TAC ATTACK

JUNE 1977

ARMED FOR FEAR....Pg 4

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JUN

FOR EFFICIENT TACTICAL AIR POWER

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Angle of ATTACK

MIDAIR AVOIDANCE

Since the first reported midair collision between United States Army Air Corps aircraft on 17 August 1917, we have made many advances in aviation safety. Unfortunately, our ability to avoid colliding with each other in the air has not advanced at the same rate and, to a large extent, we are still relying on the "see and avoid" method of collision avoidance.

Solutions to the problem of midair collisions range from proximity warning indicators and collision avoidance systems, as well as an increase in the number of terminal control areas, terminal radar service areas and general radar services, to new cockpit design and installing strobe lights on our aircraft. Because these solutions are both expensive and a long way off, the pilot must accept the fact that he is responsible to the best of his ability for collision avoidance.

Each pilot must understand that he may be involved in a collision which he cannot avoid because of his physiological limitations. However, there are things which you can do to reduce the potential for a midair collision. The first step is to constantly remind yourself that radar contact does not relieve you of the responsibility to look around (see and avoid). Proper scanning techniques, the use of radar service whenever it is available, and the use of aircraft formations which optimize flight lookout will also reduce your chances of being involved in a midair collision.

Although the solutions to midair collisions between two non-associated aircraft are down the road, we can do something about collision between two aircraft of the same flight now. Maneuvering two or more aircraft in close proximity requires a great deal of situational awareness and total aircrew discipline. Each aircrew must know where the other aircraft are and what they are doing. Discipline is essential when a flight member loses sight of his flight or element lead or another aircraft he should be visually tracking. Aircrews must know and, if necessary, execute the proper breakaway procedures. Supervisors must emphasize to aircrews not to attempt to regain formation position if there is any risk of collision. The psychological pressure on a wingman to excel -- to hang in there at all cost -- is great; but a breakaway to clear airspace which prevents a midair is worth any loss of ego.

The first collision is history, our last is not. Only by maintaining rigid flight discipline and recognizing your own limitations and those of your equipment, can you increase your chances against having a midair.

George M. Sauls

GEORGE M. SAULS, Colonel, USAF
Chief of Safety

armed for fear

All aircrews have experienced fear during their flying career; some more often than others; some more courageously than others. Why are some aircrews able to firmly face fear while others fight fear faint-heartedly? Two recent incidents demonstrate the extremes.

One aircrew (hereafter referred to as alpha crew) experienced a wheel well fire followed by indications of an engine fire and utility hydraulic system failure. Other illogical caution lamps also illuminated due to fire damage. The flaps and slats were extended by the emergency system; however, the landing gear would not extend using either system. On final, the wingman reported smoke and then visible flames in the wheel well area and that objects were falling from the wheel well. The pilot directed that the firefighting equipment clear the runway although foaming efforts were not complete. Approaching touchdown, the aircraft's nose began to rise despite pilot inputs. Full forward stick lowered the nose and a successful gear-up approach-end cable engagement was made. The crew egressed safely.

Another aircrew (hereafter referred to as brav crew) induced an emergency fuel condition

Maj Gary Thomsen is this month's Fleagle T-shirt winner.

By Maj Gary Thomsen
HQ TAC Stan/Eval

observing Bingo fuel. During the en route descent, the pilot, who was experiencing "extreme apprehension," suspected a fuel quantity indicator malfunction although it passed the self-test function three times. He also imagined excessive fuel depletion and a trapped fuel condition. Checklist procedures for these three suspected malfunctions were not accomplished. Although the aircraft was functioning properly and 1,000 pounds of fuel remained, the pilot was convinced that engine flameout was imminent and that a landing must be accomplished on the first attempt. (A closed pattern would have required 400 pounds.) Seven miles from the runway, the pilot inadvertently accelerated from 250 to 350 knots. This excess speed could not be bled off. Rather than do a 360, the pilot elected to land 50 knots fast and 3,500 feet long on a 10,000-foot runway. A pilot-induced oscillation (PIO) ensued after touchdown during which the Weapon System Operator (WSO) recommended a go-around. The flight manual also warned that a delay in going around from a PIO may result in loss of aircraft ntrol. When it was apparent that the aircraft uld not survive the next impact, the WSO, who was on his first flight in this type aircraft, saved both of their lives by initiating ejection from the properly functioning 12-million dollar aircraft.

Why the radical difference in aircrew performance? Both pilots were IPs with over 400 hours UE time. The pilot of the bravo crew had also completed Edwards Test Pilot School. The WSOs were also experienced. Each had over 1,400 hours fighter/recce time. All four crewmembers experienced varying degrees of fear. One crew was able to overcome their fear and function effectively to save a multi-million dollar aircraft; the other crew was not.

To understand why one aircrew was prepared, or "armed" for fear, and the other was not, we must look at their background. Alpha crew was from a training squadron. In this environment, instructors and students discuss procedures and crew coordination on a daily basis. Mission planning, checklist procedures and crew coordination are a way of life. Academic aircraft knowledge is excellent. Bravo crew was from a velopment and test" squadron. Emphasis in unit may have been placed on the unique requirement of each test mission and the writing and analyzing of test reports rather than the routine job of flying the aircraft properly.

Secondly, alpha crew came from a wing which has an outstanding simulator program. (Four years of higher headquarters inspections have verified this.) The crew's emergency procedure simulator training and simulator evaluations were thorough and comprehensive. Bravo crew did not have a UE simulator available at their station. Alpha crew was a product of a simulator program which took situation emergencies to completion. As the mission progressed, logically related malfunctions were added to compound the situation. There were no breaks in the 2-hour mission to relay and discuss the cockpit indications. If an indication or condition did not make sense to the crew, it was not explained until the debriefing. Instead, the unexplained condition was allowed to "play" on the aircrew's mind as it would in flight.

During evaluations, the emergency situation was compounded until the crew became task saturated and was forced to establish priorities. (Anyone can get through a checklist if given enough time.) It is acknowledged that in a task saturated situation, the aircrew may omit some procedural steps, and it is the responsibility of the flight examiner or instructor to exercise good judgment in critiquing " ---- ants" if the "elephants" were not allowed to run wild.

Some may ask, "How can a realistic profile be flown, if all bold face procedures require evaluation on EP checks?" "Evaluations" include oral examination as well as cockpit execution. However, TACR 60-2 is being revised to require one bold face procedure per phase of flight (e.g., TO, cruise, etc), and selected random malfunctions, which are developed to provide a realistic and demanding emergency condition.

Unfortunately, in some units, the EP missions are stereotyped and a given emergency is not followed through to landing. Some EP instructors will "give back" an engine after a fire or reset a malfunction after the "bold face" procedure has been completed. This destroys the realism of the mission and does not allow the aircrew to get psychologically or emotionally involved in the situation. A simulated flight situation does not normally generate the same fear that is encountered in flight. However, the "sense of urgency" developed in a realistic, task saturated situation causes "emotional flooding" similar to that associated with inflight fear. After

armed for fear

administering EP checks for four years, I have observed many signs of emotional flooding - ranging from abnormal perspiration to breakdowns to crew coordination (shouting arguments).

If the aircrew experiences "emotional flooding" in a controlled training situation, they learn to identify their personal symptoms (as they do for hypoxia). Then, by slowing down and relaxing, the crew can practice countering the hazardous characteristics of "emotional flooding." A medical analysis of bravo crew's performance, determined that both crewmembers "were performing under conditions of emotional flooding (with fear) which seemed to impair normal mental efficiency." The extremes of apprehension were characterized by preoccupation, poor memory, and narrowed awareness to the degree of excluding perception of relevant data. Behavior became inflexible and fine motor coordination was affected (too much throttle caused the acceleration from 250 to 350 knots).

Fear of the unknown (either situations not previously experienced, or cockpit indications which are not understood) can cause the above behavior. If the above attributes of a scared aircrew are not overcome by the aircrew's previous training, the probability of safe aircraft recovery is minimal. The objective of most aircraft academic instruction and all emergency procedure training is to prepare aircrews for emergencies and to minimize fear of the unknown. If aircrews (1) well trained in emergency procedures, (2) have experienced "emotional flooding" in a training situation, (3) are aware of their "emotional flooding" symptons, and (4) understand how to deal with the resulting anxiety, then they are well prepared to firmly face fear in flight. In short, training (flying, simulator, procedural trainer and academic) is the best possible armament for fear.

Proof? Alpha crew's comments shortly after landing include the remark, "It (the emergency recovery) was just like an emergency procedures simulator." They also stated that they were relatively relaxed on final because they were confident they had done everything they could (i.e., all checklist procedures, as previously practiced in the simulator, had been accomplished). Although ejection was imminent, crew coordination and confidence in each other prevailed. They were "armed for fear."

NOTE

What about units which do not possess a simulator? Cockpit procedural trainers (CPTs) are a good substitute if situational emergency training (SET) is applied. Details are available from the Government Printing Office, under the title of Situational Emergency Training, Jun 76, Publication Number AF/HRL-TR-76-47(I). Many weapons systems have achieved good emergency recovery results with only academic or CPT training available. Without a simulator, it is difficult to experience "emotional flooding," except during arguments with "the better half." However, if the hazards and methods for overcoming "emotional flooding" are reviewed during academic training, aircrews will be better prepared for fear.

