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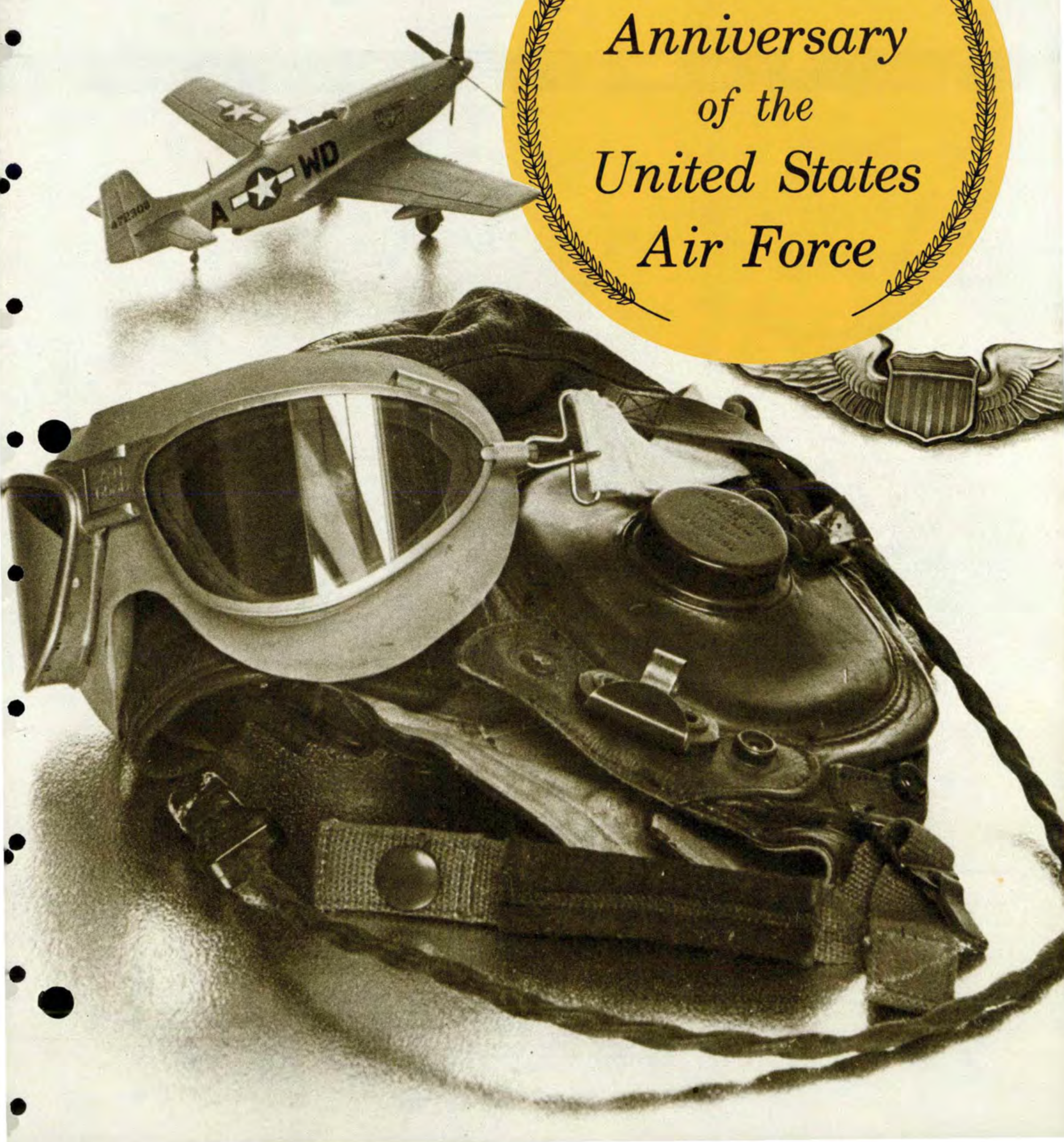

30th Anniversary of the United States Air Force

SEPTEMBER 1977

UNITED STATES AIR FORCE
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SAFETY

THE MISSION - - - - - - SAFELY!

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Our gratitude to Lt Col Russell B. Hodges, of this HQ, for the loan of the leather helmet and goggles featured on the cover, and to Mr. William Nord of San Bernardino, CA, for the wings and shoulder patches from his extensive collection.

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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SEPTEMBER 1977 AFRP 127-2 VOLUME 33 NUMBER 8

NEWS FOR CREWS

Information and tips to help your career from the folks at Air Force Military Personnel Center, Randolph AFB, TX.

MAJOR VERN ELLIS and MAJOR BILLY TUDOR
Rated Career Management Branch
Air Force Military Personnel Center

A UPT/UNIT INSTRUCTOR TOUR

One of our earlier articles listed a number of rated "Special Duty Assignments (SDAs)" available for interested volunteers. One of those was the UPT/UNT Instructor tour with the Air Training Command. Most of us can recall with some clarity, our experiences in the undergraduate flying training program we attended—UPT, UNT, or perhaps both. Memories are great, but they seldom portray the "real world" in a constantly changing environment. In an effort to provide some up-to-date information for those interested in a new and challenging type of operational experience we would like to talk briefly about the ATC instructor tour for both pilots and navigators.

Our first step in examining the Undergraduate Pilot Training (UPT) program is to look at the IP force composition. The Air Force has established a goal of 40 percent first assignment instructor pilots (recent UPT graduates) and 60 percent pilots with other weapon system backgrounds as a manning objective for FY 1980. We are continuing toward that goal and now have IPs in ATC from all MAJCOMs and major weapon system areas.

The UPT environment itself has changed significantly in the past year. A command program, "Hasty Buck," has reduced restrictions and given the IP more latitude to use his judgment in developing the student's decision making process. This favorable trend combines with many other positive aspects of an ATC IP tour and provides added improvement to an already outstanding assignment. Flying time is still a big plus, averaging 30-35 hours a month. ATC IPs continue to compete very favorably for promotion, and the job offers a wide variety of additional responsibilities that should enhance personal qualities and expand an individual's operational background. For non-weapon system identified pilots, follow-on training opportunities are excellent. Follow-on training is normally available in every major weapon system category as well as mission support type aircraft. There are, for all IPs, many fine opportunities for headquarters jobs, either while in ATC or upon return to previous weapon systems.

Selection for ATC IP duty involves a screening process which includes Form 90 desires, flight records review, personal qualifications, local commander and MAJCOM recommendation, and finally, ATC acceptance for each IP. After arriving at your new base, approximately six weeks will be spent in aircraft qualification training. You then spend approximately 13 weeks TDY for Pilot Instructor Training (PIT) at Randolph AFB, Texas. The tour length for first-assignment IPs is three years, while the tour length for all others is normally four years. This three or four year tour is generally considered by most pilots to be a stable and enjoyable broadening experience.

Undergraduate Navigator Training (UNT) is located at Mather AFB, California, with highly qualified instructors representing every major weapon system in the Air Force. Navigator-Bombardiers and Electronic Warfare Officers are also included in the UNT instructor force to provide student exposure to the entire spectrum of aircraft and missions.

Assignments to UNT are stabilized 4-year controlled tours. To qualify, a navigator must have three years operational experience, instructor navigator experience (preferred), and a highly competitive record.

The Air Force recognizes the training benefits derived from an instructor force with varied operational experience. Inherent in such an arrangement is career broadening opportunity for each instructor through his association with officers from other operational backgrounds. Because of escalating training costs and other real world restraints, obtaining this broadening experience through weapon system cross-training is impractical. ATC, in seeking an instructor force with diverse backgrounds, provides officers this career cross-feed and simultaneously enhances the ATC training mission; and that's what it's all about. If you are interested, review AFM 50-5, update your Form 90, and check with your rated resource manager for further information. ★

A PILOT'S VIEW OF SPATIAL DISORIENTATION

Before we begin, a word about the title is in order. For far too long, most available information on spatial disorientation (sometimes called vertigo by the underinformed) has been oriented towards those with a degree in medicine or human physiology. We poor laymen have been swamped with *proprioceptive* sensors and *otolith* organs in the hopeful assumption that a thorough knowledge of the physiology of the human inner ear will enable us to master spatial disorientation. Unfortunately, it just isn't so.

What is needed, then, is *pilot* oriented information. Of course, there is still a valid question—will *pilot* oriented information help us to master spatial disorientation? I believe the answer is yes; provided the information is correct and presented in words and concepts that pilots can understand. That is what this article will attempt to do.

Let's begin by saying that the conscious mind continuously determines its orientation in space by sampling two sources of information—visual cues (which come through the eyes), and gravity/inertia cues (which come from muscle sensors and the balance organs in the ear). Admittedly this represents an oversimplification and physiologists will cringe—but it is a totally adequate description. Let us go on to say that the brain, when sampling gravity/inertial cues, has no adequate way of determining whether the cue results from gravity or inertia without the visual cue as a discriminating input. Further, if the brain is receiving only one cue, it will make its determination of the body's spatial orientation by considering only that cue; that is, although inputs from all cues are required to accurately indicate the body's orientation, not all cues are required by the brain to perform that function.

As long as a person walks on the surface of the earth, there is seldom a problem. The gravity/inertia cue results from gravity, the brain correctly perceives this, and down is down. No corroborating cue from the eyes is necessary. Place this person in the cockpit or cabin

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In aircraft, however, and things change drastically.

Down is no longer down in the sense "towards the center of the earth." Instead "down," to the gravtiy/inertia sensors is in the direction of the resultant positive inertial vector (the G if you will.) This presents no difficulty as long as the aircraft is in straight-and-level, upright, unaccelerated flight, since "true down" and "perceived down" are in the same direction. Accelerate the aircraft in any dimension, however, and the potential for disorientation begins. Consider figures 1-5, which show depictions of "down" as perceived by the gravity/inertia sensors. All aircraft are experiencing one positive G.

It is easily seen in these simple cases that the brain is receiving an erroneous orientation cue from the gravity/inertial sensors in figures 2-5. If "spatial disorientation" is the inability of a pilot to correctly determine his positional orientation in three dimensional space, are the pilots in figures 2-5 spatially disoriented? The answer to that question depends on what these pilots' eyes are doing. If the weather is VFR, and the pilots are looking outside, and if they can see the natural horizon, then they will not be disoriented. Although the brain is receiving erroneous cues from the gravity/inertia sensors, it is receiving correct cues from the visual sensors (eyes). The brain has learned through long experience that the eyes are very reliable in their inputs, and the brain will resolve this conflict in favor of the visual cues.

The clever reader is now asking a pertinent question. If this conflict resolution in favor of the eyes occurs, and if the eyes are reliable in their input, then how can anyone who isn't blind be spatially disoriented?

Fortunately, the answer to this right and proper question is contained within the question itself, and the answer is in three parts:

1. The eyes are not necessarily reliable in their inputs.

2. A pilot in an IFR environment can become effectively, if not actually, blind.

3. The conflict may not always be resolved in favor of the eyes.

It is helpful to consider each of these points separately, and then to see how they can combine to disorient a pilot.

Anyone who has ever seen an optical illusion, or visited a so-called "anti-gravity" house, can testify that the eyes can be easily deceived. Since aircraft instrument panels are not designed with optical illusions built in, it is tempting to say "so what." The "what" is that the arena of flight is filled with optical illusions. Consider the pilot flying VFR above a sloping cloud bank (Figure 6). Or consider a pilot airborne on a dark night above sparsely populated terrain, when an indistinct horizon results in stars and ground lights blending together. Both of these pilots are flying along in the middle of vast optical illusions. The eyes can be fooled.

