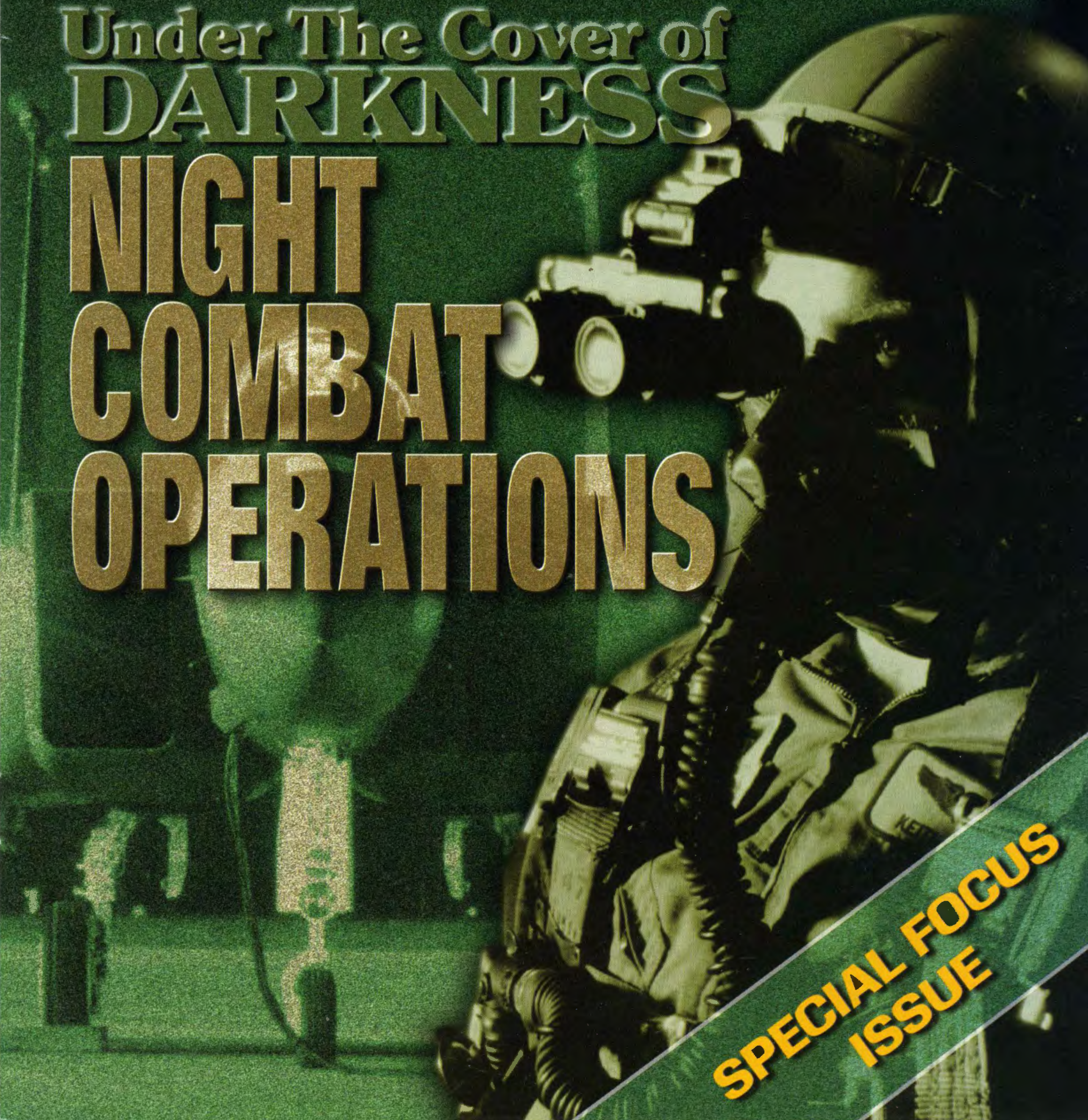
THE COMBAT EDGE

APRIL 1997

Under The Cover of DARKNESS

NIGHT COMBAT OPERATIONS



SPECIAL FOCUS ISSUE

The Combat Edge
AIR COMBAT COMMAND SAFETY MAGAZINE

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ACC SP 91-1 VOLUME 5 ISSUE 11

FEATURES

DEPARTMENTS

ACCent on Safety

Here at ACC Safety, we were planning our big annual April *Tax Time* issue and were all set to fill the pages with helpful tips. You know, like how to avoid eye strain from reading the fine print on those tax forms, the best treatment for paper cuts, keeping safe in that hectic traffic rush for the last minute postmark, and so on. But, our analysis section told us that there are a great many of you who are spending so much time in combat zones that the Combat Zone Tax Exclusion accounts for a greater part of your paycheck than your deductions for Social Security. Surprising as it may seem, we *headquarters types* do retain some ability to think logically; so we trashed the focus on taxes. We felt you might be a bit more interested in something having to do with combat capability.

Few would quarrel that the ability to continue air operations throughout the night gives us a tremendous advantage over an adversary who lacks that capability. Our quest to gain this ability has brought us improved radar, forward looking infrared, and advanced navigation systems just to name a few of our technical improvements. Along with these, the continuing development and incorporation of night vision devices has allowed us to expand our capabilities even more.

The benefits offered by increased night capabilities did not come without accompanying risks. The technological capability was still under development and the operational risks were numerous, but the potential combat advantages were obvious. Even before the concepts of Operational Risk Management had taken hold, the decision to train at night was both far-seeing and perhaps a prime example of benefit-versus-risk decision making.

In this month's issue, we focus our flight articles on night vision devices and try to pass on some thoughts dealing with maintaining situational awareness in that strange and alien green world. To those to whom *life on the goggles* has become commonplace, we apologize if some of our information seems too basic. Nevertheless, we think you'll find it a good reminder. For those who have yet to experience flying with Night Vision Goggles (NVGs), we think you'll find our offerings a useful primer.

Oh, and if you are having trouble with your tax forms, here's a hint. Don't wear NVGs; the red ink won't show up! *Ya'll take care and be safe!* ■

Colonel Turk Marshall
Chief of Safety

chemsticks, NVGs, & cockpits

Chuck AAntonio MD Hughes Training Inc Meso AZ Lee Task Ph.D. AL/CFHV

Chemsticks, NVGs, & Cockpits

Are They Compatible?

Chuck Antonio, M.D.
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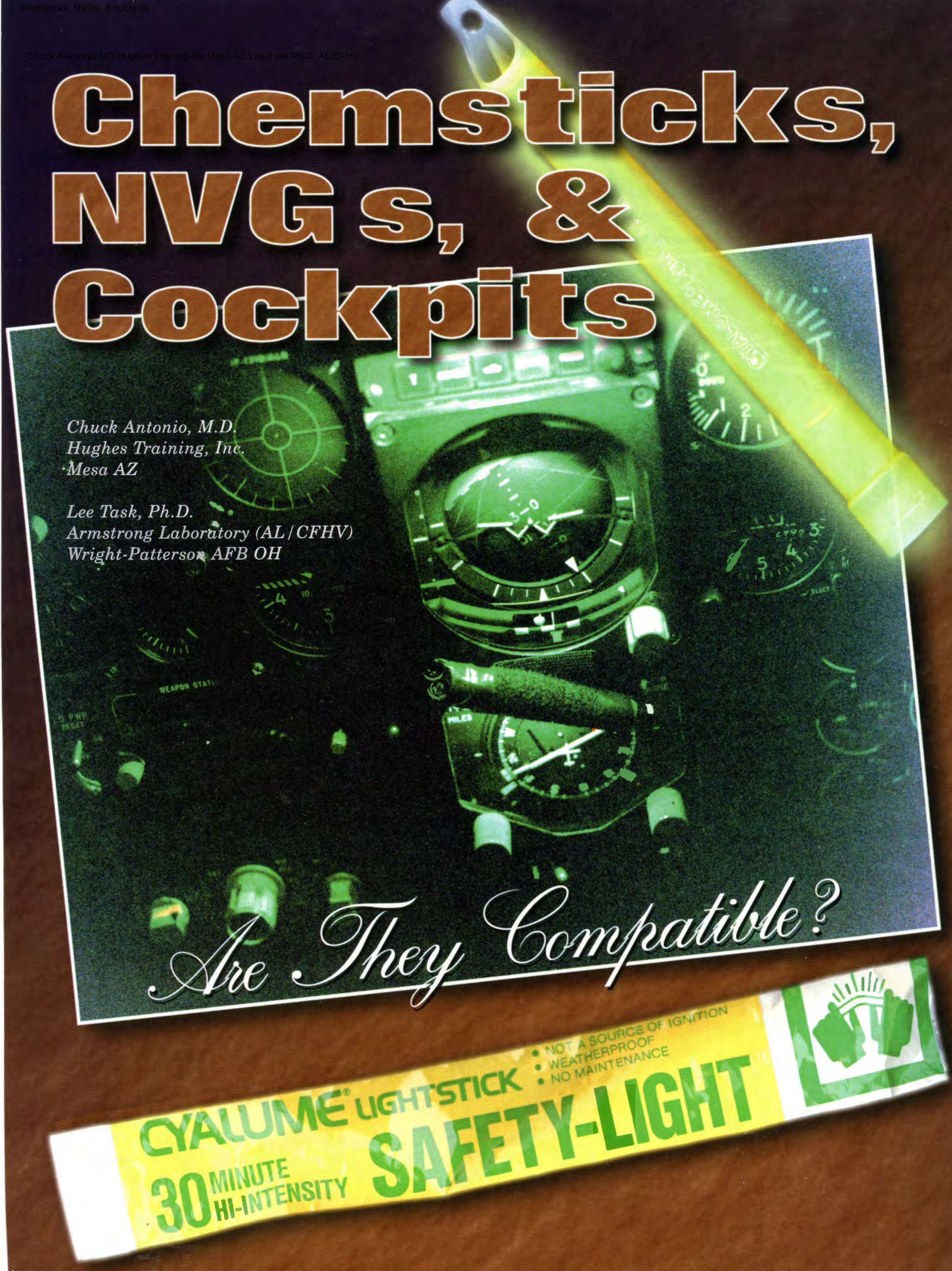


After a thorough night vision goggle (NVG) briefing and an extensive preflight during which the cockpits were configured with chemical lightsticks (chemsticks), two A-10 pilots departed base after sunset. Lead was accomplishing a goggle refresher flight while, at the same time, conducting a local area orientation for the visiting NVG instructor pilot (IP). Following this flight, both were scheduled for another NVG sortie during which lead would receive his final instructed flight, qualifying him for all A-10 NVG missions. The weather was good enough for NVG flight, but there was a low cloud deck gently sloping downward in the direction of flight. Once on the range, lead maintained an altitude of 2000 feet above ground level (AGL) while pointing out various targets and landmarks to the IP who was approximately 2 to 3 miles in trail. Noting that the cloud base ahead appeared too low, lead began an aggressive right hand turn and inadvertently entered the weather. Once in the clouds and unable to see terrain or a horizon with the goggles, he looked inside the cockpit (beneath the NVGs) to determine his orientation. Head up display (HUD) symbology indicated a descent and the main attitude indicator (ADI) was difficult to interpret with the ball appearing all black. Several attempts were made to determine orientation, but the HUD information was confusing and the primary flight instruments were not easily readable. Knowing he was at a low altitude and believing he was in a steep nose down attitude, the pilot initiated ejection -- a good decision since, as it turned out, the aircraft was only a few seconds from being out of the envelope for the ejection seat. Fortunately, the pilot walked away unhurt.