ED

Major Gary B. Thomsen (B.S., University of California, Berkeley) is F-111 Program Manager, HQ Tactical Air Command Standardization/ Evaluation Division. His service experience has included assignments as a T-38 Instructor Pilot (ATC), OV-10A Forward Air Controller, Air Division War Plans Officer, and F-111D Flight Examiner. He has 4,000 hours of flying time which include 430 combat hours.

Aircrewman of Distinction

Maj Alexander H. Murchison III
27 TFS/1 TFW
Langley AFB VA

Major Murchison was flying as number two in a flight of four F-15s scheduled to conduct air combat tactics training over the Atlantic Ocean. During the first engagement, while accelerating in full afterburner at FL 200, Major Murchison detected a large explosion from the right aft section of his aircraft. He immediately terminated afterburner, checked the cockpit instruments, and noticed the illumination of the right engine fire warning light. Major Murchison terminated the engagement and maneuvered the aircraft towards Langley AFB. As he began the emergency procedure for an inflight fire, the fuel hot and bleed air overtemperature warning lights illuminated; and the aircraft entered a nose low, out-of-control spiral. After two rolls, Major Murchison successfully recovered the aircraft and was able to maintain level flight by using full left rudder and right aft stick. High frequency vibrations in the aircraft prevailed as the engine emergency procedures were completed.

The flight lead visually confirmed the aircraft was on fire and noted that the tail hook was down. Although it had not been lowered from the cockpit, attempts to raise the tail hook were unsuccessful. Major Murchison also observed that the environmental control system warning light had illuminated. Appropriate checklist actions did not extinguish the light. To avoid overheating and a possible fire from the aircraft electrical components, the radar and other high drain electrical systems were turned off. Because of the possibility of ejecting 70 miles from land, over 40°F water, a SAR mission was activated.

Large cross control inputs continued to be required to maintain level flight. After several minutes, the fire warning light began to flash, indicating that the fire had been reduced to an overheat condition, and the chase aircraft confirmed that the fire had gone out. Major Murchison then observed that the flight control augmentation system had dropped off of the line and would not reset. However, after doing a controllability check, he determined that he would be able to land the aircraft with the degraded flight controls available. A single engine straight-in approach was flown to a flawless landing.

Major Murchison safely returned the aircraft despite intensive fire damage, severe controllability problems, and an uncommanded tail hook extension. Recovering the aircraft intact not only saved a valuable aircraft but also permitted the accident investigation board to uncover engine fire potential affecting 14 other F-15 aircraft.

The superior airmanship, prompt reaction to a grave inflight emergency, and professional competence demonstrated by Major Murchison resulted in the successful recovery of a valuable tactical fighter. His actions qualify him as the Tactical Air Command Aircrewman of Distinction.

DOWN TO EARTH

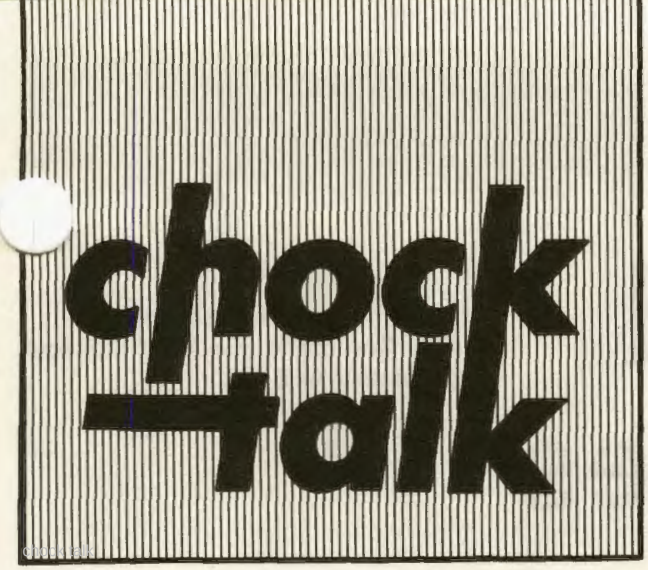
A FALSE SENSE OF SECURITY

By A1C Robert J. Gittinger
35 AMS/35 TFW
George AFB CA

After several thousand miles of road riding, I finally had my first accident. Oh, I've had my share of close calls, but this one did not involve the usual car cutting out in front of me. Nor was it a case of screaming into a turn too fast. Ironically, my speed was rather slow; there was no traffic; and the road and weather conditions were perfect for a quiet Sunday's ride. With everything so perfect, why did this unfortunate event happen? As I sat by the side of the road, looking at my slightly battered bike, the answer came to me. I simply let my guard down.

I had been riding in the mountains for an hour or two, and each turn demanded my complete attention. With a wall of rocks and trees on one side of the road and a 2-foot high guard rail on the other, I wasn't about to let my mind wander. So, after I got out of the mountains and started riding on the flat, gentle turning roads, I could relax. Right? Wrong, again! But it was such a simple turn; just a graceful right hand bend in the road. There were no obstructions to visibility. I could see the complete turn and the stop sign that was less than one-fourth mile beyond. I figured I could rest when I got to the stop sign, if only for a moment. It would be a break in the tedious ride that began hours ago.I down-shifted and began to brake slowly. I could have taken the turn at 40 MPH with ease; but at 25 MPH, I could begin to relax now. The next thing I realized was that, even though the turn had ended, I was still banked in a right turn and the edge of the road was very near. There was a 2-inch drop where the pavement ended. Rather than risk a violent movement to keep on the road, I opted to ride it out the rest of the way on the shoulder. The shoulder was soft, the front crash bar hit a clump of dirt, and I went down. I hit the ground and rolled over my right shoulder, landing in a freshly plowed field. The slow speed at the point of impact limited the damage to the bike and myself.

Why did I crash? I let myself enter a false sense of security. This bit of misjudgment promptly rewarded me with a damaged bike, a few bruises, and a quick reevaluation of my pride. The moral is: When you ride in perfect conditions, your biggest hazard may be that false sense of security.



...incidents and incidentals with a maintenance slant.

THE HIDDEN MURPHY

Two environmental repair specialists were dispatched to perform a fire extinguisher check on an A-10. Following the steps in TO 1A-10A-2-21JG-7, all the system circuit breakers were pulled. The firing leads to the aft extinguisher bottle were disconnected and properly labeled, and the cartridges were shorted. The specialist in the cockpit intended to place the selector switch to the left position to test the aft bottle, but mistakenly positioned the switch to the right. This activated the circuit to the forward bottle. The specialist then pushed in the two circuit breakers for the left engine extinguishing system. When the T-handle for the left engine was pulled, the cartridge on the forward bottle fired and discharged the extinguishing agent into the left engine.

OK -- the specialist made a mistake and placed the selector switch in the wrong position. All those who've never made a mistake, stand up. Now that everyone is comfortably seated -- what was the real cause in this incident? If you answered the Tech Order, you're right. The tech data contained a hidden "Murphy" in that it did not specifically state that the firing leads to both bottles be disconnected prior to any system check. To prevent this from recurring, an AFTO Form 22 had been submitted requiring that the power leads to both fire extinguisher bottles be disconnected prior to performing any system checks.

If you notice any hidden "Murphy's" in the tech data you're using -- change it. It could prevent someone from having a bad experience.

DROPPED DROP TANK

After a 2-week deployment, the A-7D returned to its home station on a Friday afternoon. The aircraft was configured with two external fuel tanks on pylons 3 and 6.

Following a BPO, the internal tanks were refueled; however, the crew chief failed to install safety pins in pylon stations 3 and 6 IAW the postflight and refueling checklists. Additionally, no work order was issued to dearm the aircraft IAW local operating procedures.

The next Monday the external tanks were refueled and the aircraft forms reviewed by the crew chief prior to performing the aircraft preflight. He assumed the aircraft required impulse cartridges in pylon stations 3 and 6 and entered "carts to be installed prior to flight" in the AFTO Form 781A. The preflight was then completed and a load crew dispatched to install the carts.

The load crew chief reviewed the AFTO Form 781A for a cart installation entry but failed to check the armament placard, which showed carts were installed, and failed to ensure the pylon safety pins were installed. The BITE check was then initiated. After power was applied to the aircraft, the crew chief depressed the self-test switch on the armament system control unit (ASCU) which jettisoned both external fuel tanks. The tank jettisoned from pylon station 3 and struck and fractured the crew chief's right leg.

At least eight violations of tech order and local operating procedures occurred before culminating in the mishap. The crew chiefs, refueling personnel, and weapons load crews all failed to exercise their responsibility to follow established procedures and also failed to use commonsense safety precautions. It is difficult to imagine that this accident could not have been prevented. It is also difficult for higher headquarters personnel to understand the constant cry from lower echelons to reduce the amount of written guidance when mishaps such as this continue to occur. Let's get the job done right -- the first time. And please -- don't do anything dumb.