Fooled yes, but how can they be "effectively blinded?" This one is easy. Take our pilot, put a large volume of clouds or fog that he must penetrate in front of him, and he will be effectively blinded. Aha, you say! In that event, he will have reference to his flight instruments and will, therefore, *not* be effectively blinded. This is true in the ideal situation—indeed it is what the instrument "scan" or cross-check is all about. But if the pilot is required to shift his attention away from the scan for a few seconds—to refer to an enroute chart or approach plate, or to change the

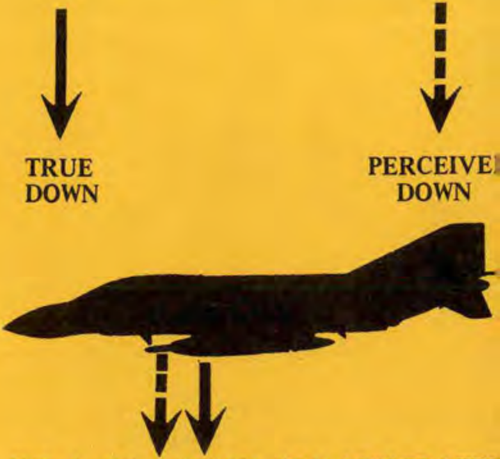


FIG. 1 - ST. & LEVEL, UNACCELERATED

FIG. 2 - ST. & LEVEL, ACCELERATING

FIG. 3 - ST. & DECELERATING

FIG. 4 - 45 BANK

FIG. 5 - 1"G" AILERON ROLL

A Pilot's View of
SPATIAL DISORIENTATION
continued

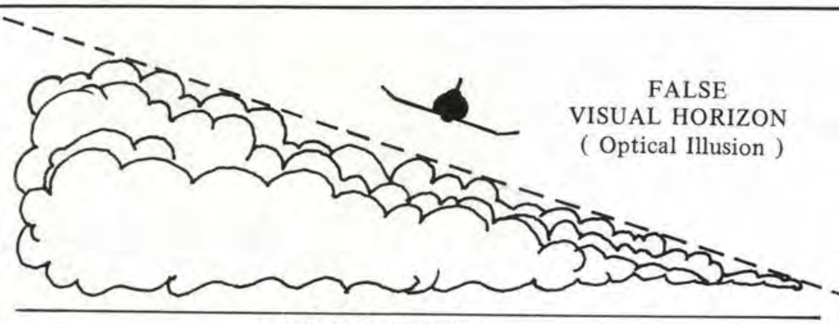


FIGURE 6. False optical references can lead to Spatial Disorientation.

frequency on a navigational radio—for the period of time that his attention is diverted, and as far as the visual orientation cue is concerned, *this pilot is effectively blind!* This leads to the third part of the answer to our original question.

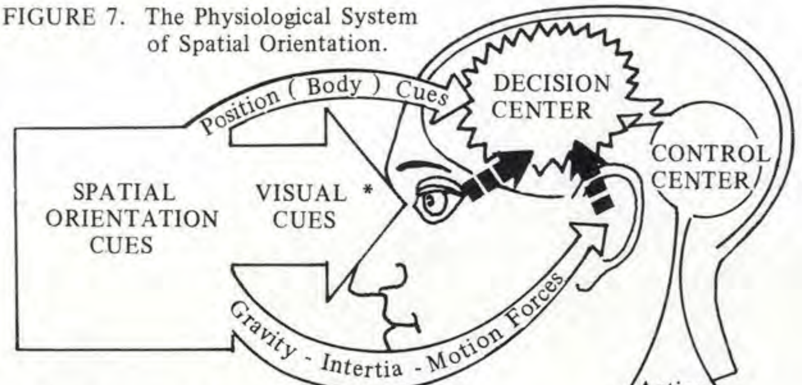
Under what kinds of circumstances will the brain not believe the cue from the eyes? A simplified schematic of what happens to the mind of our pilot will be helpful in understanding this crucial point. Referring to Figure 7, we can see that orientation cues—visual and gravity/inertia—flow into the "decision center" of the brain. Under routine circumstances, such as walking down the street, the cues will agree with each other. The decision center then sends messages to the "control center" ordering muscle signals for whatever type of activity is being performed. In routine affairs, this entire activity is so automatic that it is performed practically subconsciously—like breathing, scratching, or any of hundreds of other movements we make without conscious awareness. (Note that the "decision center" in the schematic has been differentiated to depict the different levels of activity that occur there.)

In non-routine affairs, and learning to fly an airplane is certainly non-routine for normally earthbound homo sapiens, some of this activity must occur at a more conscious level. The more experienced a pilot becomes, the more automatic his responses to requirements for controlling the aircraft will become. In fact, many high-time pilots perform much of the routine of flying as automatically as walking. This is the simple result of vast experience.

Consider, however, a situation where very few pilots have the vast experience required to relegate the decision functions to the automatic mode—IFR flight. In this situation the pilot is performing an artificial, learned task (flying an aircraft) by reference to an artificial, learned, visual orientation reference (aircraft instruments) using artificial, learned rules (FARs, etc.). The second item here, the visual orientation reference, is the item that pilots never practice enough to make it automatic. True, the more it is practiced the more it tends to be automatic. But no one has, or is likely to have, enough actual IFR experience to make this automatic, even if the other two items do become practically second nature.

So here is our situation as we

FIGURE 7. The Physiological System of Spatial Orientation.



* It is important to note that visual cues ordinarily are stronger and will dominate over all other spatial orientation cues.

have it developed: Our pilot is flying along in IFR conditions making decisions about his three dimensional orientation in space based on inputs from his visual and his gravity/inertia sensors. Because dependence on the gravity/inertial cues has been a routine part of his life since he was born, he is more-or-less automatically sampling and interpreting these signals. His visual signals, however, are being considered more consciously. He has had to learn how to correlate inputs from an airspeed indicator, an altimeter, a vertical speed indicator, and an artificial horizon. Believing what these instruments tell his eyes about left and right, up and down requires a continuous, conscious effort as long as he can't see a natural horizon or horizon reference. However, other than a slight increase in respiration, heart rate, and adrenalin flow, nothing very significant has occurred . . . yet. Nothing is likely to happen, either, until a disagreement between the visual cues and the gravity/inertia cues occurs. But when such a disagreement happens, and if our pilot is in IFR conditions it *will eventually happen,* the stage is set for the onset of spatial disorientation.

A typical spatial disorientation encounter might go like this: Our pilot is flying along, straight and level unaccelerated with a normal instrument scan. Visual cues from the instrument panel consciously interpreted, and gravity/inertia cues, subconsciously interpreted, agree and everything is fine. Now let's introduce a false gravity/inertia cue. This can occur from aircraft maneuvering, accelerating, pilot head movement, etc. Remember from an earlier point that, without help, the brain cannot tell when the gravity/inertia cue is false. Whatever this signal may be telling the brain, it feels *right.* The perceived down feels like the real down. The visual cue from the instrument panel, however, is telling the pilot what is really happening to his aircraft. The conflict has begun.

The brain is receiving two types of orientation cues that do not agree, and the decision center must determine which cue to act upon. Under normal circumstances, there is still no problem. The decision center will opt in favor of the visual cue, and signals to the control center will be made accordingly. This pilot will, of course, have a nagging feeling of discomfort as long as the two sets of cues are in disagreement, but he will not have uncontrollable spatial disorientation. After the phenomenon that introduced the false gravity cue is "washed out" or terminated, the cues will again be in agreement and everything will be fine.

Suppose, however, that the pilot, in IFR conditions remember, is performing any of a series of maneuvers that are characteristic of an IFR flight plan (climbs, level-offs, descents, procedure turns, etc.), and which induce false gravity cues. While the pilot is trying to rationalize the discrepancy between his cues, his instrument scan is broken by a requirement to retune a navigational radio. *For the period of time that he is looking away from his instruments, his brain's only orientation cue is false.* He is flying an aircraft, however, and his control center requires continuous inputs. The brain, having no choice, begins to send signals from the decision center to the control center based on the erroneous cue. This pilot does not yet have spatial disorientation. His conscious mind is busy with a nav radio, and his subconscious mind is handling orientation matters (albeit incorrectly). There is no conflict between these purposes at this time, and hence no disorientation. The alarming aspect is, however, that the brain is satisfied about its three dimensional orientation based on incorrect information.

Now our pilot looks back at his instruments and attempts to reestablish his scan. At this instant, he will become disoriented. A true conflict within the decision center has begun, and the decision center will grow increasingly frustrated in trying to reestablish the dominance of the visual cue, which it *knows* is correct, over the gravity/inertia cue, which it *feels* is correct. The situation is critical, and, without the restablishment of visual cue dominance, it may prove to be fatal.

If this pilot is able to force his decision center to believe the visual cue again, he will move back to the previous stage of nagging discomfort until the disparate cues agree. If he is not, he will probably eventually impact the ground with his decision center still locked violently in the conflict struggle. One other possibility exists—he may eventually enter a trance-like state in which the subconscious forces the conscious to cease even considering the correct, but sensorily

unacceptable, visual cue. In this event, his mind will be at peace at impact.

This, then, has been an anatomy of a spatial disorientation incident. Granted, there are other types of spatial disorientation. There are situations, such as the rapid eye flicker encountered in nystagmus, where the eyes, though open, are no longer able to send meaningful information to the brain. There are the so-called flicker vertigo incidents encountered by helicopter pilots. There may even be cases of true vertigo, where the gravity/inertia cues from different sensors are in disagreement and, therefore, these no longer "feel" right in the decision center.

But it doesn't matter, really, because spatial disorientation is spatial disorientation. The key to beating it is threefold: *(1) Avoid it, (2) If you can't avoid it, do not lose visual dominance, (3) If you lose visual dominance, get it reestablished as soon as possible.* With these points in mind, the following recommendations will help you to survive the inevitable encounter with spatial disorientation:

1. Be aware of situations that are likely to lead to spatial disorientation encounters.

• Flying in IFR conditions.

• Flying on dark nights above sparsely populated terrain.

• Flying formation under either of the above conditions.

• Flying in marginal conditions, especially in and out of cumulus cloud formations.

2. If you encounter the nagging discomfort that indicates the onset of conflict, do not lose visual dominance. Force the conflict to disappear.

• Practice IFR flight, and your instrument scan, as much as possible. The more experience you have in visually interpreting your instruments, the stronger the links in the decision center relative to this cue will be.

• Try not to allow the instrument scan to be broken unless the aircraft is in an unaccelerated mode of flight.

• Keep aircraft maneuvering to a minimum, and make all control inputs smoothly, positively, and at controlled rates.

• Keep your head movements slow, and as smooth as possible.

3. If you have lost visual dominance (the nagging discomfort is getting worse), get it reestablished as soon as possible.

• Cease maneuvering. Return the aircraft to straight-and-level, unaccelerated flight while you reestablish a firm instrument scan centered on the artificial horizon.

• If possible, transfer control of the aircraft to another pilot, or an auto-pilot, if one is aboard the aircraft.

• Talk aloud to yourself, describing the attitude of the aircraft as indicated by the flight instruments. This will provide an additional correct input to the conscious mind via another route (the auditory nerve.)

• One technique that some pilots find useful is to fly using the cross-cockpit instruments (or standby instruments) for their scan. Increased concentration is required to do this, and is apparently the reason it works for some pilots. One point—try this in practice before trying it in a real situation. The technique may not work for you . . . in fact, it may be counterproductive. If so, scratch it from your repertoire.

Do not fear spatial disorientation—but do not underestimate it either. You *will* have a spatial disorientation incident if you fly in IFR conditions. You can, however, meet it and beat it.

Major Coombes developed the material for this article while serving as the Chief of Academic Training for the USAF Instrument Pilot Instructor School. Much of the background information for this article is adapted from a study released by the School of Aerospace Medicine, Brooks, AFB, TX, entitled "Spatial Orientation Training A Staff Study," January 1975.

THERE IS A WAY

Annually the Air Force recognizes a given number of individuals, units and commands for outstanding performance. However, competition is keen and not all win major awards. To recognize all of those, AEROSPACE SAFETY is featuring one or more in each edition. In this way we can all share in recognizing their fine performance and, perhaps, learn some valuable lessons.

Nominated for the Chief of Staff Individual Safety Award

Colonel James S. Meador

As Director of Maintenance Engineering, Aerospace Defense Command, Colonel Meador directed aircraft and munitions maintenance programs that resulted in the command completing flying operations in 1976 without a single major accident attributed to maintenance. Simultaneously, the command had the best explosives safety record in its history.

Under Colonel Meador's management, trim problems and defective oil coolers on the J75 engine in the F-106 were analyzed and solved, thereby increasing the safety of the engine.