The purpose of this article is not to examine all the findings of this mishap. Rather, we will discuss the use of chemsticks for temporary NVG compatible lighting modifications, furnish information regarding limitations and provide recommendations for their use. Had chemsticks been properly placed in this cockpit, it is likely the mishap would have been prevented.

Chemsticks contain two chemicals, one of which is in a small glass ampule located within the second chemical. When the glass ampule is broken and the two chemicals mixed by shaking, the resulting chemical reaction causes the release of energy in the form of light. For many years, green chemsticks have been used successfully to provide temporary NVG compatible cockpit lighting in a number of different aircraft. Typically they are used as a method of illumination in order to allow the training of experienced initial cadre aircrew and/or to provide an interim capability until a permanent modification can be developed, tested and fielded.

Chemstick Characteristics

NVGs are sensitive mostly to the red and near-infrared wavelengths emitted by cockpit lighting, and a suitable cockpit lighting modification entails more than simply changing the white or red lights to green ones. If not properly modified, cockpit lighting will adversely affect NVG performance, thus reducing or even eliminating the pilot's ability to see outside the cockpit. Chemsticks are not perfectly compatible, and if not placed and shielded correctly, may also adversely affect the NVG image. Additionally, they have certain characteristics that are important to understand and plan for if they are to be used safely and effectively, especially during longer missions. The following briefly addresses the more important characteristics that should be considered:

1. Initial Brightness.

After activating a chemstick to begin the chemical reaction, there is an initial spike of fairly intense brightness. Within 20 to 30 minutes, the brightness will rapidly fall to a point where the decrease in brightness occurs more slowly. If the chemsticks are broken and placed in position just prior to takeoff or during the mission, there may be a tendency to reduce the size of a chemstick holder's opening in order to reduce the illumination level caused by this initial brightness. If this is done, it is important to remember that the brightness of the chemstick will decrease in a few minutes, thus requiring a readjustment of the opening. The important point is to ensure primary flight instruments are easily readable at all times.

2. Variation between Chemsticks.

The following describes the more important variations in characteristics among chemsticks of different sizes and between chemsticks of the same size:

a. The amount of illumination from chemsticks is dependent on their size. The bigger the chemstick, the greater the amount of illumination.

b. In general, after a 6-inch chemstick has been activated for 30 minutes (to allow for the initial bright spike to fade), it should provide adequate illumination (depending on placement) for approximately the next 1.5 hours. At this point, illumination from the chemstick should be approximately half of that measured at the beginning of the 1.5 hour mark, but still adequate to provide for acceptable instrument readability. The 4-inch chemstick will fade slightly sooner and the 1-inch chemstick even sooner. The more rapid illumination decay of the 1-inch chemsticks may be negated somewhat by placement close to the instrument face, but they are the most difficult to manage in the cockpit due to their size.

c. There appears to be reasonable consistency of both brightness level and length of life among chemsticks the same size. However, variation as much as 30-40% has been documented. Reasonable consistency also carries over between lots (i.e., there may be little variance between chemsticks of the same size that come from different lots). As with batteries, if a chemstick is bad, the entire lot may be bad.

3. Cold Soaking.

Although initial research indicates that cold soaking chemsticks in a refrigerator for several hours prior to use may be beneficial, further study needs to be accomplished to determine the reliability of the findings. It is probably worthwhile, however, to store chemsticks in a refrigerator if one is available. The following information concerns the effects on chemstick performance caused by cold soaking:

a. There is a decrease in the intensity of the initial brightness spike, thus possibly extending the life of the chemstick by reducing the intensity of the chemical reaction.

b. After reaching the initial brightness spike, the luminance level drops quickly, then increases slowly to a second but lower peak, and finally begins a slow decay.

c. There is a reduction in the rate of illumination loss, which could result in a more constant level of illumination during the expected useful life of the chemstick.

d. There should be no noticeable difference in luminance between 6-inch chemsticks cold soaked and those not cold soaked if both are replaced at the 1.5 hour mark.

Instrument Readability

In addition to the characteristics and limitations of chemsticks, it is vital for pilots to know how to properly place them in order for the devices to provide acceptable levels of instrument illumination. The following are recommendations to help ensure proper instrument readability over the length of the mission:

1. Cockpit Set-up Considerations.

Aircrews should use MAJCOM approved chemical light stick cockpit setups. These have been tested and approved to provide a standardized configuration to ensure the aircrew has a minimum amount of light available to accomplish the mission safely. Consider the following when determining how to place them:

a. Place chemsticks as close to the desired area as possible (e.g., close to the instrument face).

b. Ensure there are no shadows hiding critical information. If necessary, use more than one chemstick and place them at different locations to reduce shadowing.

c. Use the plastic holder made for the 6-inch chemsticks if available. If they are not available, use tape to direct the illumination away from the NVGs and toward the area of interest. The holder can be easily modified to hold the 4-inch chemstick.

d. If possible, use Velcro that has been permanently placed in position on the holder and on the aircraft. This will help avoid the problems noted with the use of tape in cold, hot or humid environments.

e. Blue chemsticks are available, but information illuminated by green light is more easily read because the eye is more sensitive to and focuses easier with green wavelengths. Therefore, green chemsticks should be used if at all possible.

2. Operational Considerations.

Take the following into consideration during NVG operations:

a. Activate the chemsticks 30 minutes prior to the time they will be required to provide instrument illumination.

b. If the mission includes more than one aircraft, everyone should activate their chemsticks at the same time.

c. Constantly check for instrument readability during the flight and adjust illumination levels as necessary by increasing the size of the holder's opening or replacing chemsticks.

d. If the flights are to be longer than 1.5 hours, pick a time convenient during the flight and change out all chemsticks even if some appear to be bright enough. Replacing chemsticks does not have to take place exactly at the 1.5 hour mark. For example, if the flight is going to go past 1.5 hours and an opportune time occurs for changing the chemsticks at the 1.0 hour mark, change them.

e. Keep track of all materials used in the cockpit to avoid foreign object damage (FOD) problems.

f. If spare chemsticks are carried, do not open the foil package containing the chemstick until ready for use. If the chemstick is removed from the package but not used, it may deteriorate prior to the next flight (especially if exposed to sunlight). This could result in instrument readability problems sooner than expected during a mission and the unnecessary waste of a potentially limited supply of chemsticks.

Properly understood and used, chemsticks can be safely and effectively used to provide a temporary means of illuminating the cockpit for NVG operations. However, the proper configuration must be determined based on operational requirements and the considerations previously discussed and should be thoroughly tested to ensure adequate instrument readability is provided and that NVG performance is not degraded.

Aviator's Night Vision Imaging System

It is imperative to remember that NVG flight is only a heartbeat away from instrument flight. Anything degrading the NVG image — such as turning into a low angle moon, the sudden illumination of a non-compatible instrument light or flying inadvertently into weather — will necessitate a transition to instrument flight. In that case, it does not matter whether the cockpit instruments are illuminated with chemsticks or with properly modified lighting. What does matter is that the illumination level is bright enough at all times for the instruments to be easily read and interpreted. ■

Performing Flight Line Maintenance at Night

SrA Curtis R. Chism
20 BS/MASA
Barksdale AFB LA

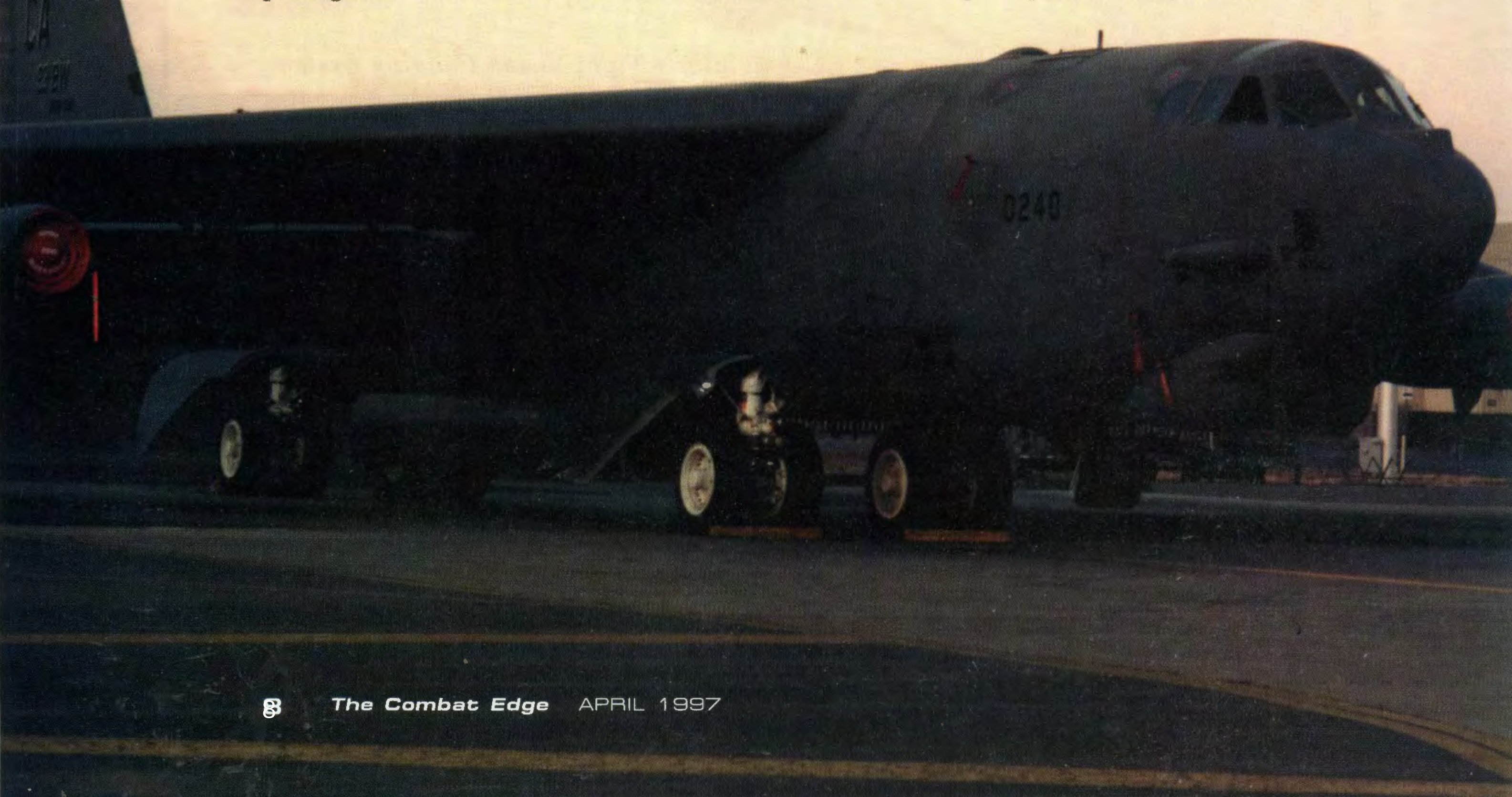
Attention!!!... To Detail

Attention to detail; it's so little to ask. When people are careless, mishaps can happen. In our case, it would have been an inflight fire on a B-52H bomber.