Prayers and Promises

By Maj Grover Musselwhite
Air Command and Staff College
Maxwell AFB, AL

prayers and promises

After years of pushing tired, old airframes around the skies, some of our prayers have finally been answered. The F-15 is well on its way as the new air superiority machine; and the F-16, with its versatile air-to-ground and air-to-air capabilities, is soon to follow. In addition, the A-10 has found its place as the future guardian of troops in contact. But did you know that along with this new generation of fighter and attack aircraft comes another promise -- a promise of a new breed of simulators? Not the typical cockpit and procedures trainers we suffered through in UPT and RTU, but visual simulators designed to provide realistic mission capabilities throughout the air-to-air and air-to-ground roles.

In 1973, TAC submitted requirements for a full complement of training devices to support the A-10. At the same time, the energy crisis hit, and the impact of fuel shortages increased emphasis on expanding the use of simulators. In the June 1974 AIR FORCE MASTER PLAN-SIMULATORS FOR AIRCREW TRAINING final report, TAC projected drastic changes in simulator time versus flying time for all training programs after FY 74. Essentially, the TAC Training Program Summary projected roughly equal hours of simulator time and flying time for all fighter transition training, and projected 30 to 40 percent cuts in continuation training hours to be replaced with simulator time. These projections have not materialized, but it was in this vein that A-10 simulator requirements continued development.

In April 1975, a Trade Study concluded the most efficient and effective A-10 simulator would be (in descending order of cost and training effectiveness): (1) a full mission simulator, (2) a weapons delivery simulator, and (3) an instrument flight simulator. A look at these simulators in some detail will give you a good idea of where we have been, where we are now, and where we are going.

The instrument flight simulator has been around since 1929 when Link trainers were installed at Randolph Field. Improvement over the years has led to present F-4, A-7, and F-111 simulators used to teach and review a variety of procedures in both training and operational units. These devices have been significant in our training and accident prevention programs, ar similar models of new weapons systems w continue in these roles.

Weapons delivery simulators have also been around for sometime but have been limited in capability. Trying to guide the AGM-12 Bullpup was probably more difficult using the simulator; and its open cockpit environment also had its negative effect. Even with a familiar cockpit, making a blind lock-on for a simulated AIM-9 shot or interpreting a radar scope to make a Radar Lay Down (RLD) hardly equates to putting the pipper on the target. The debut of the F-4E Simulator for Air-to-Air Combat (SAAC) provided a new dimension to air combat simulation through the visual presentation of a moving model. Similar efforts for visual air-to-ground simulation with an advanced F-4E simulator (#18) have been less spectacular.

Technical development of the full mission simulator is still a promise of the future and many of its features are already in use with the systems previously mentioned. The truly full mission simulator, however, will be more sophisticated than the sum of these parts; it will be capable of duplicating a new fighter's comple range of performance in a visual environme

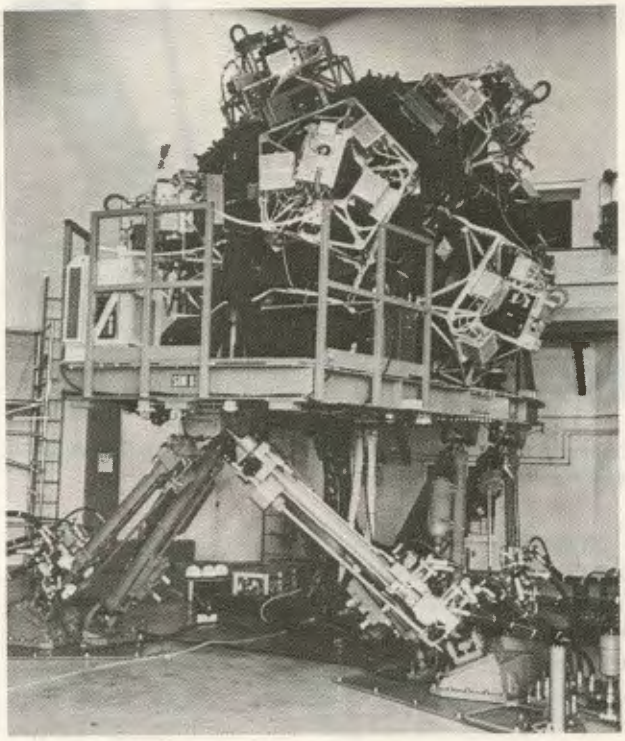
These simulators will allow a crew to train, maintain, or enhance previously acquired skills by accomplishing mission scenarios under visual and varying weather conditions. Visual displays will depict a wide view of the sky and ground, and the scene will realistically support completing any required task. Coordination of motion, "G" simulation, and sound effects will lend added realism to the visual scene.

Considering A-10 operational requirements, neither visual air-to-ground nor full mission simulation had been thoroughly developed or demonstrated. Consequently, in April 1975, an A-10 Program Management Directive initiated Project 2235, a joint Systems Command and TAC venture to evaluate state-of-the-art visual simulation technologies applicable to air-to-ground weaponry.

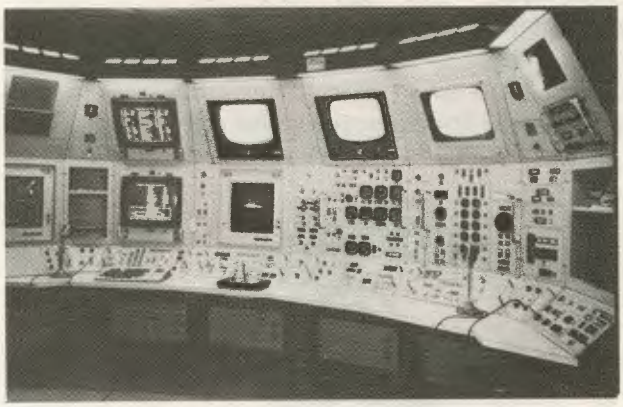
Air Force research simulators with the latest technologies in visual simulation were evaluated. Three systems were technically modified to support simulation of conventional and tactical weapons deliveries. Since it was not intended to modify each system to the same standards, the following evaluation results describe only the capabilities of the technologies and not the capabilities of the simulators.

The operational evaluation was conducted in spring 1976, with the assistance of five experienced TAC pilots from operational F-105, F-4, and A-7 squadrons and one AFSC pilot with F-100 experience. Each pilot flew ten missions in the Advanced Simulator for Undergraduate Pilot Training (ASUPT), the Large Amplitude Multi-mode Aerospace Research Simulator (LAMARS), and the Simulator for Air-to-Air Combat integrated with the F-4E #18 (SAAC #18).

The ASUPT is operated by the Air Force Human Resources Laboratory, Flying Training Division at Williams AFB, Arizona. Although designed to investigate future simulator roles in UPT, its computer image generation technique was expanded for the air-to-ground mission of this project. Technically, this system stores images as numerical data in computer memory and displays it as television video to the pilot. Software and hardware modifications to the system produced ordnance trajectories and impacts, scoring, and moving model paths. These features enhanced the visual scene which included an airfield complex, a conventional gunnery range, and two tactical areas. A gunsight was also added to the cockpit.



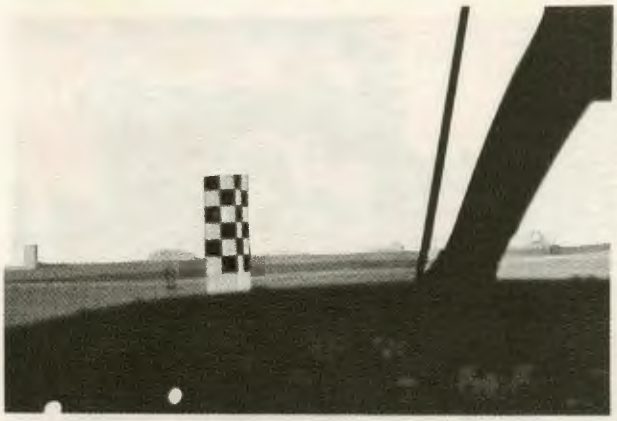
Advanced Simulator for Undergraduate Pilot Training (ASUPT) T-37 Cockpit and 7-Channel Visual Display Mounted on 6-Degree-of-Freedom Motion Platform



ASUPT Instructor/Operator Console. The training mission can be set up, monitored, changed, displayed, and a hard copy printout of flight data obtained for comparison with a standard criterion.