In explosives safety an average of 23-24 mishaps per year was reduced to six by a new approach and complete revision of the command explosive safety plan.

Master Sergeant Glendon R. Fletcher

Master Sergeant Fletcher was directly responsible for updating, revising and broadening the Nuclear Safety program for Det 3, 425th Munitions Support Squadron, CFB Baggotville, Canada.

Seeing the Nuclear Safety NCO as the key factor in the program, he devised a training plan designed to inform personnel at all levels on the basic principles of Nuclear Safety. The overall test average was increased significantly. The success of the program was directly attributable to Sergeant Fletcher's ability to set clear, concise objectives and present them in understandable writing. Through his efforts the detachment received an "Outstanding" rating on the two capability/management effectiveness inspections during Sergeant Fletcher's tour as Nuclear Safety NCO.

Nominated For The Colombian Trophy

The 20th Tactical Fighter Wing

The 20th TFW, during the period 1 January to 31 December 1976, flew a total of 6,533 sorties and over 17,000 hours completely accident-free. This included setting an F-111 record of 91 sorties flown in one day during a NATO Tactical Evaluation.

What makes the Upper Heyford, England, based unit's record even more remarkable is the fact that during this period F-111 units were experiencing serious engine problems. A number of major and minor incidents was experienced by other F-111 units and numerous mandatory TCTO's and inspections were required prior to flight.

Due largely to maintenance and safety emphasis on reporting of engine problems, the 20th TFW was able to anticipate these engine difficulties. Through strict adherence to engine maintenance standards and early safety emphasis to aircrews on new engine problems, the 20th TFW was able to limit all engine mishaps to an incident category. Although sorties had to be cut back, the wing was still able to safely meet all of its NATO commitments.

Also during the summer of 1976, the wing deployed to RAF Greenham Common while their own runways were being repaired. This deployment caused numerous problems for the Flying Safety Office, but the most significant was a flying operation set in the midst of the most concentrated cross-country glider area in the United Kingdom. Through a tremendous educational program, including wing prepared handouts for local glider pilots, only one airmiss between a glider and an F-111 occurred during the entire deployment.

These accomplishments, and others, under the prevailing conditions testify to the professional stature of the 20th TFW. ★

Are Two Heads (or three heads, or four heads..

MAJOR THOMAS R. ALLOCCA
Directorate of Aerospace Safety

"A camel is a horse designed by a committee." There are those in the Air Force who seize upon the sentiment expressed in this phrase, to shy away from any and all organizational attempts to introduce an element of corporate decision-making into their daily lives. And, for some at least, this distaste for collective judgments carries over into the subject of "committee" effectiveness in Air Force cockpits.

At the top it will be emphasized that this article has *not* been prepared to provide comparisons—and fuel the ensuing arguments—between mishap rates among different aircraft. There is scarcely a subject in Air Force flying safety circles that has given rise to more debate than the subject of comparing rates among different categories of aircraft.

Since most would agree that the fighter mission is "inherently" more hazardous than the cargo mission, it logically follows that fighter mishap rates should be higher than cargo rates. But, how much higher? Twice as high? Four times?? Ten times??? That question is infinitely complex, laden as it is with imponderables and beset with "apple-orange" complexities such as differing mission requirements, philosophies and constraints. And it will not be answered here.

This article has also *not* been prepared as an advocacy-briefing for a second pilot, or navigator, or systems operator, or . . . . The "lone eagle" sentiments of the single-seaters are legend, matched only by those who believe the multi-crewed aircraft is the only way to fly.

This article has been prepared to provide a limited review of USAF mishap experience for the 1972 to 1976 time frame. Perhaps it will answer some questions; perhaps it will reinforce some strongly-held views; hopefully it will inject a bit of objectivity into a subject area whose true dimensions have long been obscured by partisan rhetoric. The numbers—to corroborate this objectivity—follow:

THE BIG AIRPLANES AND THE LITTLE AIRPLANES

The type of mishaps considered in this comparison are "collision-with-ground, off range" and "pilot-induced landing" mishaps. (NOTE: Collision-with-ground, off range, (CWG/OR) and pilot-induced landing (PIL) mishaps are categories developed by the Safety Analysis Branch in the Directorate of Aerospace Safety. These mishap types are, for the most part, aircrew-caused.) The aircraft categories include all bomber/transport types (including the T-43, T-29 and T-39) and the fighter trainers. The mishap statistics are:

TYPE AIRCRAFT	FLYING TIME '72-'76	ACCIDENT RATE* (CWG/OR)	ACCIDENT RATE* (PIL)
Bomber/Transport	9.8 million hours	0.13	0.25
Fighter/Trainer	9.4 million hours	0.27	0.56

*Per 100,000 hrs

The numbers reveal that the rates are roughly inversely proportional to the number of people "watching the store." One must use caution in drawing any sweeping conclusions from the PIL rate for several reasons, such as: The fighter trainer fleet makes many more landings per flight hour; fighter/trainer landing speeds differ somewhat from those of the bomber/cargo fleet; and fighter/trainer landing requirements impose a greater aircrew workload than that incurred by the bomber/cargo aircrews.

BIG AIRPLANE AND BIG AIRPLANE (KC-135 AND C-141)

This is an interesting comparison, contrasting as it does two multi-crewed, four-engine aircraft which accumulate large yearly flying hour totals. Among a series of small differences, however, one could include crew size: The C-141 uses a five-man crew; the KC-135 has a crew of four.

The mishaps reviewed include all KC-135/C-141 major accidents in which "Operations Factor/Operator" (a mishap descriptor used to denote an aircrew-caused mishap) was cited as a cause.

TYPE AIRCRAFT	FLYING TIME '72-'76	MISHAP RATE* (MAJOR ACCIDENTS IN WHICH OPS FACTOR/OPERATOR WAS CASUAL
KC-135	1,431,059	.35
C-141	1,716,742	.17

*Per 100,000 hrs

or...) Better Than One?

LITTLE AIRPLANE AND LITTLE AIRPLANE (A-7 AND A-37)

The mishaps selected for this comparison include those A-7 and A-37 "collision-with-ground, on-range" accidents in which the aircraft was destroyed.

TYPE AIRCRAFT	FLYING TIME '72-'76	DESTROYED RATE* (RNG/CWG MISHAPS)
A-7	429,433	1.64
A-37	186,334	1.06

*Per 100,000 hrs

It seems that the two-seat A-37 has fared somewhat better (at least from this limited perspective) than the single-seat A-7.

SINGLE-SEAT ATTACK AND TWO-SEAT FIGHTER-BOMBER (A-7 AND F-4)

Any conclusions drawn from this comparison must be tempered with the knowledge that the two aircraft fly different mission profiles with significantly different mission taskings.

The mishaps considered include only those A-7 and F-4 "pilot-induced control loss" accidents in which the aircraft was destroyed.

TYPE AIRCRAFT	FLYING TIME '72-'76	DESTROYED RATE* (PILOT-INDUCED CONTROL LOSS MISHAPS)
A-7	429,433	1.40
F-4	2,312,455	.65

*Per 100,000 hrs

STRATEGIC BOMBER AND STRATEGIC BOMBER (B-52 AND FB-111)

The B-52 flew approximately ten times as much as the FB-111 in the 1972 to 1976 time frame. The mishaps reviewed are those in which the aircraft was destroyed and the "operations factor operator" cause was cited.

TYPE AIRCRAFT	FLYING TIME '72-'76	DESTROYED RATE* (MISHAPS IN WHICH OPS FACTOR/OPERATOR WAS CASUAL)
B-52	1,000,422	.40
FB-111	94,145	1.05

*Per 100,000 hrs

The multi-crew B-52 has experienced a lower rate than the FB-111. The mission profile of the two bombers—while similar in many respects—differs in this regard: The FB-111 low level airspeed profile is considerably higher than that of the B-52.

I began this article by paraphrasing the "lone eagle" sentiments of the single-seaters. For these hardy souls, the airmanship task is formidable—technology and engineering have produced aircraft of mind-boggling complexity and sophistication. You fellows who fly without the benefit of others' judgments . . . well, you've a professional challenge of the first order.

The statistics cited in this limited review suggest that crew composition may influence selected mishap experience—at least for the aircraft types and accident categories reviewed herein. And I suppose USAF's senior planners had such things in mind when contemplating the appropriate crew complement for an F-4, C-141 or B-52. The "accident-types" chosen for inclusion in this article were selected with design: They are the kinds of mishaps which crew composition should influence. These mishaps—be they "collision-with-ground" or "pilot-induced landing"—have this in common: They can be prevented by an increase in awareness, discipline and coordination among Air Force aircrews.

The crew coordination demands on a copilot, or navigator, or systems operator, or flight engineer should be many. Knowledge of correct individual aircrew duties is not enough; a good crew coordinator cannot be content to operate merely as a checklist-follower, smug in the knowledge that his job has been correctly performed. He must have knowledge of all unsafe aircrew practices and be bold and aggressive in questioning the judgment of the aircraft commander when circumstances dictate he do so. He must be able to readily detect unsafe situations and influence the progress of the flight when he is in doubt as to its successful completion. To the extent that he does these kinds of things —be he copilot or navigator or systems operator—he will be an effective "crew coordinator" and, in his case at least, two heads will be better than one. ★

BIRDS ORGANIZE

LTJC D. C. BLANTON
Naval Safety Center

TODAY, a high official for COMFUNDGAC (Commander, Feathered Union of Ducks, Gulls, and Chickens) and COMFAAC (Commander, Federation of All Airborne Critters) reported that due to prolonged grievances, the two organizations would join together in a strike against all manmade flying machines. The official stated that he believed the strike would be "quite lengthy in duration."

In the past, splinter factions from the two groups had engaged in strikes on their own. Now, it appears that a concerted effort will be made to instruct all members in proven methods of effective bird strikes. Extensive class work already has been completed by many of the members. An inside source (identified only as "Deep Beak") informed this reporter that final training included an inflight demonstration by veteran migrators.

As proof of the groups' seriousness, he included a picture of one of their recent strikes. He noted that the difficulty of this particular strike was increased because the pilot of the A-4 had his visor down. Degree of difficulty is determined by the skill required to injure the pilot or cause Alpha damage to the aircraft.

"Deep Beak" volunteered that the timing of this strike would provide the group the greatest element of surprise. He said that many people mistakingly believe that bird strikes occur most often during the migratory season. "Deep Beak" explained that statistics show there is no correlation between time of year and frequency of bird strikes. Apparently, an undetermined but substantial number of bird strikes involve nonmigratory birds.

When questioned about what could be done to avoid this imm

IN STRIKE

nent bird strike, "Deep Beak" produced a programmed text entitled "Effective Measures Taken by Intelligent Aviators (Human) to Prevent Bird Strikes." The text apparently had been used by FUDGAC and FAAC in ground school to inform the birds of measures taken by humans to avoid bird strikes. The birds' plan was to counter these measures by changing their own behavior patterns. However, "Deep Beak" stated that this approach had been unsuccessful. Important steps listed in the text and used by humans to avoid bird strikes are:

1. Learn about the bird life in the area where you operate. Then avoid areas and altitudes where birds are known to congregate.

2. When birds are encountered in flight, remember that they will try to avoid aircraft. Many migratory birds will do this by diving. Therefore, avoid flying directly under birds if there is a reasonable alternative. Help birds avoid aircraft by reducing airspeed at low altitude, if practicable. Showing landing lights at night will help also.