It was December 12th, about 5 hours prior to aircraft 60-057's sortie. In the dead of night, my midshift co-workers and I were about to discover the wrong fluid had been used to replenish our Electronic Countermeasure (ECM) servicing equipment. It was a routine night as far as ECM was concerned; we were tasked with performing our ECM preflight on the morning sorties. An ECM preflight doesn't consist of a whole lot in the way of maintenance...only a few operational and configuration checks. So, to the maintainer, it soon becomes second nature.

While preflighting aircraft 60-057, the heat exchanger for the ALQ-155 Receiver-Transmitter required servicing. Each aircraft contains 5 of these heat exchanger coolers, each servicing 2 RTs. A specific fluid level is required to maintain optimum performance. The heat exchanger in this particular instance was low.

After obtaining the servicing can from our sister squadron (they had borrowed it from us during the previous night shift in order to



perform preflights), we proceeded to fill (pump) the system with what we thought to be DC-200 coolant fluid. However, midway through the process, an ether smell was noticed. The DC-200 coolant fluid normally used is an odorless, clear, silicone based fluid. As a result, we became concerned about the cause of the smell. Then and there, we ceased operations and began to investigate the situation.

We questioned the squadron that had used the servicing can the previous evening. They couldn't come up with a satisfactory answer; so, we proceeded to their support section and asked to see their HAZMAT (Hazardous Materials) accountability log. It wasn't readily available, so there was no way to determine who, when or what type of fluid was signed out in order to replenish the servicing can.

We then went to our own support section, and our HAZMAT log showed no DC-200 coolant fluid had been signed out in over a week. We started reviewing the possibilities. We knew the DC-200 coolant fluid was kept in a one-gallon silver can in the flammables locker. After pondering the predicament, one of my co-workers then asked, "What is the possibility that another type of can resembling the DC-200 can could be sitting side by side in the same locker?" We later found out such a possibility was very real. A can of Desoto Solvent was located in the same flammables locker and brought out for inspection. Yep, you guessed it. There it was, the ether-based Desoto Solvent was in a can almost identical in size and shape to the DC-200 coolant fluid can. Then, at approximately the same time, our sister squadron contacted us by radio to say that they had possibly identified the substance in question; their assessment was Desoto Solvent. We had found it!

We quickly researched the MSDS (Material Safety Data Sheets) for the particulars. The Flash Point of the Desoto Solvent was listed at 115 degrees and a warning existed to KEEP AWAY FROM HEAT AND ELECTRICAL EQUIPMENT. The heat exchanger coupled with the Receiver-Transmitter can reach temperatures close to 275 degrees. Things were not looking good to say the least. With approximately 3 hours until crew-show, we reviewed our options. First, we could disable the system by pulling circuit-breakers thereby eliminating power to the system. However, this meant the Electronic Warfare Officer would be without 2 critical Receiver-Transmitters during flight. In addition, the aircraft would be operating in an unsafe condition. As a result, that idea was quickly done away with. Our second (and preferred) option, the safest thing to do, was to completely rid the aircraft of the potentially hazardous substance before flight.

We advised the flight line expeditor of the situation and made our recommendation. He agreed with our preferred option; SAFETY was the major concern here rather than FMC (Fully Mission Capable) statistics. We removed the contaminated heat exchanger, drained the solvent and began a purge of the system. We then re-serviced the equipment with the proper coolant fluid and performed an extended operational checkout in order to generate heat within the components. System operations checks were good and the aircraft was ready for its crew.

Where did the blame lie? At that particular point in time, we were less concerned with pointing fingers than getting some facts so we could keep this kind of thing from happening again. Was it the support troop who retrieved the wrong fluid from the shelf accidentally the night before? Shouldn't the night ECM maintenance technician have known what he was pouring into the servicing can and that something was clearly wrong? After all, there is an obvious difference in odors between the 2 chemicals. Was cumulative mental fatigue or exhaustion due to irregular sleep periods among the night shift crews a factor in our performance of flight line maintenance? Whatever the case, an emphasis on attention to detail was lacking; as a result, it created a situation in which 5 crewmember's lives could have been lost, a valuable national asset destroyed and our warfighting capability degraded. There may be a lot of uncertainty in the world we live in today, but life goes on...until a mistake like this occurs and goes undetected. Then, for some, time comes to a halt and ceases to exist...forever! So, please take the time to do your job right the first time and pay strict *ATTENTION TO DETAIL!* ■

Night Vision Goggles

A Green and Pleasant Land?

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Strike Safe Magazine
The Flight Safety Review of Strike Command, United Kingdom

"We have taken away the soldiers' friend -- the darkness." Night Vision Goggles (NVGs) may provide significant enhancement for flying operations conducted at night, but they do have limitations. An understanding of these limitations is necessary before it is safe to enter the "Green and Pleasant Land." The ability to see using NVGs is inversely proportional to height and airspeed. The lower and slower -- the better the visual acquisition. Generally, visual acuity starts to fall off above 300 feet. But the lower the aircraft is flying, the less reaction time to avoid obstacles.

Peripheral Vision

NVGs provide a much reduced field of vision. Only the area immediately being viewed is available. This reduced field of view can lead to a reduction in situational awareness. The only way to minimize the risk is to keep moving the head and scanning the whole area around the aircraft.

Depth Perception

Depth perception is also reduced with NVGs. Weather may appear further away than it is and closure with another aircraft or terrain may not be immediately detectable -- until too late.

Visual Acuity

The best visual acuity that can be hoped for while wearing NVGs is 6:9; this is considerably less than the average eagle-eyed pilot can manage in daylight. Corrective Flying Spectacles for NVG ops go some way to offsetting this deficiency; however, NVGs will still inhibit the ability to perceive objects and terrain features as rapidly as during the day. Unlit masts, power lines and ridges may not be seen until late -- or not at all.

Changing Illumination

Changing illumination over the landscape can be insidious. There may be some warning by scintillation (spangling) in the NVGs or increasing opacity in the halos around incompatible light sources. *The flight safety message is, "Be ready for a general degradation in the outside scene and have a backup plan."*

Scene Detail

Scene detail depends on the amount of contrast in the landscape. Low contrast (desert) will provide a poorer image than high contrast (farmland) simply because of the differences in the amount of light reflected to activate the goggles. Where possible, use Forward Looking Infrared (FLIR) to offset shortcomings in NVG performance.

Shadows

Shadows can be cast by terrain such as mountains, ridges and escarpments depending on the brightness and elevation of the moon. Obstacles or terrain may be masked by these shadows.

Spectrum of Colors

The spectrum of colors in the outside scene are not available unless looking under or around the goggles. The NVGs will deny the usual cues provided by aircraft navigation lights (or traffic lights for the intrepid aviator). Other color dependent cues will be similarly missing.

NVG Incompatible Lights

Incompatible lights, whether external or internal, seriously degrade the performance of NVGs. Avoid all non-NVG compatible lighting in the cockpit.

Cultural Lighting

Cultural lighting (from urban areas and road lighting) can improve or degrade the view, depending on the conditions. Thick cloud layers can reflect cultural lighting back to earth and improve general illumination for the goggles. However, it is also possible for incompatible light sources to create blooming and halos and so blanket the effect of the goggles -- this is more noticeable on dark nights. ■

To meet the challenge of safe and effective NVG Operations, always:

Cross-tell with other NVG users to gain from their experiences. We cannot afford to repeat mistakes.

Crawl before trying to walk. Never run with NVGs!

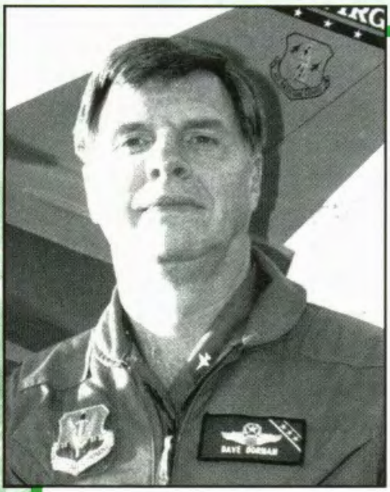
Maintain height awareness by using other inputs; for instance, Radar Altimeter (RAD ALT) alarms.

Beware of the risk of spatial disorientation caused by continous and exaggerated scanning.

Plan carefully and take into account potential dangers; for instance, avoid motorways (highways) where the vehicle lights may hide the presence of police helicopters.

Be cognizant of the airspace above; "green-out" may necessitate a low-level abort.

Monthly Awards



PILOT SAFETY AWARD OF DISTINCTION

Lt Col J. Dave Dornan
192 FW
Richmond IAP, Sandston VA

During a first run attack using a high 10 degree parameter for delivery of a simulated MK-84, Lt Col Dornan experienced an engine flameout as he reduced power during the pass in his F-16. Conditions at the time were approximately 10 degrees nose low, 3,000 feet and 500 knots. Due to speed and normal deceleration from the power reduction, the flameout was initially masked. Cockpit aural warnings first indicated a loss of electrical power. Further investigation revealed loss of the engine. Immediately, low altitude engine flameout procedures were initiated including jettisoning of the external tanks. Initial indications of a re-lite occurred as the jet descended through 2,000 AGL with 200 KIAS. Thrust was regained at 1,600 AGL and a climb was initiated with a snap divert to the nearest suitable field. That field was Elizabeth City CGS with a 7,000 foot runway, with no cables, located about 30 NM away. Further analysis of the problem revealed that with the engine running in SEC thrust could not be reduced below 95% RPM. Realizing a barrier may be needed on landing, the jet was climbed to ensure SFO altitude would permit a landing at some airport and island hopped over Elizabeth City, to Oceana and finally on to Langley AFB where an SFO over an unpopulated area (overwater approach) was possible. From this point, communication with the SOF at Richmond was established and a conference hotel was initiated. While established in the SFO pattern, and after consultation, a decision was made to return the engine control to PRI, the position from which the flameout initially occurred. Upon returning the engine control to PRI, normal engine response was regained and an SFO was flown to a safe landing at Langley. This incident was a model of quick analysis of the problem and immediate completion of emergency procedures. Superior in-flight coordination and support aided Col Dornan in avoiding an SFO into Elizabeth City, an airport not suitable for the emergency experienced.

