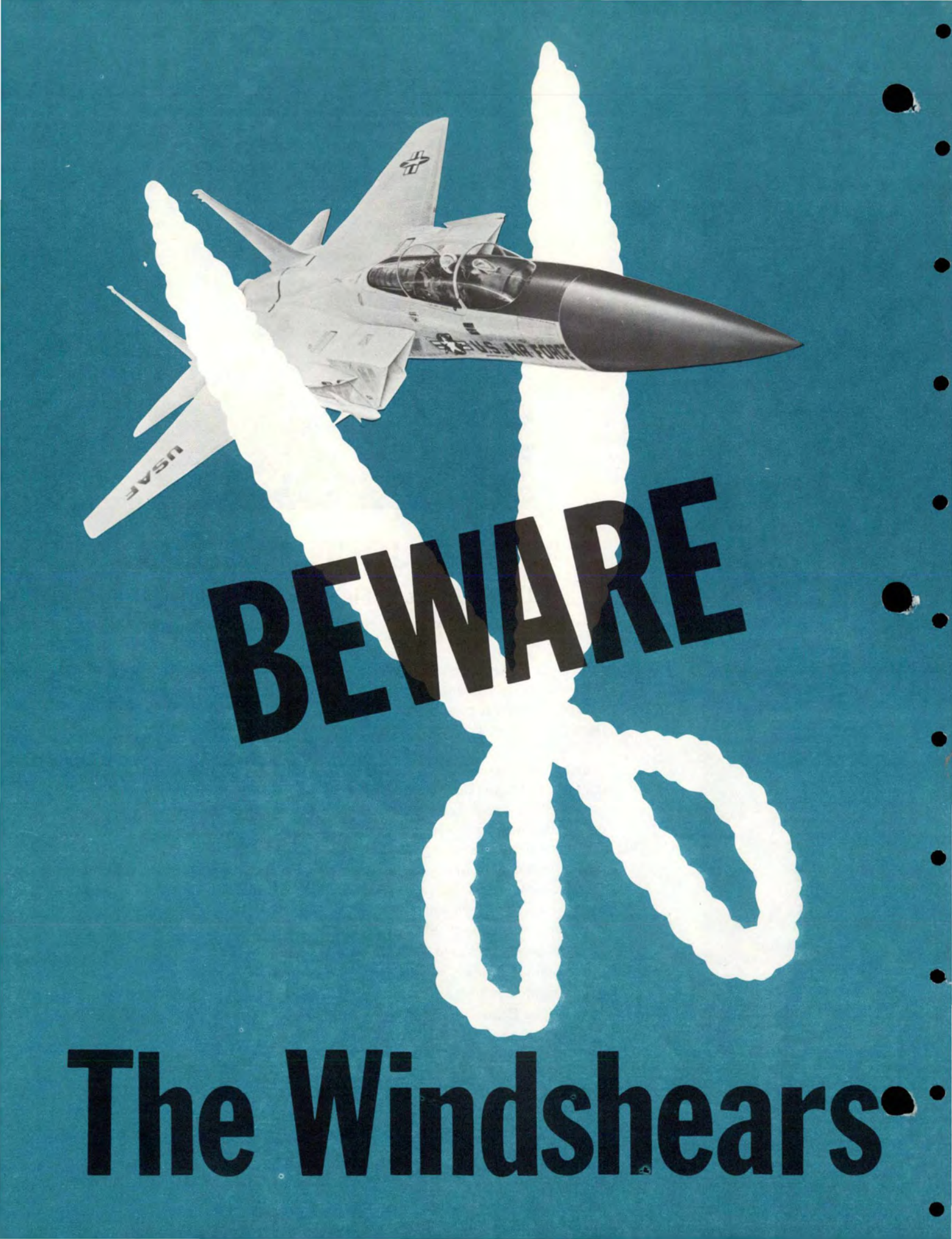
MAJOR JOHN M. EGAN

181st Tactical Fighter Group (ANG)
Hulman Field, Terre Haute, Indiana

On 1 November 1977, Major Egan was flying as an F-100 instructor pilot on an instrument training flight with an upgrading pilot in the rear cockpit. After an uneventful takeoff, Major Egan was ready to raise the flaps when he heard and felt a loud explosion accompanied by a sudden loss of thrust. He disengaged the afterburner and surveyed the engine instruments. No abnormal readings were noted, but the decay in thrust continued. Major Egan turned back toward the departure runway for an immediate landing; however, the close proximity of the aircraft from the end of departure runway precluded a safe landing in the reverse direction. He recognized this and planned to land in the same direction as that of the departure. As Major Egan flew the aircraft to a downwind position, thrust continued to decay and altitude was sacrificed to maintain a minimum airspeed of 190 knots at military power. A staccato engine vibration continued throughout this time. He briefed the rear cockpit pilot on ejection procedures and fuel tank jettison options because the option for an immediate ejection was still available should further thrust decay occur. The aircraft continued to descend on downwind and throughout the final turn. Major Egan selected one-half or intermediate flap position in an effort to hold his altitude. This action drastically reduced the descent rate, the final turn was made, and a safe landing completed. Initial engine analysis revealed severe damage to the engine turbine area. Approximately one-half of the last stage turbine wheel had disintegrated, the second stage turbine wheel was partially damaged, and the first stage turbine wheel was the only normally functioning portion of the turbine. Major Egan's good judgment and superior planning during this extremely hazardous situation possibly saved a valuable United States Air Force aircraft. WELL DONE! ★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