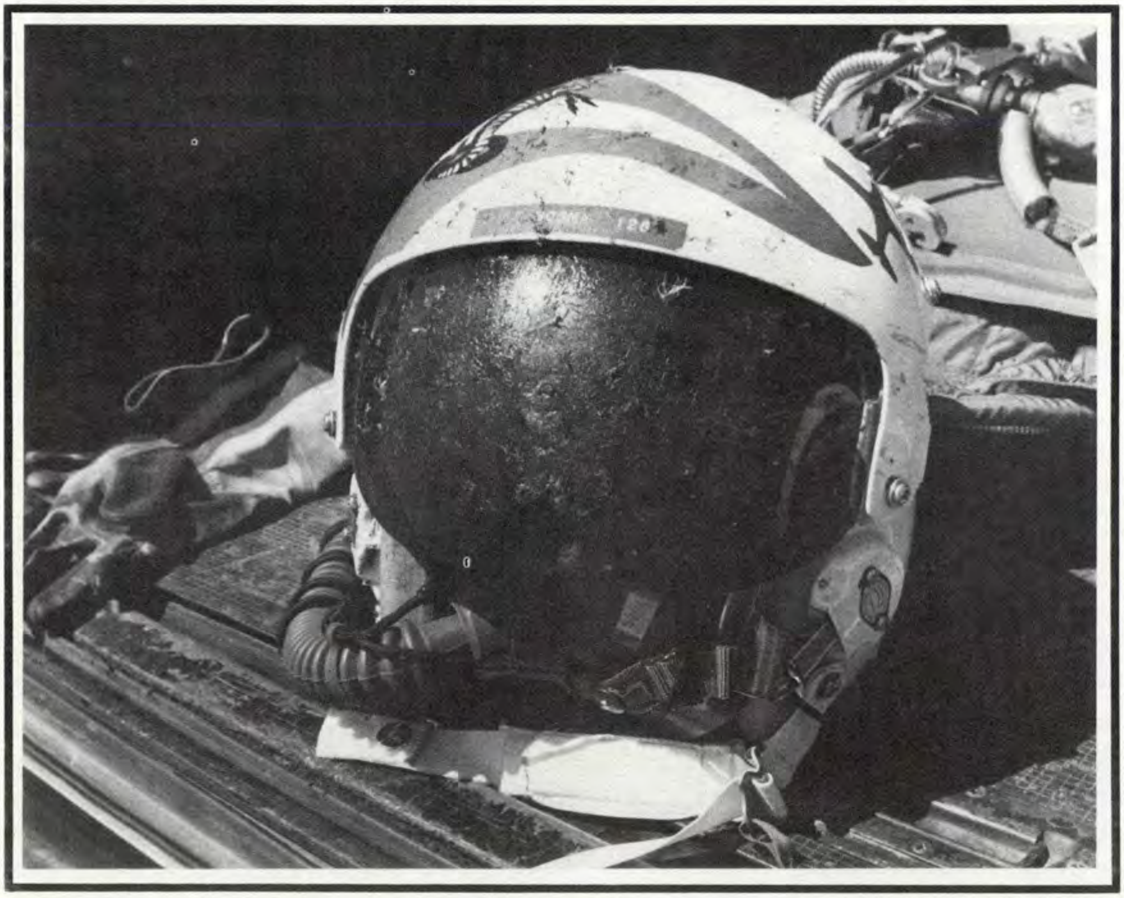
3. Some birds have learned to avoid aircraft by predicting the aircraft's flightpath. What's the old fighter pilot saying about "a predictable flightpath being for the birds?" Maybe there's new meaning to that.

4. If you collide with a bird(s) and there is any probability that a bird has been ingested by an engine, consideration should be given to landing at the nearest suitable airport. Statistics show that there is a good chance of foreign object damage when birds are hit.

5. Operate with your helmet visor down at all times (use clear visor at night). If you have a dual visor helmet, put both visors down. This can be an important factor in preventing serious injury in case of a midair with a bird.

6. Recognize that bird strikes occur most often during takeoff and landing. Keep a good lookout and be certain to report birds—on and about the airport—to the tower. Also. when applicable, report flocks of birds to the controlling FAA agency so that others may be warned.

This first meeting with "Deep Beak" then abruptly ended. He stated that he already had said too much. I did get him to agree to another meeting if conditions permitted. I honestly don't know who "Deep Beak" was. The only clue I have to his identity was the monogram on his shirt—J.L.S.—Courtesy *Approach,* August 1977. ★



ON CHECKLISTS

SQN LDR PETER WHITE, RAAF
Directorate of Aerospace Safety

The importance of conscientiously accomplishing aircraft checklists is drummed into us virtually from Day 1 of our flying career. Just what **not** completing them properly will do to you is graphically illustrated in the following examples:

The crew had completed one trip in the aircraft and on return a minor hydraulic leak was discovered in a gear well. The crew left the area to refile, while maintenance, including gear retraction tests, was performed on the aircraft. When the crew returned, one of the members commenced the thru-flight checklist (OK in this case, but check Section II of your Dash 1 and see what it says about thru-flight checklists and maintenance).

He was interrupted during the checks and left the cockpit to deal with some paperwork. When he returned, the rest of the crew had taken their places and they "completed" (but didn't restart) the checklist. After engines were started and hydraulic power applied, the aircrew experienced a lifting motion within the airplane. It then settled to the ground on the landing gear, which was retracting! As the propellers contacted the ground, one separated and tore through the fuselage, causing major structural damage.

The gear handle was then observed to be in the UP position.

The crew were set up for this mishap by maintenance procedures which created a situation in which the gear handle could be left in the UP position. In addition, neither maintenance supervisory nor quality assurance people inspected the cockpit after maintenance completion. But what caused an experienced crew to overlook such an obvious error? The accident board found deficiencies in their approach to the checklist:

- Individual attitudes tended toward "personal technique" in completing the checklist. Both the pilot and copilot were performing other tasks when the associated action which led to the gear retraction was made:
- Crew coordination and discipline were poor.
- The sequence of events prior to the mishap suggested a "business as usual" approach to the mission, i.e., the old enemy, complacency.

Let's look at another case: the aircraft was being flown back to home base with the landing gear down lock pins in place because of a system malfunction. Prior to the aircrew's arrival, the aircraft was moved, which required part of the nose gear assembly to be disconnected. It wasn't reconnected. This wasn't picked up until, on the takeoff run, a severe vibration heralded the collapse of the nose gear, and the nose dropped to the runway. Factors in this "oversight": a rushed pre-flight, fatigued crew member, and another old adversary, "get-home-itis!"

An incident which could have had more tragic results occurred when a ground crewman, thinking that the aircraft was finished for the day, shut off the oxygen supply at the bottles. In flight, the pilot suffered hypoxia. He had made an "abbreviated" preflight inspection.

In all these, as in many other, cases the mishap would have been averted if the aircrew had performed their pre-flight checklists conscientiously. Sure, other people failed to do their job, too, but the aircrew are generally the last link in the accident chain, and physically and otherwise, suffer most from the mishap.

We all know of airborne situations as well, where fatigue, preoccupation with a problem, a "just another milk run" attitude. or any of the many other distractions produced a situation where the checklist just wasn't done correctly and an item was missed or wrongly carried out. Sometimes a quiet reminder from another crewmember picked it up, sometimes it revealed itself after the "white-knuckles-body-tensed-up-to-die" stage had come and gone.

In all cases, the result hopefully, was a wiser aviator.

Checklists probably won't get you out of every tight spot you're likely to encounter, but, properly employed, they sure will keep you from getting into a lot of those spots in the first place! Much care, thought and conscientious effort went into compiling yours. Use it in the same spirit. ★

LET'S KEEP THE RAIN—WET

SMSGT HAROLD O. EASDALE
Directorate of Aerospace Safety

My job as OMS line chief has its ups and downs. At least it's never dull—always in the action or maybe I should say, in the hot seat.

The recent increase in dropped objects has caused a lot of attention in the squadron lately. I knew that improper maintenance actions were a cause for a good percentage of panels coming off in flight, but after all, we are the only ones pulling them off every day. After going over every idea we maintenance guys could think of, I started to feel that, if we were ever going to get a handle on preventing dropped objects, we were going to need all the help we could get.

I decided to go have a talk with our QC officer, who acted as our unofficial representative with the flight crews.

As I was driving across the ramp, I saw a flight crew starting a preflight. I knew the crew pretty well so I stopped to see if the "bird" was OK. While we talked they continued the walk around. We were just about back at the nose when I spotted a panel that didn't look right. It was in position and all the fasteners were flush, but something just struck me as wrong. After tapping on the panel I found out what it was. Only *two* of the 16 fasteners were secure. The rest were just *pushed in.*

Well, we were lucky. If that panel had come off there was a good chance it would have gone right in the intake. Of course, I scheduled a little talk with the crew chief to get to the bottom of why the panel was only tacked on.

But what really bothered me was why I caught the panel not being secured, and the flight crew didn't.

I thought a long time about that. I couldn't fault the crew because the panel *looked* fine. Then it hit me! Awareness! I realized that I always look closely at that particular panel because I know it comes off so often it ought to have a zipper. Because I was aware of that, I subconsciously expected something to be wrong with it.

Now I knew who we needed help from—all the flight crews. They could back up our efforts. Provide the second chance. But first we would have to help them—to make them more aware.

Well, I finally made it to QC. With their help and experience we made up a little course for all the crew members. It only took a few minutes, but showed which panels are commonly removed, which panels most commonly become dropped objects (Hmmmm! Just about the same list), which panels are often just tacked on for towing (how about that—same list again). We also covered the different types of fasteners and common problems, i.e., worn nutplates, fastener too long, too short, bad design, etc.

When we finished our little pitch, it was pretty obvious that certain panels were far more likely to become an incident than others. Of course, any panel might not be properly secured, but our problem list had a much better chance. All our crews were told to *expect* that these panels would not be right.

Remember, due to frequency of removal, poor design, practice of "tacking" them on, etc., there are a few panels that come off more than others.

Learn these panels on your aircraft (QC can help), take a good look at them on walk around and remember—dropped objects are all our problem. ★

How Low

MAJOR MIKE REAVEY
Directorate of Aerospace Safety

A relatively common gripe we hear from pilots refers to the restrictions placed on training. The complaint usually goes something like this: "Safety runs the operation, training is watered down, our accident record looks great, but what happens when the war starts?" The problem, obviously, is balancing the realism of our training with the constant pressure to conserve our resources for the day the balloon goes up.

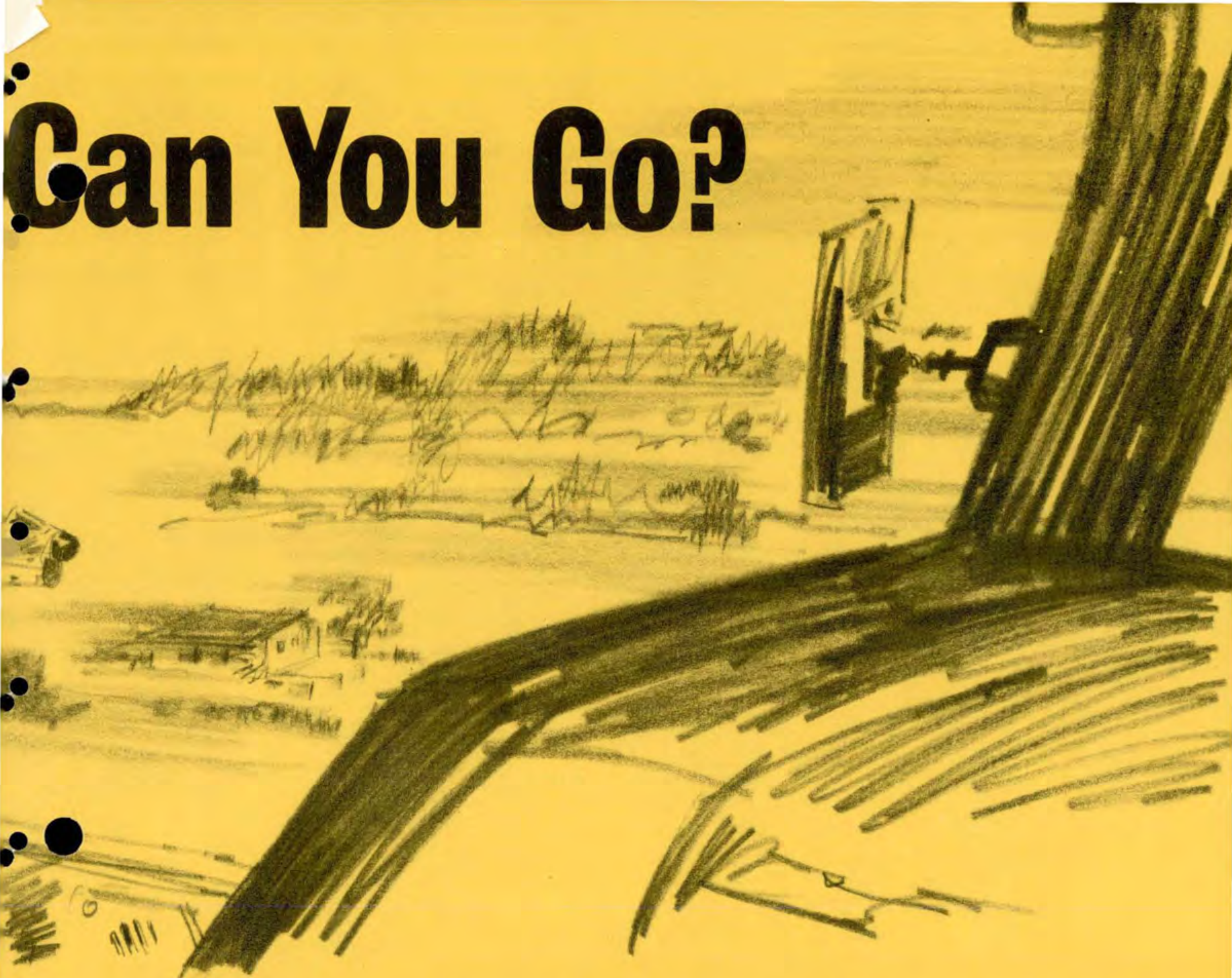
The rapid proliferation/increased capabilities of SAMs and lessons learned in SEA dictated a change in our tactics. Typical training scenarios encompass low-level navigation and ingress to a target area, pop-up or level delivery and low-level egress out of the area. Until recently, altitudes for this type scenario were restricted to 500 feet to 1,000 feet AGL enroute and 200 to 300 feet AGL for range operations.