AIRCREW SAFETY AWARD OF DISTINCTION

Capt Vance Drenkhahn, Capt Christian Watt
336 FS, 4 FW
Seymour Johnson AFB NC

Captains Drenkhahn and Watt were number two on an F-15E two-ship Low Altitude (LOWAT) intercept sortie out of Seymour Johnson AFB NC. On the first intercept, as lead maneuvered into the prebriefed position, Captain Drenkhahn maneuvered his aircraft to avoid overflight of a small town. While checking six, Captain Watt saw a few birds pass down the right side and warned lead to "Watch out for the birds!" A terminate was called just as three or four large turkey vultures passed down the right side of Captains Drenkhahn and Watt's aircraft. One of the vultures, with a wingspan of approximately 6 feet, went down the right intake causing a loud thump as it entered the compressor section. As the engine began to disintegrate, sending debris throughout the engine compartment, the MASTER CAUTION and FIRE warning lights illuminated. Instinctively, Captain Drenkhahn immediately began a climb out of the low altitude environment while Captain Watt informed lead that they had ingested a bird and had fire indications in the right engine. Captain Drenkhahn completed appropriate fire in-flight and engine shutdown procedures as they climbed to a safe altitude. The flight lead turned the flight toward the nearest divert base, performed a battle damage check and informed the crew that a small residual fire was still burning in the right tailpipe and some fuselage damage had occurred. Captain Drenkhahn was given lead of the flight as Captain Watt completed the checklists and set up for an emergency approach to Shaw AFB SC. Noticing unusual stick forces, the crew elected to dump fuel and perform a controllability check. After configuring for a single-engine straight-in, Captain Drenkhahn completed a perfect landing. With the on-board fire detection circuit rendered inoperative by the engine fire and visually unable to confirm the fire had been totally extinguished, the crew's situational awareness dictated that they shut down on the runway and emergency ground egress. The outstanding airmanship and exemplary crew coordination displayed by Captains Drenkhahn and Watt during a critical phase of flight was crucial in their safe recovery and the recovery of a $50 million Air Force asset.

CREW CHIEF EXCELLENCE AWARD

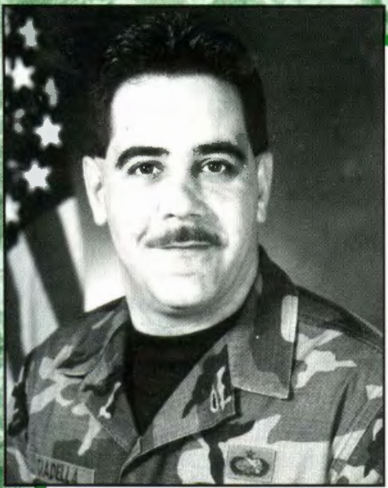
SrA Ronald W. Stull, Jr.
53 AS, 314 AW
Little Rock AFB AR

On the morning of 16 Dec 96, SrA Stull (C-130E Crew Chief for the 53d Airlift Squadron) prepared aircraft 72-1296 for a routine training mission. After servicing the utility hydraulic system in the aircraft's cargo compartment, Amn Stull noticed a peculiar odor that smelled like an electrical fire. He quickly traced the odor to the flight deck of the airplane and saw flames originating behind the center instrument panel at the base of the center windshield. Amn Stull immediately turned off power to the aircraft at the flight engineer's station, grabbed the flight deck fire extinguisher and extinguished the fire. Having accomplished all that he could on the aircraft, he flagged down the nearest maintenance vehicle and instructed them to call the fire department. Under the direction of the fire department, the ground emergency was terminated. Investigation of the mishap revealed a failure of a temperature-sensing device caused an electrical short which triggered a wire/insulation fire. Without intervention, the fire could have quickly spread to additional flight deck instrumentation and potentially engulfed the entire aircraft. Quick action limited damage to wire and windshield replacement at a cost of $2,500. **Bottom-line:** Amn Stull extinguished a potentially catastrophic fire saving a multi-million dollar aircraft.

FLIGHT LINE SAFETY AWARD OF DISTINCTION

SMSgt Willis Mucelroy, MSgt Eldon Rauch, TSgt Henry Romero, Jr.
144 FW
Fresno CA

On the morning of 10 Oct 96, at approximately 0720, an air carrier was taxiing for takeoff past the ramp of the 144 FW. At that time, TSgt Romero, who was working on an F-16, heard a loud explosion and noticed one of the dual main landing gear tires coming apart and a large piece of what looked like the rim, fall onto the taxiway. Sgt Romero thought that the pilots would have heard the explosion and stopped the aircraft, but to his surprise it kept taxiing toward the active runway for takeoff. He immediately started waving his arms and shouting trying to catch the attention of the expediter truck. At the same time SMSgt Mucelroy, in Maintenance Operations Control, heard the explosion and saw Sgt Romero urgently waving. Sgt Mucelroy used the flight line radio to direct the expediter towards Sgt Romero. When MSgt Rauch (the expediter) arrived, Sgt Romero told him what he had observed and to stop the aircraft. Sgt Rauch used his UHF radio to immediately contact the FAA tower and requested them to stop the airliner, which by now was turning onto the active runway. Then he and Sgt Romero took the expediter truck to the disabled aircraft to assure themselves that the tire had indeed blown and notified the tower of their findings. The flight was directed back to the terminal for repair. If the aircraft had not been stopped, it would have attempted to take off with major damage to its right landing gear. The quick reactions and coordination of these individuals averted a potential major accident and possibly saved the lives of more than 70 people.



WEAPONS SAFETY AWARD OF DISTINCTION

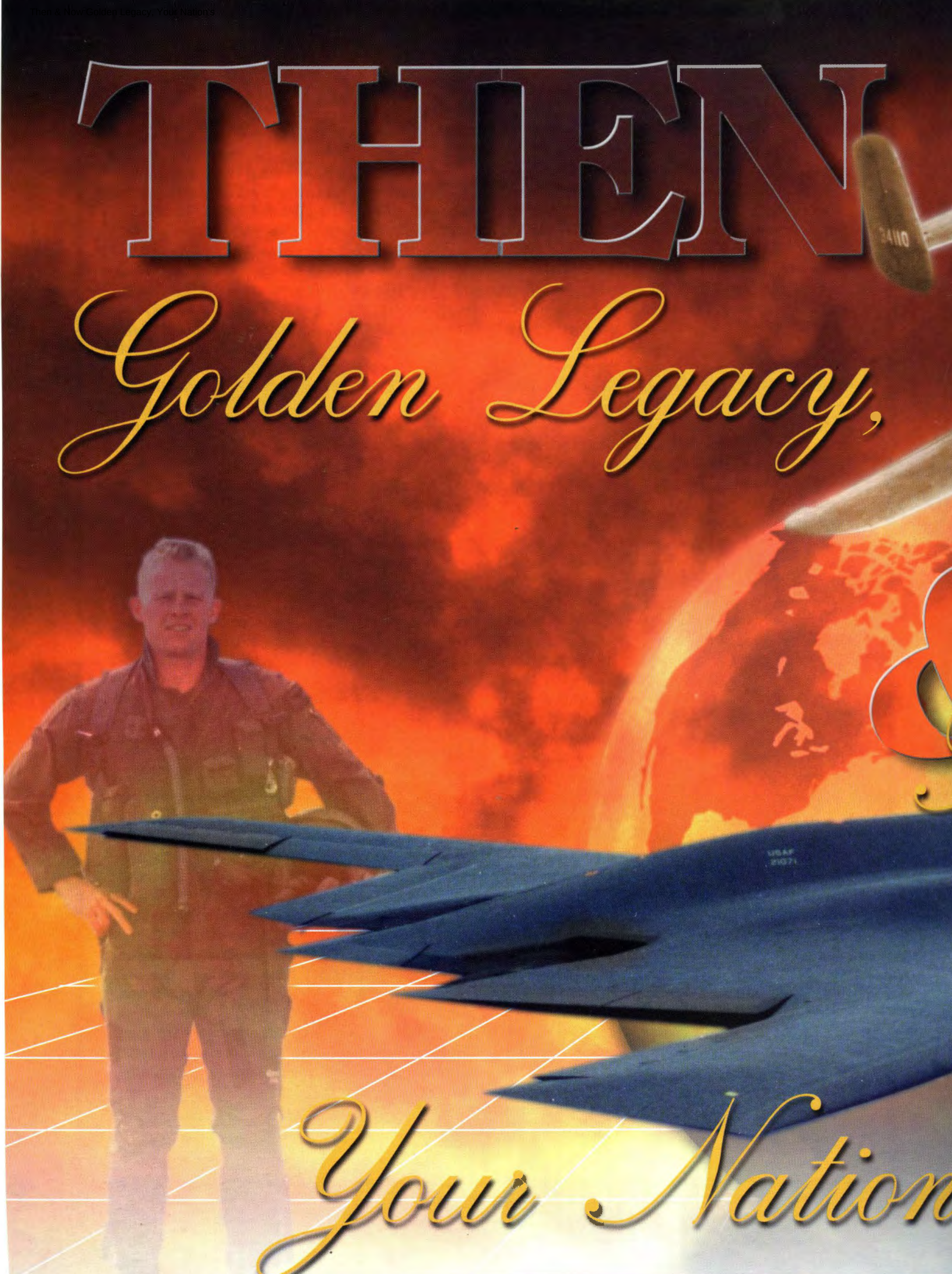
SSgt Joseph L. Ciadella, SSgt Harold C. Whisler
7 EMS, 7 WG
Dyess AFB TX

Staff Sergeants Ciadella and Whisler made significant contributions to the 7th Equipment Maintenance Squadron's impeccable weapons safety mishap prevention program. On 7 Oct 96, Sergeants Ciadella and Whisler observed smoke near the Weapons Storage Area perimeter fence, across from building 9120 and approximately 100 yards from the railhead where 19,890 pounds of net explosive weight MK-82 general purpose bombs were stored. Sergeant Ciadella immediately notified Munitions Control, while Sergeant Whisler began evacuating personnel. Sergeant Ciadella then proceeded to direct the fire department and ensure no one entered harm's way. Meanwhile, Sergeant Whisler accounted for all co-workers and safely evacuated them to the designated 4,000-foot clear zone. Expedient actions prevented a fire from spreading to the exposed munitions. Their alertness prevented a potential munitions catastrophe. These highly motivated individuals remain vigilantly attentive to the safety of others in the work area and are most deserving of this award.