The visual scene is displayed to the pilot by seven 36-inch monochrome cathode ray tubes which virtually house the cockpit. They interconnect so as to provide a horizontal field of view (FOV) of about ± 150 degrees and a vertical FOV of ± 110° and -40°. This gives excellent target orientation and allows the use of normal outside references when flying gunnery patterns.

prayers and promises



Computer Image Generator (CIG) Visual Cockpit Display Depicting Control Tower and Hangars at Williams AFB, AZ

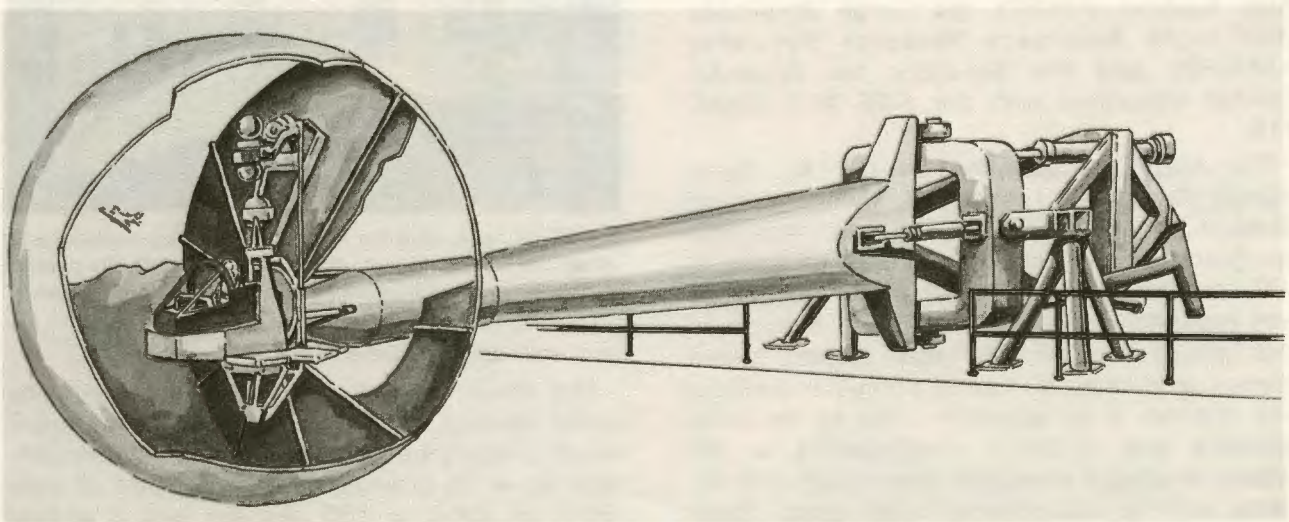
Conventional and tactical deliveries from level skip to 60-degree dive bomb were accomplished in day and night varying weather conditions. Box patterns, curvilinear patterns, pop-ups, and random attacks were some of the tasks evaluated. Displays of bomb and bullet impacts gave the pilot realistic feedback for immediate error analysis. The SAM site added even more realism when it launched a missile which had to be evaded.

Missions in the ASUPT were exciting and challenging. This was evidenced in a turkey shoot which motivated each pilot to really work hard to be the winner. Would you believe you could get excited over being top gun in the simulator? I know six guys who did.

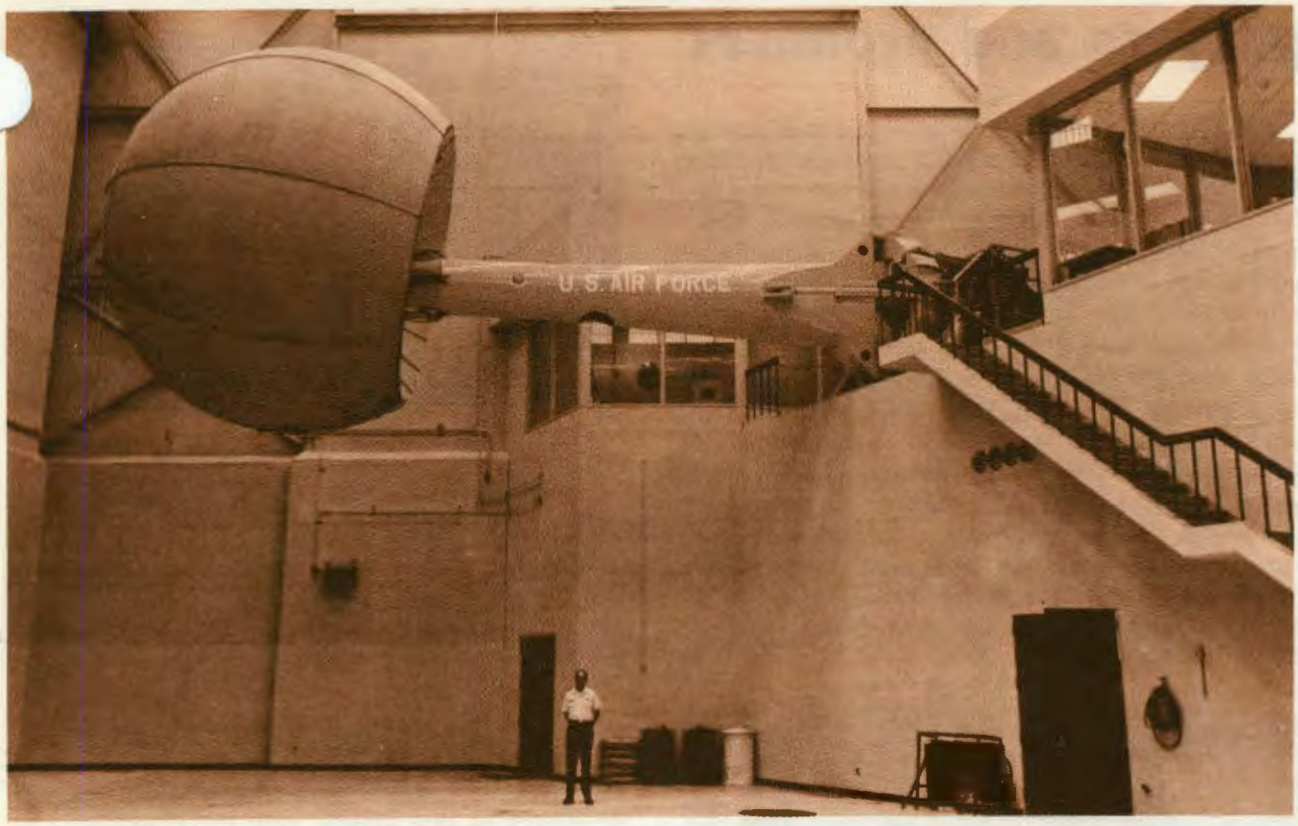
The LAMARS is the newest research vehicle in the Flight Dynamics Laboratory at Wright-Patterson AFB, Ohio. Project 2235 pilots were the first operational users of this advanced simulator although it was designed primarily for air-to-air combat mission evaluations and handling quality studies. For this project, it was adapted to air-to-ground tasking.

A combination terrain model board (TMB)/dome projection technology provided the visual display. An exceptionally detailed three-dimension model of geographic and cultural features included urban areas, rural terrain, a SAM site, an airport complex, a dive bomb circle, and a strafe panel. The cockpit is housed inside a 20-foot diameter dome in which a dual-projector system provides a stationary earth/sky background and a small scene of the target area. The scene is generated from the model board through a television camera with an optical probe. Attempts to simulate weapons deliveries were severely hampered by the limits of the probe and the use of a helmet-slaving device to determine which portion of the scene was viewed. It was like trying to fly looking through field glasses, and there was no supporting visual scene except that small view determined by head movement.

Several deliveries such as high angle dive bombing and random attacks could not be accomplished. Roll-in bank angles and dive angles sometimes exceeded probe limits and blanked out the scene. Orientation for tactical deliveries required excessive reliance on instruments for proper pattern placement and caused late target acquisition. Flying the missions was challenging -- but not realistic.



Cutaway Showing LAMARS Cockpit With Visual Background



LAMARS Cockpit Dome

LAMARS Computer Room

prayers and promises

The last technological system evaluated was in the combined SAAC/F-4E #18 simulator at Luke AFB, Arizona. Some of you have flown air-to-air missions in SAAC; but for this project, the moving model was replaced with ground image generation from the terrain model board used with #18 F-4E. This provided a TMB/optical mosaic display on the eight cathode ray tubes used with the SAAC. As in LAMARS, the visual area around the target was small compared to the total visual scene. Again, this caused some difficulty in determining position relative to the target. For example, when flying a conventional or tactical pattern, there were insufficient visual features for the pilot to determine distance, direction, and line-up without excessive reliance on instruments. Sometimes, even a good cross-check did not help.

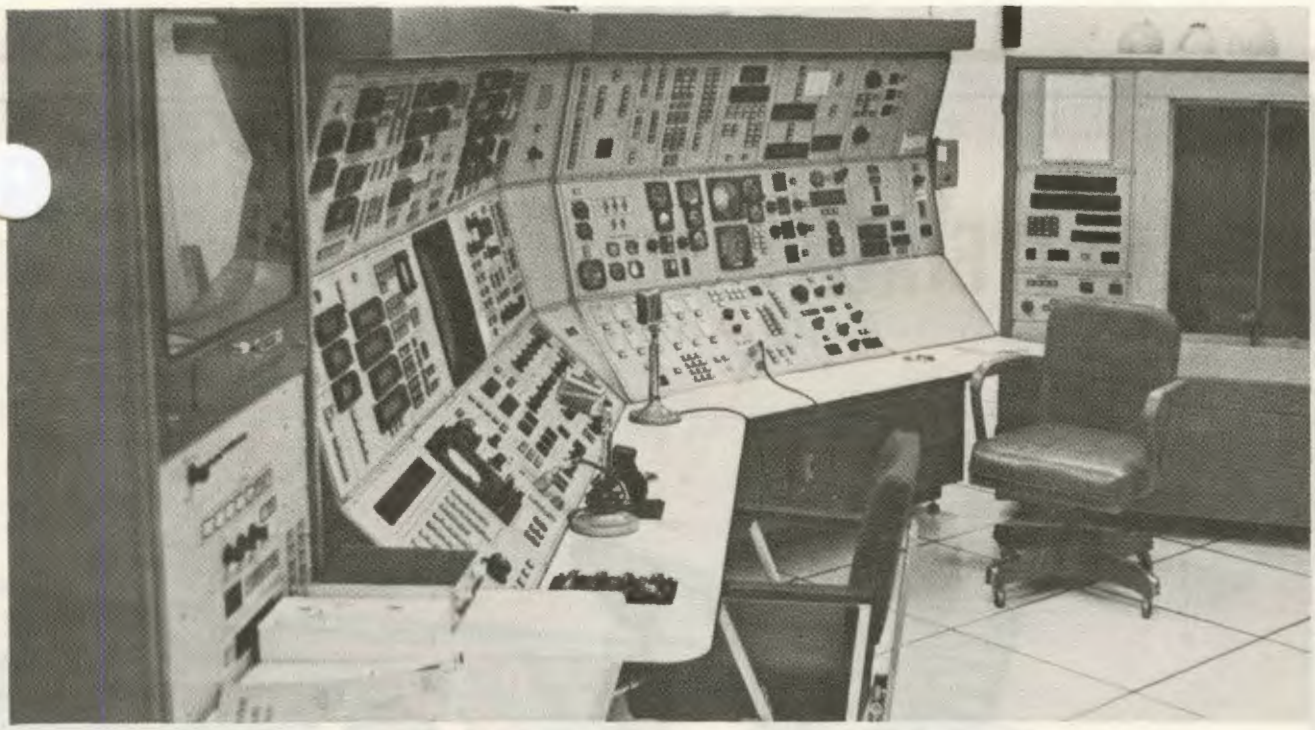
Sim #18 Cockpit and Motion Base Platform