Most jocks will agree a 500-foot low level is neither terribly challenging nor tactically feasible. We are now working our way down to 100 feet AGL low levels and conceivably could go lower. From the standpoint of realistic training, this is a quantum step forward. From a safety standpoint, it could be a quantum step backward unless we recognize and effectively cope with the inherent hazards involved.

The tasks do not change significantly. We will continue to read a map, maintain formation position, provide some degree of mutual support, update avionics, monitor aircraft performance, etc., etc.

The difference, of course, involves how we accomplish the tasks: At 500 feet AGL you couldn't "fall asleep at the stick," but these tasks could be accomplished with no major problems. At 100 feet AGL, the time element is significantly more critical, i.e., a 2-3 second span of inattention could be disastrous. Aircraft control will become more critical and tasks which detract or degrade it may need modification. Let's look

Can You Go?



at some of these tasks and how they may be modified.

NAVIGATION At 500 feet AGL, you can afford time for relatively long peeks at the low level chart. At 100 feet AGL, a quick glance is all you can afford. It appears even more thorough route study will be required almost to the point of memorizing the route.

FORMATION FLYING Tactical formations vary considerably but all have one thing in common, i.e., maintaining good position. This requires diverting attention from the area directly at 12 o'clock and at 100 feet AGL, the time you have to check position is compressed. A smooth lead will be a big help.

MUTUAL SUPPORT Once again you are tasked to divert your attention from 12 o'clock to 3 or 9 and possibly 4-8 o'clock areas. Flying at 100 feet and looking over your shoulder is a disconcerting thought. Learning how to scan/clear more effectively could reduce the time required to do the job.

AVIONICS UPDATES For those aircraft with navigation/weapons computer capabilities, data entries may be required en route. Typing at Lat/Long, Tgt Info, etc., must be done with minimum "head in cockpit." The smart money says do it on the ground whenever possible and learn to do it by "feel." In other words, minimize the requirement to look at the panel. Who knows, the old "blindfold cockpit check" may take on an entirely new meaning.

There are other areas which may present problems, e.g., maneuvering, birdstrike potential, depth perception, terrain recognition. We must identify these problem areas and develop the techniques/procedures necessary to eliminate or at least minimize them. As always, the best source of information will come from the guys who do it. The operators will decide if aggressive, invaluable, *realistic* training is here to stay. An adverse trend in low altitude training mishaps will almost certainly jeopardize this type training. The challenge is there and the door is open. Let's keep it open. P.S. Trim nose up. ★

Fire

CAPTAIN VICTOR G. GRAHN
27th Tactical Fighter Wing
Cannon AFB, NM

Our call sign that day was DRYLY 62. The mission was scheduled as an instructor weapons system officer (WSO) upgrade sortie. Takeoff, climb out, and cruise to the entry point of low level Training Route (TR) 288 were normal. Auto terrain following navigation to Green River RBS site and five "large charge" attacks were successfully accomplished. High altitude cruise to Cannon AFB transition areas 6 and 7 was accomplished where the syllabus required aerobatic maneuvers, and F-111 flight characteristics were to be demonstrated.

IFR was cancelled with ABQ Center and we entered the areas with a barrel roll, followed by a lazy eight and entry to a chandelle to the left. At the top of this maneuver, in a nose high-low airspeed condition, the wheel well hot caution lamp illuminated. Immediately, I turned the air source selector knob to off, rolled the aircraft to ninety degrees of bank, allowing the nose to fall, and opened the speed brake. (The Bold Face procedures for "Wheel Well Hot" have changed since this incident.) The WSO rapidly referred to the checklist for wheel well hot procedures.

Approximately 15-20 seconds later, as the aircraft was slowed to gear lowering airspeeds, in accordance with the checklist, the left engine overspeed caution lamp illuminated. As I checked the left engine instruments, the left engine fire warning light came on. I rapidly retarded the left throttle to off, depressed the fire push button and actuated the fire extinguishing agent. Confirming all Bold Face procedures were accomplished and the left engine was shut down, the WSO provided steering to Cannon AFB, the nearest recovery base, approximately 135 NM away.

Due to the distance from Cannon, the continuing fire light (which remained on for the duration of the flight), fuel considerations, and marginal single engine flight performance, I elected to leave the landing gear retracted and cycle the speed brake to vent the wheel well area during the return flight.

After two unsuccessful attempts to contact ARTC Center on UHF, I directed the WSO to select guard on the UHF and squawk emergency on the IFF/SIF. A UHF guard transmission was made and communications were established with several agencies and aircraft. Both the range officer at Melrose Bombing Range and AGE 32, an F-111D in the bombing pattern at the range, responded to the call. The range officer alerted the Supervisor of Flying and AGE 32 maintained an airborne communications link.

DRYLY 62 continued toward Cannon AFB, cycling the speed brake to vent the wheel well area and using power as required to maintain airspeed and altitude. Radio contact was established with the Supervisor of Flying approximately 65 NM north of Cannon. At this time, we felt we would have sufficient fuel for the recovery with the gear extended and attempted to extend the speed brake in order to slow to gear extension speeds.

As I actuated the speed brake switch, nothing happened, we noted the utility hydraulic system pressure was zero. With the loss of the utility hydraulic system and the left engine primary hydraulic pump inoperative, the aircraft was forced to fly with only one of the aircraft's four hydraulic pumps operating.

The WSO had been reviewing the procedures with me for a single engine landing, but now with the utility hydraulic system failure, he immediately referred to the hydraulic system failure landing procedure. As the aircraft was slowed to required airspeeds for slat and flap extension, fumes were noticed in the cockpit and we selected 100 percent oxygen. Emergency extension of the slats and flaps were

accomplished without incident. As we slowed to gear extension speed, I had the WSO pull the emergency gear extension handle. The emergency gear handle pulled normally; however, there was no indication of gear extension. At this time, a chase aircraft (AGE 32) joined DRYLY 62 and confirmed the gear was not down, but also stated there were no indications of fire.

DRYLY 62 was on an extended final and we elected to proceed straight through initial to a visual downwind, in order to make further attempts at gear extension. With AGE 32 on the left wing, the aircraft was porpoised in order to apply "Gs" to aid gear extension, but with no effect. At this time, it became apparent the gear was not going to come down.

With the aircraft rapidly approaching emergency fuel condition, the Supervisor of Flying ordered the runway foamed for a

n the well

gear up approach and barrier engagement. I pulled the hook release handle and AGE 32 confirmed the hook was down but stated that the aircraft was trailing a slight amount of smoke from the left engine area. At this time, DRYLY 62 was turning to an extended final and the on-scene commander asked for a few more minutes to complete the runway foaming. As there had been no new indications of fire, other than the slight smoke trail from the left engine area, I elected to execute a 360 degree turn to give more time for completing the runway foaming. As the aircraft turned from the runway, AGE 32 indicated the smoke was increasing and he could see fire in the wheel well area. Immediately, I requested the Supervisor of Flying to clear the runway for an immediate landing.

As the aircraft was turned toward the runway, rudder pedal kick-back was experienced and and AGE 32 stated the fire was getting worse and objects were falling from the underside of the aircraft.

During this time, the WSO reviewed ejection procedures over the interphone in case ejection was required; however, I felt I had control of the aircraft and we elected to continue. As I flew the aircraft, the WSO cleared the cockpit of loose articles and monitored engine instruments for additional malfunctions. As we approached touchdown, the aircraft suddenly pitched up. I pushed forward on the stick and advanced power to afterburner on the right engine to gain airspeed, in case ejection was necessary. As thrust started to increase, the aircraft responded to control stick inputs and the nose came back down. Realizing a successful barrier engagement was assured, I reduced power.

Approximately 20 minutes after the first indications of a fire, DRYLY 62 successfully made an approach end barrier engagement, on a foamed runway. The foam extinguished the fire as the aircraft slid to a stop. I shut down the right engine and the WSO and I safely evacuated the area.

As a result of this experience, the author has provided the following analysis of the handling of this emergency and a number of recommendations.

The first decision was not to lower the landing gear for the wheel well hot indication. With the indication of a left engine fire, the distance from Cannon AFB, our fuel state, and the single engine performance of the F-111D with the gear extended, I felt that it would be wiser to return to the field faster at altitude and with a fuel reserve, than low and slow with a high fuel flow. Another factor that

FIRE IN THE WELL continued

influenced my decision to leave the gear retracted was the loss of throttle boost after I turned the air-source selector knob off. This would indicate that the bleed air shut off valve had closed and any hot air leaks in the wheel well had been stopped. Prior to this occurrence all wheel well hot caution lamps had been caused by a hot air leak or faulty sensing system. I feel this was a sound decision given the conditions at the time.

The decision to use guard to establish communications was made a little hastily. I now feel that I should have tried another frequency first or used UHF 255.4 to contact a flight service for relay to Cannon AFB Command Post. By using guard, several agencies and aircraft answered our call which made communications a little confusing at first. At the time, however, we felt that immediate ejection was a possibility due to the aircraft fire indications. The HF transmitter was inoperable.

The decision to execute the 360° turn could be second guessed. At the time the SOF asked for more time for runway foaming, we had not experienced any new indications of aircraft fire, and I felt the chances of a successful recovery would be improved if the runway were foamed.

As the emergency progressed we discussed the option of ejecting. The question was which alternative represented the lesser risk to life and property; ejection, with the attendant risk to the semi populated community below, the non-zero risk of injury to the crew during the ejection, and the certainty of loss of the aircraft versus non-ejection with its obvious hazards. In the final analysis, the foam was about 8 miles ahead, the airplane was still flying well and our judgment was that attempting the landing represented the minimum overall risk.

The flight control problems that developed during final approach were most probably caused by decreasing hydraulic pressure from the remaining pump.

The overall command control during this emergency was good, and I feel the SOF did an excellent job of coordinating the recovery.

In conclusion, I feel that when an aircrew is faced with a compound emergency, a thorough knowledge of the Dash 1 is indispensable. The checklist has the procedures for just about every system malfunction that can be expected; however, it's the crew's in-depth knowledge of how these systems interrelate that makes the difference between a recovered or a lost aircraft. ★

Twenty minutes after first fire indications, the author landed burning F-111 on foamed runway. Foam extinguished the fire and the crew egressed safely.

ABOUT THE AUTHOR

Captain Victor G. Grahn is a Standardization/Evaluation pilot, 27th Tactical Fighter Wing, Cannon AFB, New Mexico. He was commissioned through the ROTC program in 1966, and entered pilot training at Williams AFB, Arizona, in February 1967. Following pilot training, Captain Grahn was assigned to the 604th Air Commando Squadron, Bien Hoa Air Base, Vietnam, where he flew 334 combat missions in the A-37A.