UNIT SAFETY AWARD OF DISTINCTION

4th Operations Support Squadron
4th Fighter Wing
Seymour Johnson AFB NC

On 3 Dec 96, Airfield Operations Flight proved that teamwork and total unit cohesiveness can prevail under turbulent and sometimes life threatening circumstances. On this day, the Control Tower, RAPCON and Base Operations each played an integral role in the safe recovery of a badly damaged F-15E and its two aircrew members. As the single-ship F-15E began takeoff roll, flames and smoke spewed from the right engine; the words "afterburner burnthrough" reverberated throughout the Tower Cab. Canceling the aircraft's takeoff clearance at this point would have had disastrous results, due to its speed and distance along the runway. Almost instantaneously, emergency actions checklists were run and the Primary Crash Circuit activated. As the F-15E became airborne, small ground fires were ignited in the dry grass along both sides of the airstrip. Tower personnel directed the responding emergency crews to the individual fires and began coordinating with the RAPCON to resolve the emergency situation. The radar controllers explained the tower's observation to the aircrew, only to find they were unaware of the problem with the right engine. In fact, they had been preparing to continue with their mission. The RAPCON coordinated with adjacent air traffic control facilities for additional airspace to place base assigned F-15Es in holding until the runway reopened. Base Operations personnel responded immediately to the crash phone and embarked on an extensive search of the 12,000 foot runway. Their inspection found three large sections of the aircraft's afterburner canister. They quickly coordinated with wing Safety for the removal of the parts and initiated runway sweeping operations. The F-15E pilot was reluctant to return to base until he could be assured that structural damage was not too extensive to permit a safe landing. While it is customary for only a qualified F-15E pilot to visually check the condition of another F-15E, the only other military aircraft in the vicinity were two A-10s from Pope AFB. The RAPCON wasted no time in enlisting the help of the A-10s, providing vectors for the aircraft to join in formation. The RAPCON sterilized the airspace directly under the formation to facilitate possible fuel dumping by the emergency aircraft. The A-10 pilot informed the F-15E aircrew that the entire afterburner "tailfeather" section appeared to be missing and advised that they recover to land immediately. The imperiled aircrew of the F-15E requested permission to dump fuel, and the RAPCON's excellent precoordination allowed instant approval. As Base Operations completed the final stages of the runway sweep, the Tower coordinated with the RAPCON to bring the emergency aircraft home. All emergency personnel were ready in position as the emergency F-15E touched down and landed safely. The aircraft came to a complete stop on the runway; emergency response personnel assisted the aircrew as they performed an emergency egress. However, the work of Airfield Operations Flight was not complete because there were still eight F-15Es in holding awaiting landing clearance. To make matters worse, the fuel status of the remaining airborne aircraft would require them to divert to an alternate field if the runway was not reopened soon. Base Operations personnel again began a thorough sweep of the runway, to guarantee that no debris or additional aircraft parts would cause damage to the recovering F-15Es. When the emergency response crew began to tow the disabled aircraft clear of the runway, the Tower coordinated with the RAPCON to begin the recovery phase of the remaining F-15Es. As the first of the recovering aircraft were approaching the airfield, the crippled F-15E was towed off the runway. It was only when the last F-15E had returned safely and shut down its engines that the mission of the Control Tower, RAPCON and Base Operations was accomplished. The performance of Airfield Operations Flight showcases its professional expertise, but it was its total team effort that ensured the safe recovery of a $44 million F-15E, its aircrew and eight other aircraft. This day was a true testament to how thousands of hours of training can triumph over an extremely stressful situation and result in complete and undeniable success.


THEN
Golden Legacy,
&
Your Nation

Boundless Future...
NOW
's Air Force
David White

THEN & NOW

U.S. AIR FORCE 50 1947 - 1997

Lt Col Adrian Robbe
HQ ACC/SEP
Langley AFB VA

Night Combat Operations and Safety of Flight

Note: Selected World War II History Gallery excerpts prepared by the United States Air Force Museum at Wright-Patterson AFB in Dayton, Ohio, were the central source of information in preparing this article. Web site address: www.wpafb.af.mil/museum/

In carrying out the ACC mission of providing the world's best Combat Air Forces with rapid, decisive and sustainable airpower...anytime, anywhere...we must continue to do all we can to maintain and improve safety of flight operations - - including those combat missions that occur at night. The hazards associated with flying in night-fighter combat operations have never been (nor will it ever be) totally without danger. However, the Air Force has made great strides in lowering the level of risk associated with night combat. The following article demonstrates how identifying factors that add unnecessary risk to flight operations and taking action to eliminate those factors through advances in technology have been key in helping to improve safety in carrying out night-fighter combat missions.

- Ed.

As early as World War I, night bombing and interdiction have been countered by defending fighters and anti-aircraft guns. The fighters, in the earliest stages, depended on visual sightings assisted by searchlights and sound tracking; but they achieved only marginal success. By World War II, the defenders were assisted by ground radars which could guide (vector) them to the general area where the enemy might be found by visual means. But practical and effective night interception had to await the development of a radar compact enough to be carried aloft by the fighter. Such an airborne radar could aid in detecting, stalking and identifying the enemy and bringing the night-fighter into firing range.

World War II Night-Fighters

In 1941, a contract was awarded to the Northrop Corporation for the design and construction of the P-61 "Black

The heavily-armed Bl
be America's first ai
designed for fighting i

Widow," the first U.S. aircraft to be designed from the drawing board as a night-fighter. The heavily-armed Black Widow was to be America's first aircraft specifically designed for fighting in total darkness. It would carry an airborne radar in the nose of the aircraft which would enable its crew of two or three to locate enemy aircraft in the dark and fly into proper position to attack.

The P-61 flew its first operational intercept mission as a night-fighter in Europe on July 3, 1944, and later was also used as a night intruder over enemy territory. In the Pacific, a Black Widow claimed its first "kill" on the night of July 6, 1944. By the end of the war, the P-61 was the standard United States Army Air Force (USAAF) night-fighter and was in service with 15 of the 16 night-fighter squadrons operating in combat theaters.

While waiting for the scheduled late 1943 delivery of P-61 production aircraft, the USAAF acquired and operated the British Beaufighter (and later the British Mosquito) with good success in the European theater. The twin-engine Bristol Beaufighter was being used throughout the war to clear Britain's skies of enemy aircraft engaged in night-bombing raids.

The above transcript is a report on a combat mission flown by a Bristol Beaufighter of the 415th Night Fighter Squadron during which a German Heinkel

SECRET

1 October 1944.

HEADQUARTERS 64TH FIGHTER WING JG/rar
Office of the Senior Controller
APO 374

TO : CG, Hq 64th Fighter Wing
APO 374
U.S. Army

SUBJECT : Interception on HE 111, 30 Sept 1944.

1. At 0100 hrs, target "X-Ray 5", one aircraft at Angels 4 appeared about 4 miles South of Dole Airfield. The Night-Fighter "Dream 3", was patrolling several miles below this target at Angels 6 and traveling in an Easterly direction.

2. Lt Frahm, the Controller on duty at the GCI Station, Delaware, immediately vectored the Beaufighter into position to establish contact with the target. The Beaufighter was told 4 miles at 0108 and 2 miles at 0110. Contact was made at 0111 hrs and the bandit was shot down at 0121 hrs, just 1/2 mile North of Forward Ops "2".

3. Captain Augspurger, the pilot of the Beaufighter, called Major Goldstein immediately after landing and reported the enemy aircraft to be a HE 111, painted green with yellow stripes. He also reported that it took him quite sometime to identify the target and that he was on his tail for more than ten minutes before he positively identified the target as hostile. He then gave the bandit a burst of a few seconds, received in turn a spray of machine gun fire from the tail gunner followed by small pieces of debris, glycol, etc. His windshield was covered with glycol making it difficult to see. He landed safely at 0145 hrs.

4. Colonel Jackson and Major Goldstein visited the wreckage of the HE 111 the following morning. There was no apparent payload on the bomber; there was evidence that there were two (2) machine guns on the plane and there were 30 and 20 caliber and millimeter bullets respectively strewn all around the wreckage.

Julius Goldstein
JULIUS GOLDSTEIN
Major, Air Corps
Senior Controller

SECRET

Declassified in accordance with DOD Directive 5200.9

ck Widow was to
craft specifically
total darkness.

HE 111 was intercepted, identified and shot down. It illustrates the role of ground control personnel who, using ground radar equipment, guided the night-fighter into proper position for an interception. The subject transcript was donated by Dr. Harold F. Augspurger, Dayton, Ohio, the Beaufighter pilot on this mission.