Sim #18 Terrain Model Board

You have probably already guessed that the primary conclusion from this evaluation favored the computer image generation/optical mosaic technology associated with the ASUPT. The Project 2235 Final Report, published October 1976, supported this conclusion with a detailed analysis of the technical and operational phases of the evaluation. The report also recommended initiation of a program to provide a production prototype of this system with the expanded capability to fulfill as many A-10 operational requirements as possible.

In essence, the objective of Project 2235 was to evaluate a new area of application for the advanced simulators that will accompany all new fighters -- not just the A-10. Prior to this effort, visual simulation of the ground attack/ground attack tactics mission was virtually unexplored. Only the technology of three Air Force systems was evaluated, but the implication was clear. A mission capable simulator is possible for fighter/attack aircraft, and the Air Force intends to provide that capability to TAC aircrews.

One key factor of success goes beyond technological capability. That key factor is crewmember acceptance. Technology has always led the way in producing the hardware. However, a less than enthusiastic attitude has developed among the ranks. And why not? When was the last time you really enjoyed a simulator mission? The point is that no matter how good the system might be, unless you are willing to use it with conviction, it will not produce the intended results. Certain criteria are essential in creating this attitude. First, the system really has to be good, and it must be capable of going beyond being just a fancy procedures trainer. Second, it must reinforce experience, not be a substitute



Instructor/Operator Console of F-4E Simulator #18

for it. Third, the missions have to be realistic and challenging -- but not expected to replace flying. And fourth, the atmosphere and manner of conducting missions have to provide positive motivation.

From what was seen during this evaluation, new visual roles for simulators can meet these criteria and make worthwhile that occasional trip to "fantasyland." In the continuation training environment in which these systems were tested, the missions were realistic, flown with anticipation, and completed with a true sense of accomplishment.

Just how big a role visual simulators will eventually play in initial and continuation training is debatable. DOD interest in simulation is high, but for more reasons than saving fuel and reducing operating costs. Previous training value notwithstanding, the contribution simulators can make to increase or enhance combat skills is becoming a reality. Better error analysis, learning maximum performance maneuvers safely, learning more effective evasive maneuvers -- these are but a few of the possibilities. But there are limits. The keen edge of combat superiority must be maintained, and that means flying and doing. Regardless, requirements for more capable simulators do exist, and you can bet your wings they will have an increased role in your future. We trust you will use them to add another dimension to your ability to do the job better than your adversary. ➤

•••

A follow-on evaluation Project 2360 continues the efforts of Project 2235, but with emphasis on full mission capabilities. A contract will go to two companies for competitive prototype systems to be integrated with A-10 operational flight trainers. A "flyoff" will determine which system gets the production contract. Target date is 1981.

Editor

Major Grover E. Musselwhite (MPA, Golden Gate University) is presently attending the Air Command Staff College at Maxwell Air Force Base, Alabama. His previous assignments have been as a T-38 instructor pilot (ATC); a combat tour as an F-105 pilot with the 355 TFW, Takhli RTAFB; an Air Officer Commanding at the USAF Academy; and, a Flight Commander and Assistant Operations Officer in the 561st Tactical Fighter Squadron, George AFB, CA. Major Musselwhite also was one of five TAC pilots selected for the evaluation phase of joint TAC/AFSC Project 2235, Air-to-Ground Visual Simulators. He is a Senior Pilot with over 3,000 hours flying time, including 303 combat hours. His decorations include the Distinguished Flying Cross, the Air Medal with nine Oak Leaf Clusters, the Meritorious Service Medal, and the Air Force Commendation Medal with one Oak Leaf Cluster.

SPITFIRE

James H. Brown

PHYZ-BIZ

The Cup that CHEERS

Part-I

By Lt Col Harold Andersen
HQ TAC Physiological Training Coordinator

Alcohol is an interesting substance, from many points of view: historically, chemically, physiologically, socially, etc. There are many kinds of "alcohol," but when we use the term in reference to beverages, only one type can be considered: ethyl alcohol (or ethanol). All alcohols are toxic; and as bad as ethyl alcohol is, the others (methyl, or wood alcohol; isopropyl, or rubbing alcohol; etc.) are even worse. To begin with, it is a habit-forming drug, and there are millions of alcohol addicts in the U.S. alone. Its known effects are so detrimental that if it were being introduced to society today, as is marijuana, there is little chance that it would be legalized. Its discovery and use predates recorded history -- as early as 2100 B.C., the physicians of Sumeria were prescribing beer for their patients, and the oldest known code of laws (Hammurabi's) regulated drinking houses.

The use of alcohol is nearly universal. Very few cultures failed to discover the fermentation process which produces alcohol (e.g., most of the peoples of Oceania and most of the pre-Columbian Indians of North America) and few, if any, are successful in prohibiting its use. While its discovery was probably accidental, the range of sugary and starchy substances which have been, and are being, fermented to produce alcoholic beverages is amazing. Cacti in southwestern U.S. and Mexico; banana and palm wine in Africa; rice wine (Saki) in Japan; honey (mead wine) in Scandinavia and Britain; potatoes in the Slavic countries and Russia. Corn, wheat, rye, barley, fruits, berries, (even dandelions) produce alcohol in the temperate climates of the world where they are grown. You name it and somebody has used, or is using, it as the backbone of the local "Happy Hour."

Approximately 800 B.C., the Chinese developed a process which concentrated the alcohol and permitted a higher percentage of alcohol by volume than had been possible before. Natural fermentation is a self-limiting process, and the maximum concentration of ethanol is 12-14%. The Chinese process, which we call "distillation," permits production of nearly 100% pure (absolute) alcohol. This opened Pandora's box by introducing very strong libations such as whiskey, rum, vodka, tequila, gin, etc., and extended the range of concentrations of alcohol from approximately 2% in some mild Scandinavian beers to 50% or more in some whiskies. For those looking for new gustatory adventures, there's a mild 2% drink called "kumiss," an Asiatic product from fermented mare's milk).

Someone once observed that, "candy is dandy, but liquor is quicker." Distilled spirits do, indeed, act very quickly. High concentrations permit more rapid diffusion directly into the blood stream via the lining of the stomach so the drinker doesn't have to wait for the alcohol to pass from the stomach into the small intestine before getting his kicks. Fatty foods will slow alcohol absorption/diffusion into the blood stream, while the presence of carbonated water seems to have the opposite effect.

While alcohol can be introduced into the body and blood stream at varying rates, its removal is at a fairly constant rate, which averages approximately 1/3 of a fluid ounce of pure alcohol per hour (the amount found in about 2/3 of an ounce of 100 proof booze, or 1/2 of a 12 oz. can of beer). Between 2 and 10% of consumed alcohol is eliminated by way of the lungs, kidneys, skin, etc. The remaining 90-98% must be processed through the liver, which is the detoxifying organ of the body. Here, a chemical process converts it to CO_2 and water. This chemical process proceeds at a normal rate at body temperature, and cannot be increased by exercise, breathing 100% oxygen, drinking coffee, etc. These things will only produce a sweaty, well-oxygenated drunk with a full bladder (coffee is a stimulant to kidney action).

If the rate of introduction is high, while the elimination rate is fixed, it is apparent that alcohol will pile up in the blood stream. If this condition exists for very long, the amount of alcohol in the blood and tissues increases to critical, sometimes fatal, levels. When the blood level of alcohol approximates 0.05%, the highest brain centers (those which control judgement and inhibitions) are affected; at 0.10%, motor areas of the brain are inhibited, and such things as speech, balance and normal dexterity are impaired, and vision is less acute; depression of all motor areas and some mid-brain functions (emotions) occur around 0.20-0.30%; and at 0.45%, the celebrant becomes comatose (unconscious). Should the alcohol level reach 0.50 to 0.70%, respiratory and circulatory centers of the brain are paralyzed and death quickly ensues.