From Vietnam, Captain Grahn was assigned to Laredo AFB, as a T-38A instructor pilot. In 1972, he was assigned to Cannon AFB, to fly the F-111D. While at Cannon AFB, Captain Grahn became the first pilot to log 1,000 hours in the F-111D and also the first pilot to log 1,000 hours of IP time in the D model.

Captain Grahn was recently awarded the "Aviator Valor Award for 1976" for this incident.

A SLIGHT CASE of CONFUSION

Recently a hazardous air traffic report was filed as the result of a mixup in communications, aircraft identification, and a declared emergency. Although the situation was rather unique, the safety implications are such that the incident deserves wide dissemination.

The principals involved in this scenario were an A-4E, call sign Shark 17, and an Air Force C-123, call sign Pawk 17. While on a local training flight out of NAS Memphis, the pilot of the A-4 was informed that the field had gone below minimums. He executed a missed approach and requested divert to Blytheville AFB. After being informed by Memphis Approach that the weather at Blytheville was below landing minimums, the pilot requested a climb to FL260 and vectors to Little Rock AFB.

Memphis Approach cleared Shark 17 to climb to 9000 feet and to contact Memphis Center for further flight following. When he contacted Memphis Center, the pilot again requested a higher altitude and vectors to Little Rock AFB. At this time, he informed the Memphis controllers that he would be declaring "emergency fuel" upon arrival at Little Rock AFB. Memphis Center approved any altitude the pilot wanted.

Approximately 50 miles east of Little Rock AFB, Memphis Center instructed Shark 17 to descend to 9000 feet at pilot's discretion and contact Little Rock Approach Control. Little Rock Approach then received Shark 17 as a "handoff" from Memphis Center.

Meanwhile, the pilot of Pawk 17, the C-123, on an IFR flight plan to an Ohio destination and on the same Memphis Center frequency as Shark 17, heard the frequency change instructions for Shark 17 and thought they applied to him. Little Rock Approach received contact from Pawk 17 and confused the call sign with Shark 17 as they issued instructions to descend to 2000 feet for vectoring to final approach course to Little Rock AFB. Pawk 17 immediately replied thanks but he wasn't interested in landing at Little Rock since his destination was in Ohio. Little Rock Approach then issued instructions to Shark 17 to immediately climb to 10,000 feet and contact Memphis Center for further flight following. (Readers, stay with us; we may get this cleared up yet!).

Shark 17 (the real one) heard these instructions and informed Little Rock Approach that he was "emergency fuel" and wanted an immediate descent for a precision approach to Little Rock AFB. Meanwhile, Little Rock Approach Control and Memphis Center were coordinating to eliminate the confusion. Finally, the light bulb blinked on, and both Approach Control and Memphis Center realized they were handling two different aircraft with two similar-sounding call signs.

The primary reason for the call sign confusion was from their similarity in sounds and the fact that Pawk 17 replied to instructions issued to Shark 17. This confusion was further compounded in that Approach Control only had a "flight following strip" on Shark 17. When the confusion was finally straightened out, Shark 17 was 1 mile out on final approach to Little Rock AFB at 9000 feet. He subsequently landed safely, and although not mentioned, it is presumed that Pawk 17 flew happily and somewhat wiser on to his Ohio destination.—Courtesy US Navy *Weekly Summary* No. 21-77 (15-21 May 1977). ★

KNOW THE NATIVES

SRA WM. DAVID GOODRUM
Operations and Requirements Branch
3636th Combat Crew Training Wing
Fairchild AFB, WA

"All of us see through the lens shaped by our own culture. A web of culture binds us to a style of life, to a moral order and a definition of human nature. We see, understand, and make judgments based on the codes and values we grow up with.

"Folklore, art, religion, technology, and social order reflect the way a person comes to terms with life. Each culture embodies an experiment in human potential. Each culture stands as a monument to man's achievement, and each testifies to the human capacity to find a formula for survival."

(Vanishing Peoples of the Earth, *National Geographic,* Matthew W. Sterling, PhD)

This summarizes what many military people continually experience in their travels—that people around the world are culturally different. However, we seldom realize that cultural diversity is normal and in no way reflects inferiority or superiority.

Here at Fairchild AFB, Air Force personnel learn a number of basic survival techniques and procedures. To most of you, "survival" probably conveys a picture of a person or group of people alone in the wilderness. However, in many cases (especially in our ever-expanding civilization), the survivor must be familiar with different cultural groups' customs and beliefs, to communicate effectively, and survive, among his possible rescuers.

Of course, you can't know everything about different cultures worldwide, but you can learn and remember some basic truths about dealing with people everywhere.

RESPECT THEIR CULTURAL BELIEFS AND CUSTOMS

Learn to deflate your own prejudices through knowledge and research. Because other people are different doesn't mean they're inferior. Remember, as a survivor, you probably aren't going to be in a position to be demanding anything. In all likelihood, you'll be in dire need of assistance, and once you insult a man's heritage or culture, you cannot recant. Whether inadvertent or not, an insult with no attempt to apologize can be hazardous. An attempt to apologize is usually appreciated; however. minor insulting behavior is usually accepted as typical of an unknowing stranger. Showing interest in people and respect for their customs will more than compensate for inadvertent mistakes.

ACTIONS SPEAK LOUDER THAN WORDS

In many cultures, outsiders are judged more by what they *do* than by what they *say*. Your actions may well determine whether you will be accepted or ostracized by your possible rescuers. For example, the Bedouin peoples of Saudi Arabia consider it an affront to their honor if you display the soles of your feet while sitting. In addition, the right hand is used exclusively for eating, drawing, or greetings.

In South America, many people will take offense at our A-OK sign with the index finger and thumb forming a circle (see picture). It is analogous to our displaying the middle finger in anger.

The people of Asia and the Far East consider bowing to be an honorable and respectful greeting between equals, not an indication of inferiority as many Americans believe. The list of physical sign languages is enormous. In stating these examples, we are not saying that you should subscribe entirely to your hosts' cultural beliefs, but that you must respect and tolerate cultural differences. Your best source of on-site information is to carefully watch the local peoples' body language and actions, and then make an attempt to mimic them. But do it with respect for their society.

KEEP YOUR PROMISES

In many cultures of the Middle East, your promise is comparable to a written legal contract. The spoken word, in many instances, is all a society may rely on for legal harmony within the group. If one member of the group should renege on a promise, he is ostracized, and without the group's assistance, his immediate survival is placed in jeopardy. A member's discourtesy or dishonesty may also affect the entire group's survivability. The group's contacts and relations with other interdependent groups may be severed or weakened through a poorly conducted transaction. Therefore, the ramifications of an insincere promise may be life-threatening.

BE PATIENT

Patience is another essential virtue in cross-cultural contacts. Other people may do things in a completely different manner than you may expect. Don't become anxious and assume you will receive immediate remedies to your probems. Patience will aid you much more than being impetuous.

KEEP A STIFF UPPER LIP

To survive among people, you must also maintain a good attitude and conceal apprehension. Many people will make an outsider the focal point for abuse or jokes. As a survivor, you should show good humor even if the joke is at your expense. A case in point concerns two American PWs in Southeast Asia. They were incarcerated together in very primitive surroundings near the battle area. The enemy was continually ridiculing them—spitting, cursing, etc. They were given food, which consisted of rice and gruel, and chopsticks as eating utensils. One of the prisoners was familiar with the use of chopsticks and began to eat. The other looked around inquiringly and then, remembering that he should eat whatever is offered, reached down and scooped a handful into his mouth. The guards watched in amazement and then burst into virulent laughter. All their ridicule now shifted to the prisoner who ate with his hands.

The Vietnamese consider eating with their hands as uncivilized. The Macaque monkeys they kept as pets ate with their hands and the captors related the prisoner's actions with those of their monkeys. This caused the man who was unfamiliar with chopsticks to wonder if his fellow prisoner might have collaborated with the enemy, resulting in dissension and distrust between the two prisoners. All of this was caused by the chopsticks and could have been avoided through prior knowledge. If the second prisoner could only have known more about his enemy's culture and habits, he could have alleviated many unnecessary abuses.

Training and research before exposure are the most available and factual means of becoming more sophisticated in your dealings with other peoples. The 3636 CCTW's Environmental Information Division (EID) at Maxwell AFB, Alabama, has published many informative cultural briefs and studies on people worldwide. Your own information library may have Ethnic cards with concise, informative outlines of the basic physical characteristics and customs of sociological groups world wide (see picture). Also, a film in the Air Force inventory (SFP #1297, Land Survival: Ethnic Groups) displays basic techniques and procedures for establishng initial contact with native peoples. It is a 16mm, 40-minute documentary type film designed to demonstrate successful cross-cultural contacts. Although filmed in the American tropics, the principles portrayed apply worldwide. If it is not available through your film library, you may obtain this filc by writing to AAVS, Norton AFB, CA 92409.

The key to success in dealing with other peoples of the world is *you*. Successful cross-cultural contact depends upon patience and a basic insight developed through knowledge and understanding. In subsequent articles, we will give you more research sources, along with examples of cultural differences in relation to hostile territory, environment, eating habits, courtesies, transportation, and psychology of the survivor. The EID publications listed below may be ordered by writing to 3636 CCTW/DAD, Fairchild AFB, WA 99011. These documents will assist you in developing the insight needed:

ENVIRONMENTAL INFORMATION PUBLICATIONS

A-103, *Down in the North*, Analysis of Survival Experiences in Arctic Areas.

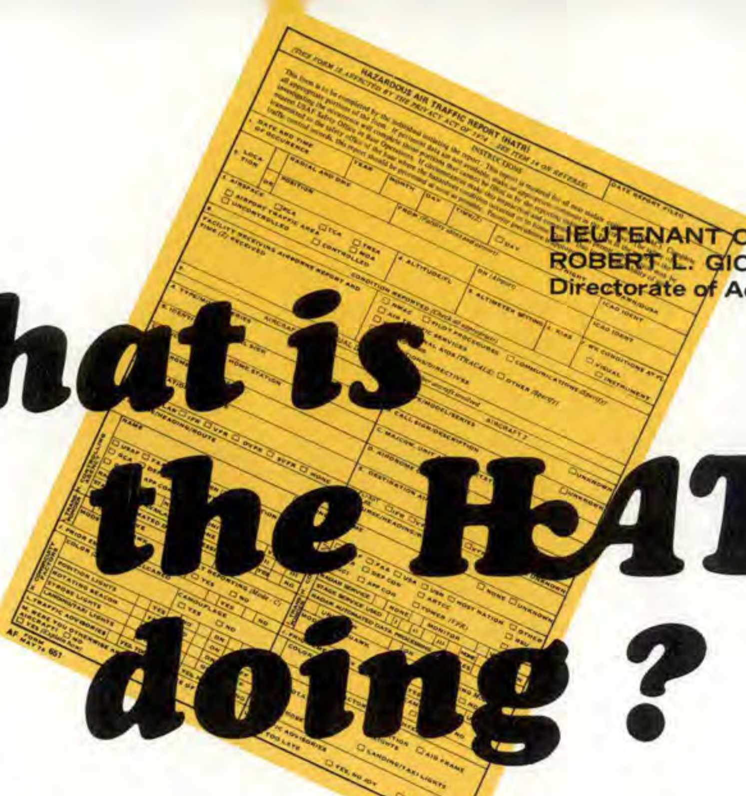
D-100, *Afoot in the Desert*, Basic Information for Survival in the Desert Regions.

D-102, *Sun, Sand and Survival*, Analysis of Desert Survival Experiences during WW II.

G-110A, *An Annotated Bibliography of Basic Survival, Combat Survival, and Counterinsurgency*

Cultural Briefs: *The Peoples of Iran, Iraq, Israel, Jordan, Lebanon, Saudi Arabia and Syria.*

Questions or comments concerning the information contained in the article should be addressed to SrA Wm. David Goodrum, Operations and Requirements Branch (DOTO), 3636 CCTW (ATC), Fairchild AFB, WA 99011 or AUTOVON 352-5470. ★



LIEUTENANT COLONEL ROBERT L. GIORDANO
Directorate of Aerospace Safety

what is the HATR doing?