Technological Advances in Night-Fighter Flying Safety

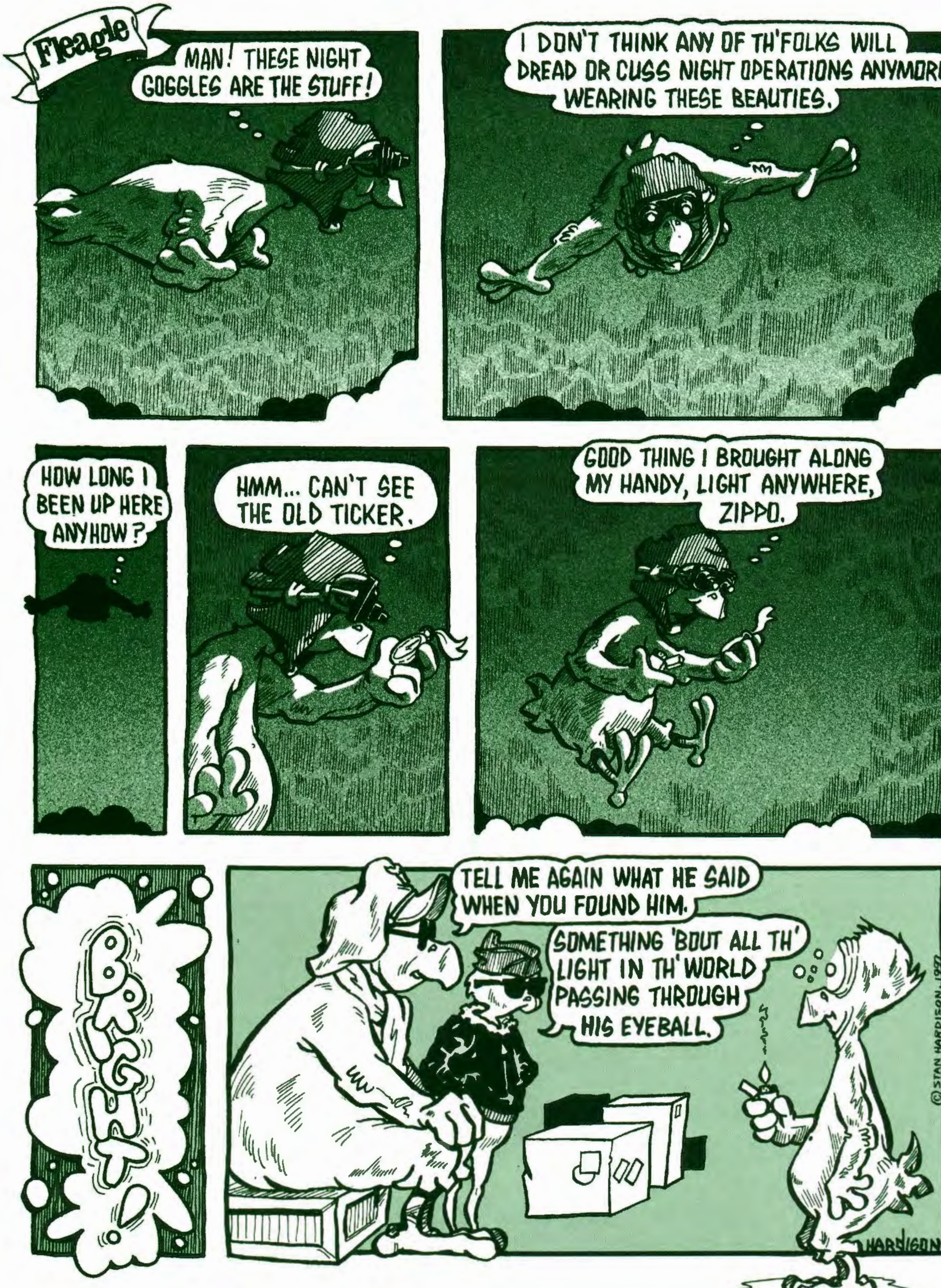
Technological advances and the conversion to a jet Air Force in the late 1940s saw further development of the night-fighter into the "all-weather" interceptor of the 1950s, '60s and '70s, such as the propeller driven F-82, and the jet F-86, F-89, F-94, F-101, F-102 and F-106 models. Beyond this, the advanced radar and electronics integrated in the current F-15 Eagle and F-16 Fighting Falcon give these even more advanced tactical fighters a true all-weather capability.

In contrast with the limited capabilities of World War I and II night-fighter aircraft, modern technological advances have significantly increased the combat performance and safety of flight for accomplishing night-fighter missions today.

For example, technology available for incorporation into today's tactical fighters includes Aviator's Night Vision Imaging Systems as well as electronic systems and weaponry to detect, acquire, track and attack enemy aircraft while operating in friendly or enemy-controlled airspace during adverse weather conditions. Weapons and flight-control systems of today are designed so one person can safely and effectively perform air-to-air combat under the cover of darkness. Avionics systems of today's fighter aircraft include head-up displays, advanced radars, inertial navigation systems, flight instruments, Ultra-High Frequency (UHF) communications, tactical navigation systems and instrument landing systems. Tactical electronic-warfare systems, "identification friend or foe" systems, electronic countermeasures sets and digital computers are also state-of-the-art technologies available today. In contrast with the limited capabilities of World War I and II night-fighter aircraft, modern technological advances have significantly increased the combat performance and safety of flight for accomplishing night-fighter missions today.

ACC Safety Goal

Air Combat Command's (ACC's) Safety Goal is to preserve combat capability through aggressive mishap prevention. The key to achieving this goal is in getting every member of the Air Force team (military, civil service, as well as defense contractors) involved in identifying and helping to eliminate the factors that add unnecessary risk to combat operations and taking action (whether it be modernization of equipment, improvement in flying tactics or initiatives in safety awareness and education) to correct those deficiencies. Air Force improvements over the past 50 years in flight safety provide a solid foundation for dedicated ACC professionals to continue to build upon in exploring new and innovative ways to accomplish aerial, night combat operations safely and effectively. As the theme of the 50th anniversary states, our nation's Air Force has a golden legacy with a boundless future. ■


Fleagle
MAN! THESE NIGHT GOGGLES ARE THE STUFF!
I DON'T THINK ANY OF TH'FOLKS WILL DREAD OR CUSS NIGHT OPERATIONS ANYMORE WEARING THESE BEAUTIES.
HOW LONG I BEEN UP HERE ANYHOW?
HMM... CAN'T SEE THE OLD TICKER.
GOOD THING I BROUGHT ALONG MY HANDY, LIGHT ANYWHERE, ZIPPO.
BRIGHT!
TELL ME AGAIN WHAT HE SAID WHEN YOU FOUND HIM.
SOMETHING 'BOUT ALL TH' LIGHT IN TH' WORLD PASSING THROUGH HIS EYEBALL.
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HARDISON

The DARK TRUTH About Nighttime Boating

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A year-long study of nighttime boating fatalities indicates that an alarming number of accidents occurring after 6:30 p.m. involve alcohol, and quite often the level of intoxication is way beyond the legal limit. The BOAT/U.S. Foundation for Boating Safety launched the study after numerous questions were raised following a nighttime collision in Florida that killed two Cleveland Indians pitchers. The highly-publicized tragedy involved the three most obvious factors for nighttime accidents — alcohol, speed and visibility.

The study's preliminary findings are disturbing and should serve as a wake-up call to boating safety advocates, law enforcement officers and, especially, boaters:

* 30 percent of all boating fatalities occur between 6:30 p.m. and 6:30 a.m., disproportionate to the amount of boating activity during these hours which is estimated to be only 5 percent, based on previous national boating studies.

* Alcohol was present in 62 percent of fatal nighttime accidents. The levels of blood alcohol content (BAC) were surprisingly high, in some cases over .30 and .40, three to four times the legal limit.

* Speed and visibility proved to be minor factors in causing nighttime accidents, contributing to about 15 percent of fatal nighttime accidents.

* Boaters are at a 370 percent greater risk of being involved in an accident at night and a shocking 725 percent greater risk of being killed in a boating accident at night.

* Nighttime fatal accidents increase sharply from 10:30 to 11:30 p.m. This may be related to alcohol use, which was indicated in more than 70 percent of the accidents during this hour, but more study is needed.

The Foundation focused its study on accidents that occurred over a 1-year period and compared those national statistics with the previous 2 years to make sure it was a typical year. It was. Original police reports from state and county officials along with follow-up investigation reports were collected and studied.

Only in reading through every detail of each accident report involving a fatality were Foundation researchers able to build a comprehensive database of 180 fatal nighttime accidents that resulted in 213 fatalities. The database also includes details on 1,204 nonfatal nighttime accidents taken from Coast Guard statistics. Where no police reports on fatal accidents were available because of state privacy laws, Foundation staff obtained newspaper clippings about the accidents.

Open motorboats were the most common type of vessel involved in nighttime accidents, followed by cabin motorboats, canoes and kayaks. Some of the findings mirror overall accident statistics with most accidents involving small boats and occurring on lakes, ponds and reservoirs.

A typical nighttime accident is much like this scenario that occurred on a popular New Jersey lake: three young men and one woman, who witnesses said were drinking heavily, left a lakefront tavern at 2 a.m. in a 16-foot outboard. At 2:10 the operator of the boat turned sharply to starboard and the female passenger sitting on the rear port side fell overboard and drowned. "All aboard were highly intoxicated," says the police report. In another fatal nighttime accident, a group of young people in Florida took a rowboat without permission at 4 a.m.; since there were no oars on board, they decided to paddle to the middle of the lake with their hands. It was discovered too late that the owner of the boat had also removed the plug and the boat sank; one man drowned 90 yards from shore. The victim's blood alcohol was .14 and all three had been drinking and using illegal drugs.

Another example of alcohol involvement was an accident on the Susquehanna River in Pennsylvania where two men, one a very experienced boater, were drinking at a party and at a tavern. They then took a 15-foot open motorboat out on the river at about 8:30 p.m. and decided to shoot the lowhead dam. They had life jackets but were not wearing them, and the last words witnesses heard were, "Go faster." Their bodies were recovered 9 days later so a BAC was not determined.

The victim in another nighttime accident in New Hampshire had an astonishing blood alcohol level of .30, a level at which most people would be unconscious. He started the motor in gear on his jon boat and it pitched him overboard. He was a non-swimmer and was not wearing a life jacket.

30 percent of all boating fatalities occur between 6:30 p.m. and 6:30 a.m., disproportionate to the amount of boating activity during these hours which is estimated to be only 5 percent...

One possible reason why nighttime boating has a higher risk is because so many of the accidents involve small boats that are less stable and more vulnerable to the shifting weight of the occupants. Alcohol use compounds the balance problem. In addition, many smaller boats are not well equipped with safety equipment, particularly if something goes wrong.

Also difficult for law enforcement and regulators to address is the fact that in an alarming number of these accidents, the boat is taken out at night without permission of the owner. So all regulations regarding proper equipment, proper operation and even education directed to the owner of a boat may be irrelevant in these cases.

Another factor that may relate to nighttime boating fatalities is that on many bodies of water all enforcement ends in the early evening. More drinking may occur because there is no fear of being caught by marine police. ■

FATIGUE AFFECTS EVERYONE...

Even Desk Riders

Captain Neal Murphy
366 WG/CPO
Mountain Home AFB ID

The following article demonstrates several human factor risks associated with high intensity periods in Command Post operations. In addition to the elements of physical fatigue and mental exhaustion that cause degradation of crewmember performance, the author provides keen insights through firsthand-lessons-learned experience as to why Air Force personnel need to maintain proper crew coordination, task proficiency and total situational awareness in carrying out their assigned mission. The danger of channelized attention (fixation) as well as the importance of a proper balance between prioritization of tasks and external communication is also demonstrated. After reading this article, I believe you will have an improved understanding of the benefits of making smart risk management decisions in high tempo military operations.

- Ed.

"Moments of sheer terror mixed in with hours of total boredom" is how one colonel described Command Post work, and this shift was no exception. Our Command Post has the unique task of controlling a live bombing range with no visual contact when the Range Control Officer (RCO) is not actively controlling the range or is out performing maintenance on it.

Being the eleventh hour of our shift, our focus was beginning to turn toward shift changeover and passing the day's information on to the next pair of controllers. Three hours earlier, the RCO had turned the range over to us. He confirmed with the next squadron scheduled to use the range that they had no "droppers" until after 1930, so he gave us control of the range in order to perform maintenance on one of the range targets. The stage was set for a quiet shift changeover. At 1800L, the UHF frequency for the range blasted out:

"Raymond, this is Hitman 01."