The effects of alcohol on the central nervous system (CNS) are depressant, not stimulant, in nature. Fortunately, the higher centers are affected first, and the depressant effect works down to the lower brain stem levels later.

the Cup that CHEERS

Alcohol affects the brain in two ways: one is believed to be due to the action of alcohol in changing the proportions of two substances called neurohormones. These substances, norepinephrine and serotonin, are believed to control such states as mood and alertness. Because of this action, people frequently do and say things which would ordinarily not be done. The second effect is the one with which crewmembers are probably most familiar, because they have had it explained several times during Physiological Training courses. Alcohol poisons an enzyme in the cells, and thereby disrupts normal cell function. The cell is less able to produce the required energy for its own maintenance and function; and it must necessarily work at a lower, less efficient level. The cells cannot utilize the available oxygen, and they have no need for it. Eventually the cell dies. This condition is called "Histotoxia Hypoxia" which means "tissue poison"; and alcohol acts as a histotoxic agent, causing hypoxia.

You may also remember that the deficiency of oxygen (hypoxia) affects the most sensitive tissues; those which have the highest rate of utilization of oxygen, first. The neuron, the unit of structure and function in the CNS, has the highest demand for oxygen of all body tissues -- even greater than exercising muscles. So great a demand, in fact, that even slight deficiencies are quickly effective in disrupting normal function. Severe deprivation of the neuron's oxygen supply can result in the irreversible death of the cells. If enough neurons die, the body dies.

Massive doses of alcohol can, and have, caused death. It's easier to do than one might imagine. For example: a young paratrooper was celebrating his recent graduation from "jump school," and after consuming enough beer and booze to raise blood alcohol level to approximately 0.20-0.30%, someone challenged him to "chug-a-lug" the remaining pint of whiskey. He accepted the challenge and the cheers of his comrades as he downed the dregs. While en route to a new party, he "passed out" (became comatose) much to the delight of his companions. They'd really give him the business the next day! Since he was unconscious, he was left on the back seat of the car to "sleep-it-off."

When his buddies returned several hours later, they found him as they had left him, with one important difference -- he was dead. His friends couldn't understand what had happened.

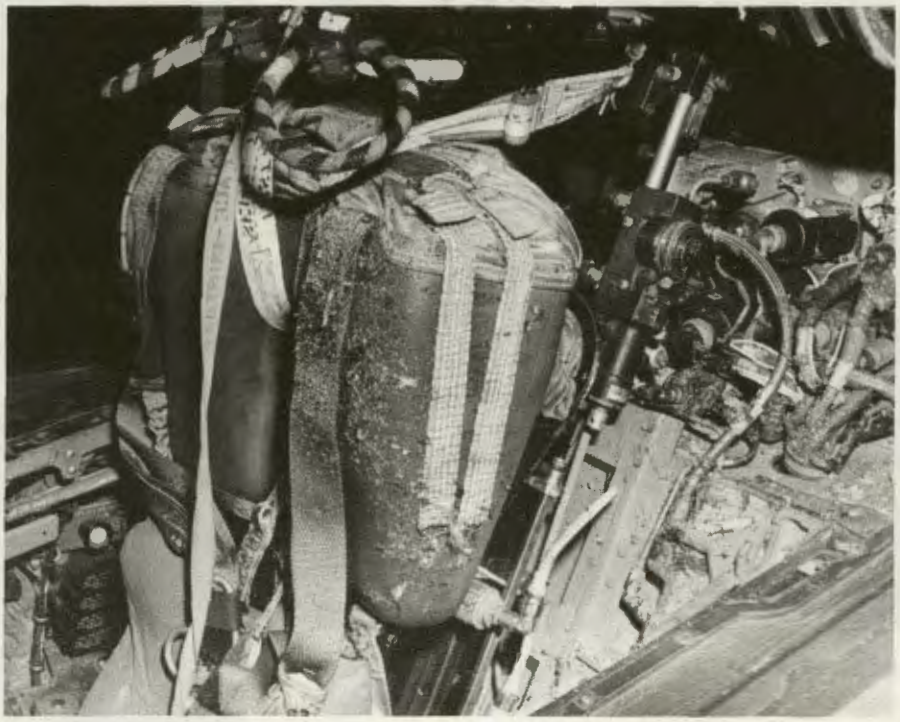
Well, what did happen? The most plausible explanation is this: his early drinking raised his blood alcohol level to somewhere around 0.20%. At this point, the "chug-a-lugged" pint quickly zapped him to the coma-producing level, approximately 0.45%. He also failed to vomit to rid his stomach of the large volume of whiskey it contained. While in the unconscious state, the alcohol continued to be absorbed until he passed through the fatal limit (probably 0.70% or greater).

This is only one example in many. Any set of circumstances whereby a massive amount of alcohol is imbibed in a short time interval could produce the same end result (one individual did it while attempting to set a record for drinking Martinis in a Chicago bar).

Next month, we'll continue our discussion, and investigate other ways in which "The Cup That Cheers" might become the "Cup of Death."

TAC TIPS

...interest items, mishaps with morals, for the TAC aircrewman



FEATHERED FOES (FLEAGLE'S FRIENDS?)

The Photo-Phantom was flying as number two on a two-ship low-level training mission. While at 1,000 feet AGL and 480 knots, the pilot observed a bird at his 12 o'clock position. The jock lowered his head and made a 5 "G" pull-up in an effort to avoid the feathered foe. In less than one-half a second, the bird impacted the right quarter panel of the windscreen and entered the cockpit spraying the left quarter panel with remains, causing the center windscreen to shatter and become translucent, and striking the pilot in the right shoulder.

The pilot began a climb, informed lead, and ...ared an emergency. During the return to base, the pilot could only communicate with the WSO using the side tone of the UHF because of the high noise level. Fuel was reduced, and the pilot made a perfect landing while looking through the area of the broken right quarter panel.

Keep those visors down and be alert for birds along your route of flight. If you see any large flocks of birds on low-level routes, on ranges, etc., give a call to the SOF so he can get the word to the other jocks who will be flying in the same area. It could save a buddy of yours from one of those "moments of stark terror."

PLACE THE FACE

This Spitfire pilot, assigned to the 541st RAF Photo Reconnaissance Squadron at Benson Air Field, England, prepares for a combat mission.

As the closing date for our April contest approached, we thought we had everyone stumped. Even Fleagle was seen smiling -- maybe he would not loose another tail feather. On the last day of the contest we finally received a correct response.

The winner was Senior Master Sergeant Ralph W. Roper, 354th Tactical Fighter Wing, Myrtle Beach Air Force Base, South Carolina. He recognized the F-86F crew chief as Chief Master Sergeant Irving H. White, Jr., F-4 maintenance superintendent, Deputy Chief of Staff Logistics, Headquarters Tactical Air Command. Sergeant Roper will receive the coveted "Fleagle Fanny Feather of Fate Award," emblazoned with one of Fleag's own tail feathers.

This month we'll make things a little tougher for everyone with the photo of an RCAF Spitfire pilot. Yes, Virginia, he is in the USAF now. Can you "Place the Face"? Send all responses to:

TAC/SEPP
Langley AFB, VA 23665

Good luck!

TAC SAFETY AWARDS

Ground Safety Award of the Quarter

Technical Sergeant Andrew J. Glover, 16th Special Operations Squadron, 1st Special Operations Wing, Eglin AF Auxiliary Field No 9, Florida, has been selected to receive the Tactical Air Command Ground Safety Award for the first quarter 1977. Sergeant Glover will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

TSgt Andrew J. Glover

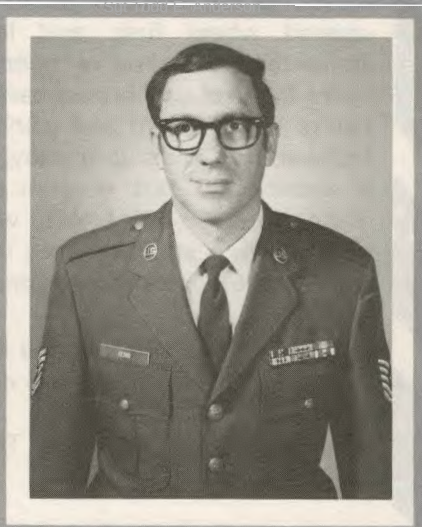
Crew Chief Safety Award

Sergeant Todd E. Anderson, 27th Organizational Maintenance Squadron, 27th Tactical Fighter Wing, Cannon Air Force Base, New Mexico, has been selected to receive the Tactical Air Command Crew Chief Safety Award for this month. Sergeant Anderson will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

Sgt Todd E. Anderson

Maintenance Safety Award

Technical Sergeant Joseph G. Serio, 35th Munitions Maintenance Squadron, 35th Tactical Fighter Wing, George Air Force Base, California, has been selected to receive the Tactical Air Command Maintenance Safety Award for this month. Sergeant Serio will receive a certificate and letter from the Vice Commander, Tactical Air Command.