Okay, all you guys out there who have been bad-mouthing the Hazardous Air Traffic Report Program—WATCH IT!

It's taken us a year of tinkering with the computer and the data to get the program working right, but here's what it's done for us so far!
ITEMS

• Hazardous Air Traffic Reports (HATRs) have identified some terminal areas where general aviation is not aware of our operations. One of the solutions that has been picked up is publication of a Terminal Area Graphic Notice in Part 4 of the Airman's Information Manual. Graphic notices show the relationship between the IFR traffic flow and the recommended VFR routing. There have been fewer near midair collisions in some of the terminal areas since publication of a graphic notice.

• A deficiency was corrected in the relationship between missed approach procedures and climbout procedures for successive instrument approaches in AFM 51-37, "Instrument Flying." Oddly enough, the basic reports and investigations did not identify this deficiency and each HATR could have been closed out with local corrective action. However, when related data were pulled out of the automated file, the root cause was identified and corrected.

• Safety advisories, i.e., traffic alert and low altitude alert, were originally only included in the radar section of the air traffic control procedures handbook. HATRs pointed out that these advisories were applicable to all types of air traffic services, not just radar. That was acknowledged by the FAA, and these advisories are now in the General Control chapter of the handbook.

• The requirement for radar air traffic controllers to monitor VFR (Mode A/3, Code 1200) squawks was unclear and was very permissive as to controllers' responsibility. HATRs pointed out that display of VFR squawks can improve radar advisory service. FAA has acknowledged this and now requires that Automated Radar Terminal System (ARTS) facilities display Mode C (altitude readout) on all untracked (VFR) targets. This should improve future traffic advisories.

• A revision of the Federal Aviation Regulation concerning taxiing on the aerodrome is proposed. Although the impetus for this action was primarily from the Tenerife, Canary Islands, collision between two B-747s, HATR data pointed out deficiencies in the regulation and were used to establish a supporting position for the proposal. As is often the case, the individual HATR may not have addressed the real problem, but collectively, they provided the data needed to help solve a larger problem.

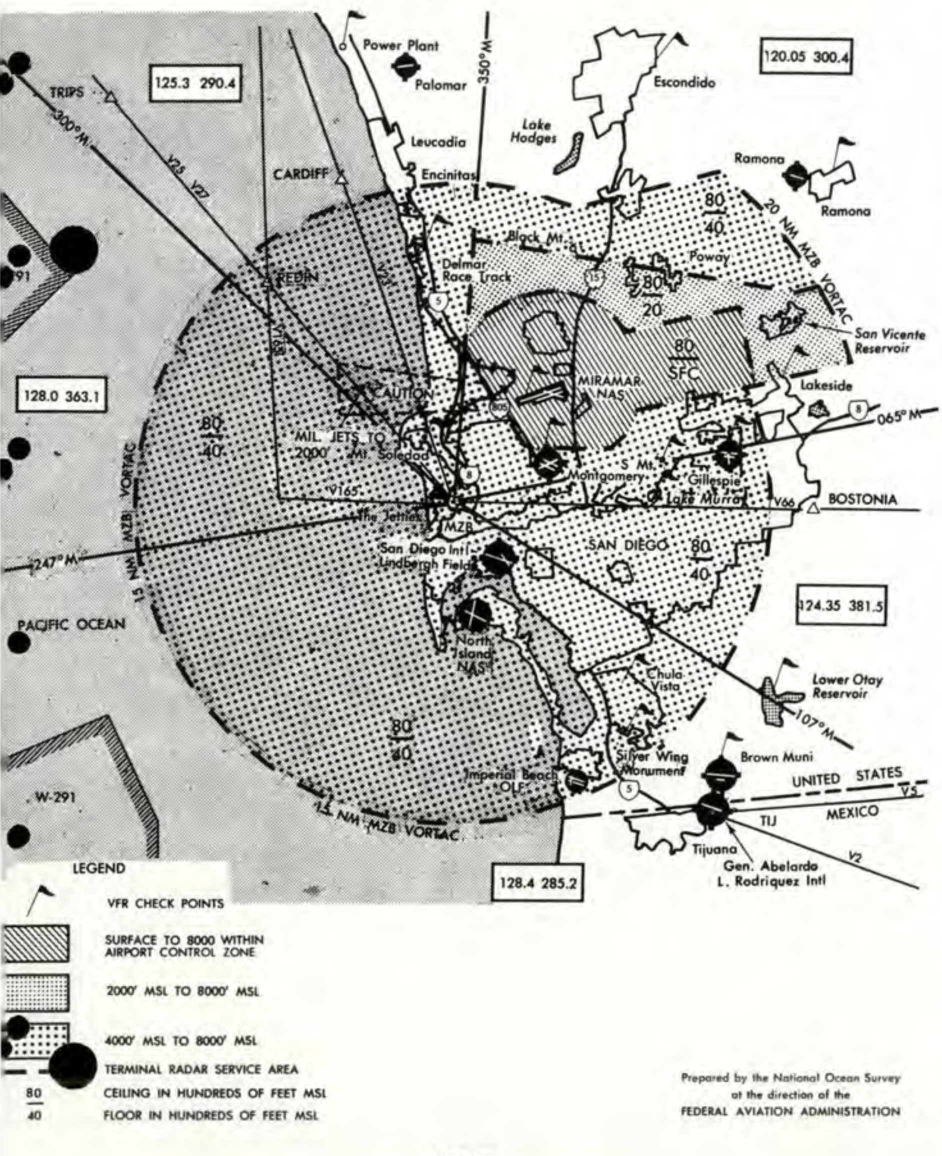
• Aeronautical Systems Division (AFSC) has let a contract for a mid-air prevention system study. The contractor, AIRINC Research Corporation, found that HATR data and its accessibility were of great value to their efforts. We may never see the product of their study or recognize resulting changes, but the HATR data base will make a significant contribution.

Furthermore, the HATRs are providing us an interface with the NASA Aviation Safety Reporting System. Because of the thoroughness of our reports, we have been able to rebut many criticisms of military operations which would otherwise have gone unanswered. Although you don't see this in action, we are frequently able to show NASA and the rest of the airspace users that the real problem is in the system, not in the military.

HATR summaries are published quarterly in the *USAF Safety Officers' Study Kit*. The last was in the August 1977 Kit; the next will be in the November 1977 Kit. Visit your FSO and you can follow the progress of the program in the summaries which include more detail than we have presented here. You may even recognize the reference to one of your HATRs. We appreciate your inputs to the program—aircrews, air traffic controllers, FSOs and others. As the data base grows, and we become more proficient in how to use it, system deficiencies can be recognized and corrected before they result in a mishap.

So—keep those Hazardous Air Traffic Reports coming in folks. The system works, and it's doing us some good. ★

SAN DIEGO, CALIFORNIA
MIRAMAR NAS
FIELD ELEV. 477'MSL



THE

REX RILEY
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McCHORD AFB	Tacoma, WA
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NORTON AFB	San Bernardino, CA
BARKSDALE AFB	Shreveport, LA
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
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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, OK
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

OPS TOPICS

NEGATIVE MEANS NONE

Sometimes the terms pilots use to report wind shear lead to misunderstanding. When a pirep reports "negative wind shear" the usual interpretation is no wind shear encountered. However, some pilots have been using the terms negative wind shear to describe a loss of airspeed or lift. The preferred method of wind shear reporting is to state the loss/gain of airspeed and the altitudes at which the shear was encountered. An alternative method of reporting is to state altitude of occurrence and effect on the aircraft, e.g., "abrupt wind shear at 800 feet on final, max thrust required."

Even if pilots report wind shear accurately, it is worthless until it is relayed to other pilots. So controllers must accurately pass on such reports (include the reporting aircraft type, also).

HYPOXIA

A C-130 was departing on the final leg of a mission in Europe with seven crew members and eleven passengers. As the aircraft approached FL 220, the pilot in the left seat noticed the onset of hypoxia symptoms and checked the cabin altimeter; it read 17,000 feet. After landing, the bleed air inline filter to the outflow valve in the pressurization system was found to be clogged. This obstruction restricted the airflow to the differential control system in the cabin pressure controller. In effect, it indicated to the pressurization system that the aircraft was overpressurized.—Major John D. Woodruff, Directorate of Aerospace Safety.

BAN ON WEAPONS AT AIRPORTS PROPOSED

The Federal Aviation Administration has proposed a rule that would make it a federal offense to carry an illegal weapon into an airport terminal.

FAA said the ban on firearms and other weapons is being proposed because they continue to be detected at airport screening points in alarming numbers, although present screening requirements have been in effect for more than 4 years. In the last 6 months of 1976, for example, 2,840 firearms—including 859 handguns—were detected at airport screening points throughout the nation.

Existing FAA regulations make it a federal offense to carry weapons aboard an aircraft but do not prohibit persons from bringing them into the terminal. And the agency noted that many of those detected carrying weapons in airports have not been airline passengers but were persons who went through the screening points when meeting or seeing-off passengers. These individuals were subject to prosecution under local gun control laws but not under federal law.

The proposed rule would not apply to firearms inside luggage that is to be checked to the passenger's destination. It is legal to carry such weapons in checked luggage as long as they are unloaded, the luggage is locked and the passenger has the only key, and the passenger informs the airline that the luggage contains a weapon.

OPS TOPICS

UNSAFED PINS

When the pilot in the front seat of an F-4 opened his canopy, the rear seater saw the pin bag with the ejection seat safety pins fall over the left canopy rail and back into the engine intake. Despite immediate shutdown of the engine, all stages of the compressor were damaged. The pilot had stowed the pin bag in the thermos bottle holder. He did not use the map case because it was filled with maps and approach plates.

The mission included some instances of zero and negative G flight. Neither crew member noticed the pin bag move but, since it was not secured to the thermos holder, it probably moved up and became lodged against the canopy rail or ejection seat. Thus, when the canopy was opened, the bag fell free.

AIRPORT QUALIFICATION PROGRAM

In the January issue we wrote about the new airport qualification slide tape presentations being developed. There are now 25 of the presentations complete on bases from Norton to Dakar to Kaneohe Bay. Check with your film library for a complete list.

FOLLOW THE YELLOW BRICK ROAD?

An F-4 loaded for a live ordnance mission was parked in a TAB VEE shelter. The clearance upon taxiing out of the shelter is critical, so all aircrews were briefed to adhere closely to the yellow taxi lines for exit. In this case when the crew was ready to taxi they saw two taxi lines emanating from the shelter. They picked the one they could see the best and started to taxi. The crew chief seeing the nose gear centered on the line cleared the aircraft to continue to taxi.

Just after the aircraft started a left turn, the WSO saw that the right wing tip clearance was decreasing. Although he warned the pilot, there was not sufficient time to stop before the wing struck the wall. When the taxi lines were painted, one line (the one selected by the aircrew) was incorrectly positioned. A new line had been painted but the old one had not been marked out or covered. Thus, the crew falsely assumed that either line was O.K.

AN INCH IS A LOT

When an HC-130 pilot asked for the current altimeter setting, he was given 30.31. However, the true setting should have been 29.31. The 1-inch error was due to an incorrect entry by the weather observer on the telautograph. Fortunately, the crew of the HC-130 was pretty sharp and they questioned the altimeter setting. After several queries, the error was discovered, and the crew got a good altimeter setting.

DON'T HELP MURPHY

During an ejection, a pilot lost his life because his survival equipment, which he had hooked up improperly, prevented proper operation of his parachute. Your egress and survival gear will function as designed if it is properly installed and operated. Mr. Murphy wins enough, don't stack the deck against yourself by not using your survival gear properly—Capt Michael T. Farson, Directorate of Aerospace Safety. ★

APPROACH MONITORING

Q. When can a pilot expect to reeive a radar monitored approach?

A. Any approach can be monitored by Precision Approach Radar (PAR) if the final approach course of the instrument approach procedure to be flown coincides with that of the PAR from the final approach fix to the runway. When one of the following conditions exists, PAR monitoring is mandatory:

1. The reported weather is below basic VFR minima (1000 feet and 3 miles),
2. At night, or
3. Upon request of the pilot.

Also, all simultaneous ILS approaches will be monitored by Airport Surveillance Radar (ASR), regardless of the weather conditions, to ensure lateral separation between aircraft on parallel courses.