The flight lead of an unscheduled four ship of F-15Es was requesting clearance on the range. Before we had a chance to answer Hitman's call, the secondary crash phone rings:

"Standby for inflight emergency."

"F-15E Moby 01 has smoke in cockpit, two souls on board, unknown fuel, unknown ordnance, wind 230 at 9, any questions?"

The quick reaction checklist (QRC) was opened, notifications were started, radio calls were made and received and the Wing CC was requesting information ASAP. The radio blasted again:

"Raymond, this is Hitman 01 requesting clearance on range."

With 11 hours behind us, Hitman seemed just to be a minor distraction.

"Hitman, you are cleared on range, squawk 4000, and altimeter setting is 30.08; confirm you are not dropping."

The phones were ringing and fire radios were cackling from numerous response teams among a multitude of personal distractions.

"Negative, Raymond; we are coming in hot."

After handling the Logistics Commander's questions regarding the inflight emergency, we cleared Hitman onto the range.

"Make a dry clearing pass, specify your target and give a 60-second call from target."

"Hitman copies."

It was 1807L, the IFE was terminated and the QRC was closed; then it hit us...the Range Control Officer who gave us the range 3 hours ago was going to work on it until he resumed his shift at 1930! Was he still on the range? We need to stop Hitman! Time is critical, we've got to move...now!

"Hitman, this is Raymond. Knock it off. You are not cleared on range; personnel are on range."

Was this an accident waiting to happen? Fortunately, we diverted Hitman and potential disaster was avoided.

Several factors surface as we look at this situation closer. Better command and control, crew coordination, an improved understanding of the situation by the RCO, Command Post and Maintenance Operations Center as well as staying attentive during long drawn out shifts are all key elements for safe operations. Communication is the key; keep talking it up and ensure everyone in the loop is informed. Next, when the symptoms of fatigue are apparent, take a break. If necessary, request another person to cover for you for a few minutes while you clear your head. In addition, always remember to keep a balanced distribution of workload on your team and keep a proper prioritization of tasks. Lastly, think safety, stay alert and stay alive. ■

Editorial Comment:

The proper Mountain Home AFB range procedure is that "when Class B range operations are in effect (i.e., when no Range Control Officer is present in the range tower), range maintenance is conducted only if the impact area is closed." Therefore, this local base procedure does not allow overflight of the impact area below 18,000 feet MSL or the release of any weapons unless the request has been previously coordinated and approved through the wing scheduling office, command post or the RCO himself.

- Ed.

All in a Night's Work

Mr. Bo Joyner
HQ AFRES/PAP
Robins AFB GA

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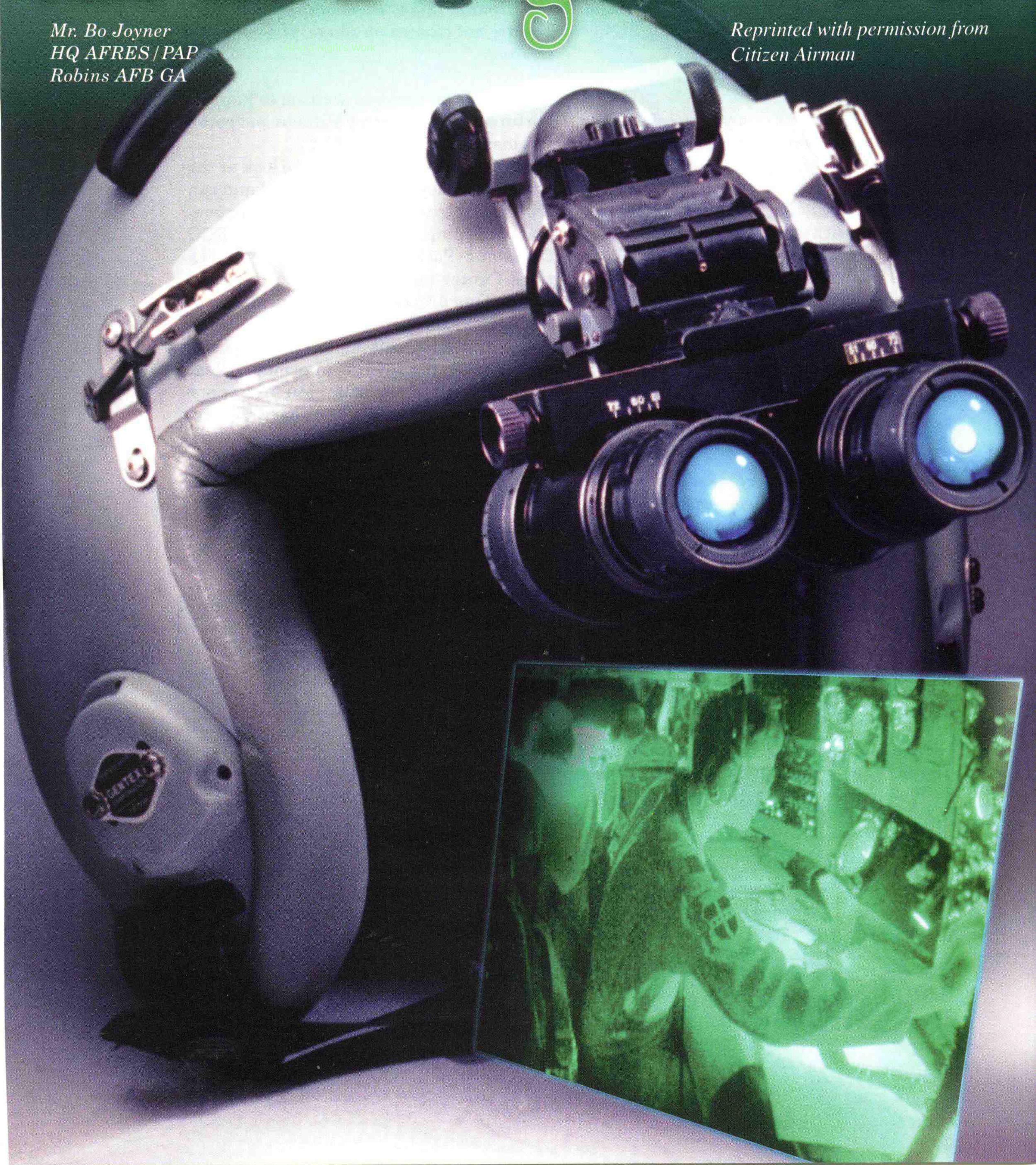
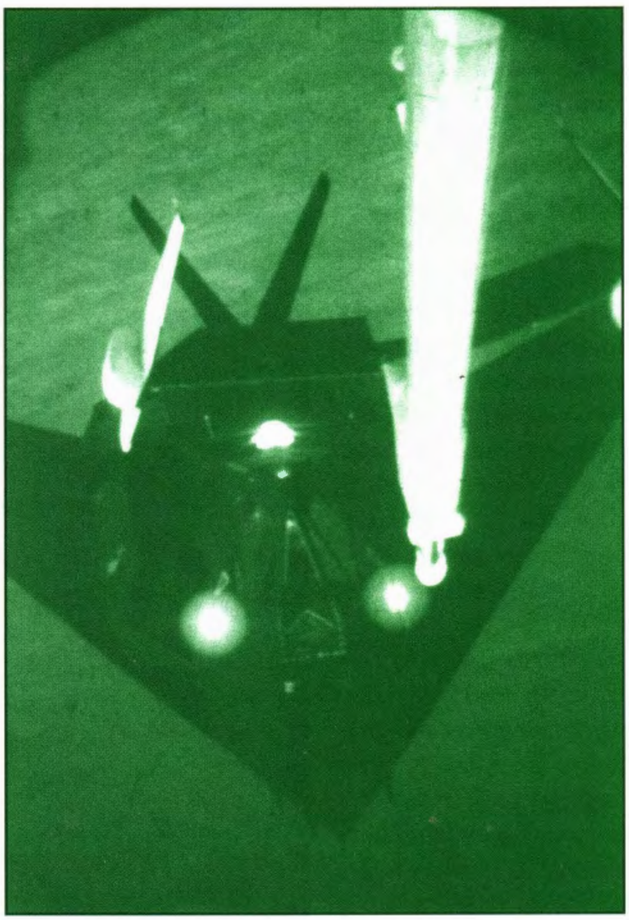


It's 10 p.m. on a cool autumn evening. Things are quiet at Whiteman Air Force Base MO, most members of the 442d Fighter Wing having left for home hours earlier. But for Major John Notestein, a pilot with the 303d Fighter Squadron, the work-day is just beginning. A few miles from the base, he's racing toward the ground at 400 miles per hour in a 45-degree dive, piloting his A-10 Warthog on a night-range sortie in virtual pitch-black conditions. His state-of-the-art night-vision goggles (NVGs) amplify the faint moonlight, starlight and light from a couple of flares about 4 miles from his target, allowing him to see through the near-total darkness. The landscape, as seen through the goggles, is an eerie green but remarkably clear; so clear the pilot has no problem identifying his target and completing the mission. Flying at night certainly is nothing new for the Air Force Reserve. But as Notestein and other pilots throughout the command can attest, it's becoming more and more commonplace. "Flying operations throughout the Air Force Reserve are in the middle of a radical change. AFRES is committed to improving its night-flying combat capability," said Lieutenant Colonel Bob Hovden, project officer for the Air Force Reserve Night Capability Program. "The Reserve has invested a tremendous amount of time and money in improving the way it flies and fights at night. We're starting to see some dividends from this investment."

Reserve rescue and special operations squadrons have been operating at night for years, using night-vision goggles and a host of other tools, like forward-looking infrared sensors, to carry out their unique missions. But it's only been over the past few years that the Reserve has started expanding its capabilities to improve the way fighter and tactical airlift aircraft operate at night.



F-117 aerial refueling in support of Desert Storm as seen through Night Vision Goggles.

In the past, an A-10 night flight consisted of shooting instrument approaches, maybe doing a night air refueling and then landing. Now, A-10 pilots, as well as F-16 and C-130 crews, are starting to train to do at night just about everything they do during the day. The reason is simple. "The night arena presents an opportunity that can widen the differential between our warfighting effectiveness and that of any future adversary," Hovden said. "It doubles our combat capability," said Colonel Joe Barnes, an Air Force reservist who serves as Director of Night Special Projects for the Air National Guard/Air Force Reserve Test Center in Tucson AZ. "We're learning to do things in the night that we couldn't do before. The other reason is the Army owns the night. If we can't go out and fight and see the same things the Army sees, we're not doing our job."