TSgt Joseph G. Serio

A-7
Emergency Situation Training

By Maj Wiley E. Greene
162 TFTG (ANG)
Tucson IAP, AZ

SITUATION: After 10 years, 2 months, and 29 days, you've been certified, stamped and approved to taxi without yellow lines, land on the upwind wheel first, and lead flights as an instructor pilot. You've been tasked to lead a strike flight of two brown bars and a B-4 retread. You're heavyweight and going to the Tac Range. Number Two joins up quickly, and Number Three is coming on fast enough to need his speed brake. You're 2,000 ft AGL when Number Three tells you in a squeaky voice that his speed brake won't come up. Whatcha' gonna' do?

OPTIONS: A. Ignore him and see if he'll go away.
B. Tell the ex-B-4 driver not to hit him.
C. Call the SOF.
D. Tell Number Three to turn his generator off.

DISCUSSION: Option "A" is occurring at a rapid rate anyway. Option "B" is only necessary if he reverts to previously learned habits. Option "C" comes later. That leaves "D." Based upon neat things like density altitude and gross weight, it is conceivable that the SLUF won't sustain flight with the speed brake down; ergo, the problem. Dropping the landing gear should work, but there is a speed restriction, and the added drag might be the straw that does in the camel. What you want to do is remove electrical power from the speed brake system. The first choice in the Dash One is turn off the generator. Removing electricity from the speed brake selector valve should cause it to move to the "Close" position. The other way to do it is to place the flap handle in the "ISO" position and put the gear handle down. The second method is useful when you don't want to be without the generator. The gear itself will stay up until the flap handle is moved out of "ISO." If the speed brake doesn't retract when the electricity is turned off, then your problem is to keep flying while you jettison the heavyweight load and dump fuel 'cause you're gonna' land with the dumb thing down

WAR SOUVENIRS- A TIME BOMB IN THE HOME

By Maj Gerald A. Fabisch
Chief, Weapons Safety Div
9 AF, Shaw AFB, SC

Recently, when I was discussing Revolutionary War-era weaponry with a fourth grade class, their questions gradually evolved to the topic of "old rusty bombs and bullets at home." If this class was any indication of the norm, we may be in for big trouble. Over two-thirds of the class (consisting mostly of military dependents) described in detail various and sundry war souvenirs in their homes that were brought back from Okinawa, the Philippines, Europe, or dug up from historic U.S. battlefields.

This problem is not limited to just one Air Force Base, but is prevalent throughout the entire U.S. military and civilian communities. Consider the millions of U.S. servicemen who served on active duty in war zones since 1941. Couple this with the souvenir-hungry G.I. fascinated by supposedly "harmless" relics of past wars. Sure, captured enemy arms, shells, grenades, rockets, etc., make great conversation pieces. In a sense, they represent an integral part of the serviceman's life that he can never forget. The morbid fascination of possessing a device capable of violent destruction is a syndrome that is difficult to cure. Unfortunately, the "cure" is sometimes very sudden and tragically permanent. Children, tempted by their natural curiosity, are usually the innocent victims. They wonder what that rusty object on the mantelpiece is or if those bullets ringing an ashtray are really empty as "Daddy" claims. The propellant may be gone, Dad, but live primers and residue propellant can still remove an eye or mangle tiny fingers.

There are sordid tales attesting to the violence of "dud" munitions. They are usually accompanied by shocking photographs of eviscerated children or adults who brought home souvenir munitions which subsequently exploded. Some of the munitions functioned by merely falling to the floor; others detonated when an attempt was made to empty out the explosive fillers.

Unexpended or dud munitions are not limited to foreign shores. Many unexploded Civil War cannonballs and other dangerous relics are still being unearthed by farmers, Civil War buffs, and amateur treasure hunters. Most of these folks have no idea of the inherent danger of such finds. A physics professor at an Eastern University approached me several years ago. He wanted to know if a 50-pound cannonball in his lab was safe for a free-fall demonstration from a height of approximately 75 feet! Finding no Explosives Ordnance Disposal (EOD) markings on the rusty sphere, the building was evacuated immediately, and we called for an Army EOD team. The cannonball was found to be fully loaded with 15 pounds of black powder. Black powder becomes more sensitive with age, and a drop from that height could have resulted in a devastating detonation.

Even though you or your neighbors may not have any such souvenirs, don't discount the possibility of your children locating such objects elsewhere. This was the case recently in Virginia. Several boys were injured, and one was killed when they attempted to drill into an unexploded 40mm projectile. The shell was found on a nearby military weapons range. The boys had entered a "forbidden area," found a shell, and attempted to perform their own method of demilitarization.

How can we prevent such tragedies? First, we must take a long hard look at ourselves. If you have any suspicious munitions items at home, swallow your pride and call your local EOD team. Educate your neighbors; talk with children to gain their confidence in such matters. Convince everyone who has souvenir munitions of their potential hazards. EOD will be only too happy to put your conscience to rest. Your prompt action could save the life of a loved one or friend.

By Capt John C. Gonda
336 TFS/4 TFW
Seymour Johnson AFB, NC

On the morning of 15 April 1976, the crews of Vesty 21 flight, three F-4Es, stood at the duty desk and discussed the weather prior to the flight briefing. It wasn't thunderstorm season yet; and severe weather was the farthest thing from their minds. They were more interested in the cloud coverage and winds at Dare County Bombing Range. Would they be able to complete the TGM-65 (Maverick) training they had planned? Could they expect to use Naval Bombing Target #9 (BT-9), off the coast from Cherry Point MCAS, if the Dare County Range was unworkable due to weather? No thunderstorms were forecast or expected, and there hadn't been any in the last few weeks. As they all gathered in the briefing room, the consensus was that the mission would be routine.

Almost one month later, around that same duty desk, and in that same briefing room, a similar set of crews discussed the weather in the same area. However, on this particular morning, thunderstorms were forecast and occurring in the eastern North Carolina area and flying was at an obvious standstill. The briefing had included all possible contingencies: lost wingman procedures; thunderstorm avoidance; and, a discussion of spatial disorientation.

Why all the emphasis and why had the flying been suspended by a "weather hold"? Lightning! Lightning had been forecast and sighted, and the Supervisor of Flying (SOF) had made the decision to keep the aircraft and crews on t

ground. As the SOF looked outside the tower and observed a bolt of lightning strike the ground, he began thinking about a conversation he had at the bar with one of the members of the April 15th Vesty 21 flight and the war story he had heard ....

The flight had completed their briefing; and after an uneventful preflight, takeoff, and rejoin out of traffic, they found the en route weather unfavorable for flying tactical formation or for doing the systems checks they had planned. With IFR Flight Following from Washington Center, Vesty 21 flight descended to VMC for entry to the Dare County Range. After initial contact with the Range Control Officer, who advised them of the rapidly deteriorating `ather conditions, they decided to make one s -- just to have a look. Just as forecast, the weather was below working minimums. Lead decided to proceed with the alternate mission and headed toward the BT-9 range hoping they would have better luck there. An IFR flight clearance for Flight Level 140 was coordinated through Washington Center, and a handoff to Cherry Point Approach Control for clearance on to BT-9 was initiated. Clearance received, the flight began an IFR descent and entered a thick stratus deck. Passing through 9,000 feet, static on the UHF radio cut out almost all transmissions. St Elmo's fire danced on Vesty 22's canopy, and, at that moment -- ZAP! No warning, just the familiar "crack, crack" of a lightning strike. Number three later recalled, a "steady stream of electricity appeared from in front of number two's aircraft, went through his pitot boom and exited his wing tip." Number two

vesty 21--"strike flight"

glanced at his cockpit instruments which were spinning wildly; and although he was in the weather, he maintained his formation position momentarily. Seconds later, he was unable to stay in position due to abrupt pitch and roll transients and an apparent loss of power. He again looked at his instruments and observed his right engine rolling back to 70 percent RPM. The radio transmission that followed went something like this:

"Vesty 22's lost wingman. I've lost my right engine, and I am declaring an emergency."

"Vesty 23's lost wingman. I can't get any thrust out of my engines."

The flight of three had rapidly degenerated into Vesty 21, 22, and 23 -- three single-ship flights. Number two had sustained the main strike. His attitude indicators were in complete disagreement, altimeter was frozen at 6,000 feet, AOA indicator was frozen at 9 units, airspeed was 0; and he was in weather, single-ship. This was not your "standard" lost wingman procedure. After two unsuccessful airstart attempts, he finally regained full power on the right engine. He selected afterburner on both engines and started a "seat-of-the-pants" climb using the needle, ball, and "whiskey" compass for a heading toward home base. Reaching VMC, a rejoin with Vesty 21 was effected, and a visual inspection revealed an 8 x 40 inch section missing from the top of number two's vertical stabilizer. Closer inspection after landing revealed that the pitot tube had also received extensive damage. Number three also regained power and recovered single-ship.

Although the circumstances associated with lightning strikes vary widely, if we analyze Vesty flight's experience, we may be able to confirm or deny certain statements concerning the phenomenon of lightning. We may also be able to determine why the lightning strike occurred in an area of no thunderstorms.

We can all agree with the statement that "lightning is probably the least understood phenomenon encountered by flight crews." A thunderstorm is not a prerequisite for occurrence because lightning is no more than electrical energy moving from one charged area to another. In Vesty 21's case, neither "on-board" radar nor Cherry Point Approach Control radar were painting any thunderstorm cells. The fact that thunderstorms were not forecast presents additional evidence that this strike may not have been due to a thunderstorm. However, don't rely only on the weatherman to keep you clear of severe weather. He can't tell you exactly where lightning will be, but he can tell you where it might occur and where it isn't.