Q. When being monitored on a nonprecision approach, what information can I expect to receive? What about ILS?

A. Prior to beginning final descent, a pilot executing a non-precision approach will be advised that glide path advisories will not be provided. The pilot should also be informed when he passes the final approach fix (FAF). On all approaches, course trend information will be provided (with respect to the PAR azimuth cursor) when the aircraft position is well left or well right of course and whenever the radar safety limits are exceeded. Glidepath trend information is provided for ILS approaches only. It consists of aircraft position reports in respect to the PAR elevation cursor, when the aircraft is well above or below the glidepath and whenever it exceeds the radar safety limits. The position of the aircraft in relation to the course and to the area above the glide path is a judgment call by the controller. The only safety limit normally displayed on his radar scope is the lower safety limit for the glide path.

Q. How does a pilot know when he has exceeded a radar safety limit?

A. The controller will advise the pilot of his position with respect to the glidepath and/or course. Then the controller will inform the pilot that if he is unable to proceed visually, he should execute a missed approach. If sufficient visual cues are available for the pilot to continue the approach without the need to refer to his navigation instruments, then he may continue and land. If not, a missed approach should be executed.

Q. When will the controller discontinue providing approach monitoring information?

A. For other than simultaneous ILS approaches, approach monitoring information will be given until the aircraft is over the landing threshold or commences a circling approach. Normally, monitoring of simultaneous ILS approaches will be discontinued at one mile from the landing threshold.

ENROUTE DESCENTS

Q. When can a pilot expect an enroute descent at his destination?

A. At any time. Normally, unless a pilot requests otherwise, Air Traffic Control will give an aircraft an enroute descent upon arrival at destination. This practice enables the controller to handle aircraft more efficiently, thus increasing traffic flow and saving fuel.

Q. What type of approach can I

expect to receive upon arrival at destination?

A. Usually the controller will give you a precision approach, if one is available. However, you can request any approach you desire to fly. Factors such as active runway, navaid status, amount of traffic, etc., will determine if the controller will issue you a clearance to fly the approach you desire. If you must fly a specific approach because of equipment malfunctions or lack of certain navaid receivers, advise the controller as soon as possible after initial contact to aid him in planning ahead, to assure you receive the necessary services.

Q. As an F-4 pilot, should I expect to receive clearance for an approach published in the high altitude terminal publications, whenever I am given an enroute descent?

A. Yes, unless you are being given an ASR or PAR approach. Single-piloted turbojet aircraft, such as the F-4, A-7, T-38, F-111, F-15, etc., may expect to receive clearances for procedures published in the FLIP Terminal High Altitude Approach booklets. In addition, when the enroute descent is conducted via a non-radar routing, the clearance received by the pilot should only include those navaids/fixes depicted on the appropriate high altitude approach publications.

Q. May a single-piloted turbojet aircraft fly a low altitude procedure after receiving an enroute descent?

A. Yes. If you want to fly a low altitude procedure, request it from the controller prior to beginning the enroute descent.

RADAR PROCEDURES

Q. What and where is the "Approach Gate?"

A. The "Approach Gate" is an imaginary point located on the final approach course. It is used by the radar controller as a reference point for vectoring aircraft so they will intercept the final approach course at least one mile prior to the final approach fix or five miles from the landing threshold, whichever is farther from the landing threshold.

Q. When being radar vectored to the final approach of an instrument approach procedure, where should an aircraft intercept the final approach course?

A. When the reported weather indicates a ceiling of at least 500 feet above the minimum vectoring altitude and the visibility is at least three miles, a controller should vector the aircraft to intercept "final" prior to reaching the approach gate. Any other time, final interception should occur at least two miles outside the approach gate.

Q. Will an aircraft ever be vectored to intercept the final approach course closer to the runway threshold than the approach gate?

A. Yes, but only if the pilot requests a shortened final approach. Even then, the aircraft will not be vectored to intercept final any closer to the threshold than the final approach fix.

Q. At what altitude should the final approach course be intercepted?

A. For precision approaches, at an altitude which will allow the aircraft to intercept the glide slope from below. In the case of a non-precision approach, at an altitude which will allow descent in accordance with the published procedure.

Q. What is the maximum intercept angle that should be used by a controller when vectoring an aircraft to final approach course?

A. When the distance from the final approach course interception point to the approach gate is less than two miles, then the maximum intercept angle is 20 degrees. When the distance is more than two miles, then the maximum intercept angle is 30 degrees for fixed-wing aircraft and 45 degres for helicopters.

Q. When being vectored to final, should a pilot initiate a turn onto the final approach course without being issued an approach clearance?

A. Even though the controller is responsible for advising the pilot if he is to be vectored through the final approach course, the pilot should continue to maintain his last assigned heading unless he has determined that he has experienced lost communications. If you can still hear the controller transmitting, continue flying the assigned heading, unless you determine it is unsafe to do so. In any event, attempt to contact the controller and either request his intentions or advise him of the actions you have taken.

We appreciate the interest shown in the consolidated "USAFIFC Approach" article booklet. We still have plenty of copies if you haven't received yours yet. For a copy of the booklet, call AUTOVON 487-4276/4884. ★

If everyone could take five minutes a day to think of a safer way to fly, possibly half the USAF accidents would never occur.

The Old Pro

Mail & Miscellaneous

Send your ideas, comments, and questions to:
Editor, Aerospace Magazine
Norton, AFB, CA 92409

A HOT COMPLAINT

Approximately three hours out, a lady passenger approached the steward complaining that her purse was getting very hot. It was discovered that a 9-volt battery in her purse was generating the heat and smoke was coming from the battery. An oven mitt was used to remove the hot battery from the purse so it could be placed on the front galley to cool. The lady then removed some coins, that were quite hot to touch, from the same section of her purse. Apparently the passenger had removed the battery from her portable radio but unwittingly dropped it into the section of her purse containing the coins. The battery was shorted. The manufacturer of the particular battery stated that a fresh 9 volt battery shorted by a coin could easily produce sufficient heat to cause a fire or the battery itself could explode.—Courtesy **British Airways Air Safety Review,** May '77.

GROWN UP & EDUCATED

While going through an old diary of mine I came across a note on an incident which took place some years back.

I have reproduced the details and am forwarding herewith as a manuscript for your esteemed magazine.

I hope it may be of some interest to you.

"Some years back I was responsible for transient maintenance on an air force base. One day a USAF C-135 aircraft landed for in route maintenance. I detailed the party to help the aircraft crew-chief and was standing by.

"The crews and the passengers disembarked from the aircraft and went to have a snack or rest in the passenger lounge. I saw a little child of about 5-6 years of age —he must have grown up into a MAN now, impatiently looking for something. I approached him and asked if I could help him, thinking that some persons feel very uneasy to relieve themselves at higher altitudes and he may be looking for W.C. First he hesitated and then replied that he had some candy wrappers in his pockets and was looking for TRASH CAN to dispose them off. To know his reactions I told him that there is no harm if he threw them on the flight ramp here itself. No sir, it is no good. It will make the place dirty and I won't like to do that. I showed him the TRASH CAN and he emptied his pockets there. Thanking me he left the place.

"It was very pleasing to get such an answer from so small a lad. This is the UP BRINGING—the way he had been brought up.

"Every day we see people who knowingly throw cigarette ends and other trash all over the places. Some of these cigarette ends have caused BIG FIRES. Metallic articles have damaged tires of aircraft and vehicles or blown to the flight ramp to be picked up by jet engines causing FOD (Foreign Object Damage). These are the few examples.

We are grown up and educated!"

The incident took place in May/June, 1965 at Masroor AFB, (Karachi), Pakistan.

M. Abbas A. Ovaisi
ex Master Warrant Officer
Pakistan Air Force
Dezful - Iran

MEMORIES

The "Name That Plane" picture of the B-18s in your June edition of **Aerospace Safety** brought back memories from a bygone era. As a teen-aged enlisted man I flew in the B18A with the 41st Reconnaissance Squadron at Langley Field, Virginia before WW II. You pictured No. 4 assigned to the 18th Reconn Sq as lettered on the nose and tail section. Some other recollections: The pilot's cabin was carpeted and I remember doing my share of vacuuming the cabin. However, the aft section was a cold, uncarpeted place. During high altitude bombing practice we sucked oxygen hoses because face masks were not in use at the time. Armament included a flexible .30 cal machine gun in the rear mechanically operated turret and another in the ball of the nose section.

One incident I recall occurred when I flew for the first time as a nose gunner. The pilot was our squadron operations officer, Capt Curtis E. Lemay (later Chief of Staff). Upon firing my first burst, the tow target immediately collapsed and fluttered away. I was scared skinny at what Capt Lemay might say after all the preparation it took to get the mission set up. Of course, when told what had happened he showed no emotion, but gruffly called up the tow aircraft to put another sleeve target out on the cable. After that I took better aim!

Later, we took a giant step forward when our B-18s were replaced with six B-17Bs from the Second Bomb Group.

I would like to take this opportunity to let you know how much I have enjoyed your publication over the years—both as **Flying Safety** and as **Aerospace Safety.** Your excellent articles are highly instrumental in maintaining an efficient, professional force. Keep up the good work!

Lt Col Art Herman
432nd Tactical Drone Group
Davis-Monthan AFB, AZ

HOT REFUELING

I was very interested in reading your article about hot refueling in the April 1977 issue of **Aerospace Safety.** As an Aviation Safety Officer of a Marine F-4 squadron, my interest in this type of operation has been intense. I was particularly impressed with the use of pneumatics for control in place of electricity. I am making an effort to convince the Navy/Marine Corps of the safety aspects of this system of control.

The one feature that appears to be lacking in the USAFE system that has proved invaluable to us Marines has been a large, easy to read counter that indicates the quantity of fuel that is being delivered to the airplane. This has proved to be invaluable to the pilots in that they can cross-check the aircraft's fuel indicating system to the fuel pit system, ensuring a complete fuel load in external fuel tanks and adding a safety measure to a somewhat hazardous operation. ★

Capt D. C. Cullison, USMC
H&MS-24 MAG-24
MCAS Kaneohe, Hawaii

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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.

LT CMDR HARRY W. HARTSELL, USN

3246th Test Wing
Eglin Air Force Base, Florida

On 7 February 1977 Lieutenant Commander Hartsell, a Navy exchange officer, flew a T-38 photochase mission of an F-111 weapon drop over the Gulf of Mexico. While flying at 1000' AGL, 575 KCAS, he noticed the right fire warning light was illuminated. The F-111 crew notified him that white smoke was trailing from the T-38. He retarded the throttle to idle and, although the light extinguished, smoke remained. A few seconds later the right warning light came on again, then—the left fire warning light. He shut down the right engine, retarded the left throttle to idle, and initiated a zoom climb towards Eglin. Next he shut down the left engine. Both fire lights remained on. He decided to remain with the aircraft and attempt one airstart, choosing the left engine because it had maintained normal instrument readings. It started and smoke was no longer visible. Lieutenant Commander Hartsell made a single engine, straight-in approach and landing. The fire had burned through the right stabilator control rod and burned the stabilator trim wiring causing unusually heavy stick forces during the approach and landing. On the runway, he shut down the left engine and battery, and ground egressed. An examination of the aircraft revealed the fire was caused by a crack in the right combustion case that burned the right engine oil servicing line, igniting an oil fed fire that burned through the left engine compartment. Lieutenant Commander Hartsell's calm, accurate assessment of this critical emergency coupled with his professional airmanship prevented the loss of a valuable aircraft. WELL DONE! ★

September 18, 1947-1977

Last month we featured an article, 70 And Going Strong, *which described the birth of military aviation in this country. The covers this month salute the 30th anniversary of the US Air Force as a separate military entity. Our display contrasts an SR-71 pilot's helmet and the leather helmet and goggles still used in 1947 along with some shoulder patches from that era and various kinds of wings.*