"Cloud-to-cloud" discharges make up the majority of all lightning strikes and are, by far, the most troublesome to aircraft. These involve negative and positive charge centers that flash from cloud to cloud, cloud to upper air, or flash within a cloud. This would seem to fit the incident except that no thunderclouds were observed.

"Sheet lightning" describes flashes within a cloud that are generally hidden from view. All you can see is a diffuse general illumination which lights up portions of the cloud. Although the crews of Vesty 21 flight described the glow they experienced as St Elmo's fire, they probably didn't see true St Elmo's fire which is where positive charged upper regions of thunderclouds tend to draw electrons from the upper air. St Elmo's fire and precipitation static, while less brilliant, alert the crew to the electrified air they're flying through. Vesty flight recalled the static and the glow, but unfortunately these did not give adequate warning to allow circumnavigation of the area.

Another possible explanation for the strike is based on the theory that when a high speed aircraft passes through an air mass, it becomes charged by friction or attraction. The faster the aircraft, the greater the charge. Also, adding more aircraft to a flight or increasing the aircraft size will have an additive effect and tend to increase the amount of charge acquired.

Ever wonder why aircraft are grounded to the ramp? Any time electrical power is applied to aircraft, the airframe accumulates a sta

electrical charge. Fuel being pumped into, or of, the fuel tanks also creates an electrical ge by friction which must be routed away from the aircraft through a grounding wire to the airframe. This electrical charge, as well as that created by the many "black boxes," is sent into the parking ramp while an aircraft is being preflighted or refueled. When an aircraft is airborne, however, this charge has nowhere to go except into the air around it. When an aircraft so charged approaches another charge center, it attracts a stroke to itself, or discharges itself to the cloud center. Such a charge can build to sizeable proportions; such that the conditions necessary to produce lightning are present. A corollary to this theory is that the charge carried by the aircraft is so small when compared to the charge center of the cloud that it could hardly be considered an important factor. This idea may be true for a single aircraft; but when the additive effect of a flight of three and the speed involved is considered, we might very well draw the conclusion that the charge acquired by Vesty 21 flight triggered the strike. A parallel to Vesty 21's incident occurred in Japan in 1968, and involved a flight of two F-4Cs. The strike was from the leader's right and passed through bird to the wingman in close formation on right. Number two's left drop tank exploded, but part of it stayed on the bird -- and made it fly peculiarly. Yaw or pitch inputs caused by aircraft damage at night or in turbulence are vertigo inducers of the first order. Most strikes also occur in the 5,000 to 10,000 foot level. Ring a bell? Vesty 22 was struck at 9,000 feet.

Let's look at the aircraft itself. One theory is that "as the avionics in aircraft become more complex, the susceptibility to a lightning strike is increased. When lightning does strike an aircraft, damage is usually slight." This may have been true in past strikes, but the aircrew in Vesty 22 would probably argue the point considerably. The increases in "black boxes," and the increasing use of non-conductive materials on parts of the aircraft more likely to be struck, have made damage increasingly serious. The areas most likely to be struck are the extremities such as the nose, tail section, and wing tips. This fact was certainly confirmed by Vesty 22 -- his pitot boom was welded shut, and a large piece of the tail section was destroyed in the incident.

Probably the scariest part of this incident was loss of power experienced by Vesty 22 and 23. Both crews mentioned that engine response to throttle movement was low, and number two reported engine instrument indications which definitely confirmed RPM rollback. Engine losses or power interruptions are quite common in reciprocating engines which depend on continuous electrical ignition. However, the J-79s in the F-4 have rarely been known to react adversely to the effects of such a massive electrical discharge because they don't depend on constant electrical ignition to function (ignition is only provided while the ignition button is depressed). Nosing around the maintenance complex and a few informal discussions with the engine experts yielded some interesting facts. First, it seemed that this was the first time anyone there had ever heard of such an occurrence. Second, they ruled out the possibility of an interruption in airflow at the compressor primarily because no damage in that area was discovered on the aircraft involved. Third, and a probable cause, is that each J-79 engine has a temperature amplifier which electrically controls nozzle position at high power settings. It is likely that the electrical discharge or lightning strike travelled through the airframe until it reached the temperature amplifier. The resultant electrical disturbance could have caused the nozzles to open for a few seconds, ergo -- loss of power.

"Gyros are not so prone to malfunction as a magnetic compass if a strike occurs and should provide you with an accurate heading." Not so with Vesty 22's aircraft. His heading systems spun wildly and can be attributed to the large electrical interruptions induced by the strike. In this case, it was the magnetic compass that saved precious time and fuel by providing a fairly reliable heading to Seymour Johnson.

The needle and ball flying demonstrated in this incident, as in others, was the ultimate means to a successful recovery. A good knowledge of how to fly using these basic control instruments, and a little practice in their use, could be a lifesaver in such a situation. It might be a good idea to try some "needle and ball" flying the next time you go to the simulator.

The real kicker of this whole article is that lightning can occur in areas where none is forecast; and, therefore, the SOF and weatherman will be of little or no help to you. The fact that it wasn't predicted doesn't make it less of a hazard, and it just goes to prove that it can happen -- and happen to you!

Editor

A lesson that is not in the books. For RF-4C backseaters to properly monitor instrument flying procedures, the rear attitude indicator should be indicating the correct attitude. Sometimes the AI can have pitch-and-bank errors, especially after a lot of manoeuvring (Oxford spelling). To re-erect the AI, have the AC fly straight and level, engage autopilot and altitude hold, synchronize the heading system with the synchronization knob (not the "primary/standby" reference system selector because autopilot will disengage). Hold that state for one minute and, hey presto! the rear AI will magically erect before your eyes.

Flt Lt Jack Lynch
RAAF Exchange Officer
33 TRTS Flying Safety Officer
Shaw AFB, SC

I say, old bean, jolly good tip!

ED

Editor

In the March issue of TAC ATTACK, Lt Col Andersen's article, "Cold Injury," states, "... flesh may freeze in one minute if exposed to a temperature of -90C with wind conditions of 30 mph."

My rough computation makes this a chill factor of about -165° F! I believe him! I believe him!

Lt Col David H. Bell, USAF (Ret)

Oops! You, and a few other folks, caught us with our degree symbols (°) down. The correct temperature should have been -9° C. While not as cold as -165° F, it'll still chill your gizzard with a 30 mp... wind blowing.

ED

Editor

Thought you guys might like to know that good ol' Fleagle won first place in CFB Winnipeg's Winter Carnival held during February 1977. Fleagle won first place in the intersection ice sculpture competition and was built by my guys at the Canadian Forces School of Aeromedical Training. The "Winged Wonder" is shown receiving his final paint job from Sgt Brian Ross.

Please pass along to Stan Hardison for a laugh, and mention that Fleagle is being "put on ice" until we need his services as an Air Superiority Weapon. Perhaps you could use this picture in an upcoming TAC ATTACK edition. Much thanks and keep up the excellent job!

Capt Brian Crowell
CO Canadian Forces School of Aeromedical Tng
CFB Winnipeg, Canada

Dear Capt Crowell

You gladdened old Fleag's gizzard with your fro photo. The "Ace of the Ice" looks in fine for. Thanks for the photo.

ED

TAC TALLY

	TAC			ANG			AFR		
	APR	thru APR		APR	thru APR		APR	thru APR	
		1977	1976		1977	1976		1977	1976
MAJOR ACFT. ACCIDENTS ►	2	9	11	3	4	4	0	1	1
AIRCREW FATALITIES ►	0	2	3	0	0	2	0	0	1
TOTAL EJECTIONS ►	1	8	7	2	3	1	0	1	1
SUCCESSFUL EJECTIONS ►	1	8	7	2	3	0	0	1	0

TAC'S TOP "5" thru APR

TAC FTR/RECCE	
ccident free months	
16	4 TFW
12	474 TFW
10	56 TFW
8	33 TFW
7	67 TRW

TAC GAINED FTR/RECCE		
accident free months		
61	127 TFW	ANG
27	156 TFG	ANG
22	122 TFW	ANG
22	117 TRW	ANG
16	434 TFW	AFRES

TAC/GAINED Other Units		
accident free months		
117	182 TASG	ANG
97	135 TASG	ANG
89	507 TAIRCW	TAC
85	193 TEWG	ANG
83	602 TAIRCW	TAC

MAJOR ACCIDENT COMPARISON RATE 76/77

(BASED ON ACCIDENTS PER 100,000 HOURS FLYING TIME)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAC	76	2.9	8.6	9.0	7.3	8.0	8.1	6.9	6.8	7.5	8.1	7.4	7.0
	77	0.0	5.3	5.8	5.3								
ANG	76	10.5	5.0	6.5	4.8	3.8	3.9	3.4	3.5	3.7	3.9	4.0	4.1
	77	0.0	3.1	1.9	5.7								
AFRES	76	0.0	0.0	11.3	8.1	6.1	5.0	4.2	7.2	6.4	5.7	5.3	7.3
	77	0.0	0.0	10.1	7.3								

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Idea: Courtesy of Capt Kenneth D. Pesola, Seymour Johnson AFB