"Almost gone are the days when the Army would begin a major offensive assault as the first light of dawn creeps over the eastern horizon," Notestein said. "Instead, using darkness as a cloak, they prefer to hammer away at the bad guys with tools unseen by the naked eye and exploiting weaknesses made visible with our new technology. Following the close air support rule of thumb, we fight when the Army fights."

What's making it possible for the Reserve to improve its night-flying capabilities are improvements in night-vision equipment and a commitment from senior leadership to improve the way the command flies and fights in the dark. "The Reserve leadership started a Process Action Team in December 1992 to try to get a handle on where our night program should be," Hovden said. "What was decided was that our desired goal is a complete night capability, not just night vision. Fielding night-vision goggles is just one piece of the larger night-capabilities puzzle.

"The concept of complementary, overlapping sensors must be understood as the key to developing a night capability and addressed concurrently and in conjunction with NVGs." These overlapping sensors include NVGs, digital terrain systems, moving map displays, global positioning systems, radar altimeters and forward-looking infrared systems, just to name a few. "Tying all of these systems together is the key to establishing a true night capability," Hovden said.

As a first logical step toward achieving this goal, the Reserve is pursuing a night-vision capability for its pilots by buying state-of-the-art night-vision goggles and modifying existing aircraft lighting to be compatible with NVGs. As goggles become more and more advanced, it's becoming easier for pilots to see through the cloak of darkness. "In the early days of goggles, you had to have one person inside the cockpit without goggles just to make sure the person with goggles on didn't lose situational awareness," said Major Gordie Elwell, a pilot with the 914th Airlift Wing, Niagara Falls International Airport Air Reserve Station NY, the Reserve's lead C-130 night-vision unit. "You had to wear a complete face shield, so you had no peripheral instrumentation vision whatsoever. They were really dangerous."

Coming from a rescue mission background, Elwell has seen firsthand how much goggle technology has improved since the mid-

What Lies ahead in Night Vision technology?

The way military aviators operate at night has improved by leaps and bounds over the past 30 years. Take the field of rescue operations, for example. On Christmas Eve 1968, an F-105 went down in Laos. The pilot's wingman made radio contact with the downed pilot and told him to take cover for the night and help would arrive at first light.

When the HH-53's parajumper reached the ground at dawn on Christmas, he found the pilot had been killed. The parajumper strapped the corpse to the jungle penetrator and began to ascend through the trees. Enemy troops, hiding in wait, opened fire, knocking the parajumper off the penetrator. Then, they took aim at the helicopter. Dying, the parajumper radioed the pilot to clear the area because the enemy troops were nearly on top of him, and his situation was hopeless. If the rescue could have been made the night before, it's likely that the pilot and the parajumper would have survived.

Just a few months after this incident, in November 1969, a low-level light television system was installed on an HH-53B based at Udorn Air Base, Thailand, beginning the progression of night-vision technology that would be used in rescue aircraft. Today, Air Force Reserve rescue squadrons, like the 305th Rescue Squadron, Davis-Monthan AFB AZ, use a number of systems to help them accomplish their mission 24 hours a day.

"It's more than just night-vision goggles," said Captain John Grigsby, the 305th's Chief of Weapons and Tactics. "With Night Vision Goggles (NVGs), our forward-looking infrared sensor and our navigation system, we're able to find the people on the ground who need our help, particularly for a combat pickup." In peacetime, the 305th can put all of its night-vision capabilities to work to find hikers and rock climbers who have fallen in an inaccessible location.

What improvements can aviators expect in the years to come in the world of night flying? Colonel William Berkley, Director of the Night Vision Program in the Aircrew Training Research Division at Armstrong Laboratory in Phoenix, foresees a number of new enhancements that someday might make flying and fighting at night even easier and safer.

Ahead in Technology?

"Future modernization efforts will focus on a number of different sensor technologies in addition to image intensification, which is the basic technology behind night-vision goggles," he said. "In the long term, we'll see multiple sensors with fused imagery — that is, image processing will take the best characteristics from each sensor and combine them into a fused image that basically will take advantage of the best properties from each sensor. The technology to do that exists right now, but the money to develop the systems and field them does not. "For the short term, the next 10 years or so, we will continue to see a predominance of night-vision goggles and conventional forward-looking infrared as our primary sensors, along with basic radar. That's dollar-driven, pure and simple. There's already been a great deal of research and development in sensor fusion and other sensor technology; however, fielding those systems is far term."

Will there ever be a time when technology will allow pilots to fly at night with the same comfort level they have during the day? "The theoretical answer is yes," Berkley said. "But there are some significant problems that would have to be overcome to make that happen. The prospects for that are going to be dependent on the resources available." Berkley does see continued advancements in the night-vision goggles that play such a pivotal role in operating at night. "The current goggles have a 40-degree field of view, but the Air Force is working on an ejection-compatible goggle that has a 45-degree field of view," he said. "They should be ready for production in Fiscal Year 98. "In addition, there is a prototype goggle that has a 40-by-100-degree field of view that's receiving a lot of attention. And the Army is about to mature a program to develop a goggle with a 60-degree field of view."

Regardless of what happens in the future, Berkley believes the Reserve will continue to play a leading role in the field of night operations. "The Air Force Reserve continues to be a leader in terms of acquisition of state-of-the-art goggles and in the areas of modifying cockpits and aircrew training," he said. "Collectively, the Reserve has taken a strong, proactive approach to night operations." ■

Reprinted with permission from Citizen Airman

1980s. "I have to take my hat off to the aviators who flew with second-generation goggles with the full face plate," said Colonel William Berkley, an Air Force reservist on extended active duty who serves as Director of the Night Vision Program for Armstrong Laboratory's Aircrew Training Research Division in Phoenix. "That was an amazing feat as far as I'm concerned."

Today, the goggle of choice among military aviators is ITT's third-generation AN/AVS-9, formerly known as the F4949 Aviator's Night Vision Imaging System. The days of the full face plate long gone, the AN/AVS-9 resembles a small pair of binoculars, attaches to an aviator's helmet and can be placed in viewing position with a flick of the wrist. The Reserve is buying AN/AVS-9s for its A-10, F-16 and C-130 units. AFRES has on contract the purchase of 100 pairs of AN/AVS-9s for its C-130 units alone. Twenty pairs were recently delivered to Niagara.

"These new goggles are so much better than the first models I flew with, it's unbelievable," Elwell said. "The technology is getting better and better all the time." With the AN/AVS-9, a pilot can see lighted objects more than 10 miles away and something as small as a lit cigarette more than 2 miles away. Simply put, the AN/AVS-9's two image-intensifier tubes intensify the small amount of light available at night. They convert electromagnetic wavelengths beyond the range of the human eye and barely perceptible light within the eye's range into visible light. Original light images are amplified several thousand times. As good as the AN/AVS-9s are, they still have their limitations.

"The advantages of goggles are obvious; the limitations are not," Berkley said. "That's what aviators have to learn and constantly keep in their minds when they're flying with goggles." "One of the big disadvantages is the restricted field of view," Elwell said. "Normally, a person's field of view is almost 180 degrees. With goggles, it's about 40 degrees. It's like taking two toilet paper tubes and looking through them. Constant scanning is a must." "You don't have the depth perception you're used to," said Captain John Grigsby, Chief of Weapons and Tactics for the

305th Rescue Squadron, Davis-Monthan AFB AZ. "Add that to the limited field of view, the fatigue factor that comes with the added weight of the goggles and the fact that lighting isn't always a good thing, depending on where it's coming from and its intensity, and you can see that flying with goggles is something that has to be practiced over and over again before you become really comfortable with it."

"If we're going to fight at night, then we have to train our people to do that. Flying an airplane with night-vision goggles is something you must train people to do. It's not just a totally intuitive act," Berkley said. To handle the training requirements involved with night flying, the Reserve is taking the cadre approach. Instructor pilots from each unit receive night training at Armstrong Lab, the Air National Guard/ Air Force Reserve Test Center and other sources. They fly as many as 18 sorties with NVGs before they're able to take what they've learned back to their unit to train others.

The 303d Fighter Squadron has nine certified NVG instructor pilots who are able to check out the rest of the squadron on goggles. Across the AFRES command, a cadre of about 12 pilots per A-10 unit are flying with NVGs. It's estimated that within a year, all of the command's A-10s will be modified with lighting compatible with NVG flying. For F-16s, the command's aircraft are currently awaiting lighting modifications. Goggles are also being delivered and initial F-16 instructor pilots are being checked out and gaining NVG experience. Training will soon begin cascading from these instructor pilots to unit NVG cadre flyers. For C-130 units, "we have two levels of qualification," Elwell said. "At level one, you know how to use the goggles, but you're not physically handling the airplane. Level two means you're mission qualified. We have pilots at both levels here within the unit."

For "part-time" aviators, like Air Force reservists, finding the time to train is one of the biggest challenges for the entire night-capability program. "In the northern latitudes during the summer, the sun doesn't set until 9 p.m., so you can't even start the NVG portion of a mission until 9:30 or 9:45 at night," Elwell said. "That's normally when we're landing, when we're finishing our day. It's impossible for the reservist who goes to work at his civilian job at 7:30 in the morning, works until 4:00 in the afternoon, drives out here, changes into his flight suit, goes through mission planning, briefs, checks out his goggles and then has to fly. The crew rest and duty day issues are a big problem. "During the winter, it's not as much of a problem because it gets dark at 5:30. But winter is when you start running into a lot of weather problems."

"As it currently stands, we have 18 weeks per year scheduled for night flying. That's 36 percent of the year, meaning a major lifestyle change," Notestein said. "While the rest of the wing is leaving for home in the afternoon, many involved in night flying are just showing up. It's harder to schedule meetings, get paperwork done and coordinate day-to-day business with the rest of the world." "When you have part-time aviators, extending the operational envelope into the night is a real problem," Berkley said. "It's not a simple thing to conduct night operations in any organization that also has to function in the daytime." Finding the time to train is a big problem, but the payoff during a conflict is worth it.

"We have to have the operational capability at night," Berkley said. "It's a basic requirement for war as it has evolved in the late 20th century. OPERATION DESERT STORM is a classic example of the advantage of being able to conduct a war 24 hours a day. It simply allows you to be much more effective than you can during the day. And it has a tremendous effect on casualty generation. The very, very low number of casualties we had during the war was largely a result of the fact that we were able to operate at night and they were not. Increasing the gap between our ability to fight at night and our enemies' ability to fight at night is going to be a key to winning wars for a long time to come." ■

ACColades

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	TOTAL			ACC			CANG			CAFR		
	FEB	THRU FEB		FEB	THRU FEB		FEB	THRU FEB		FEB	THRU FEB	
		FY97	FY96		FY97	FY96		FY97	FY96		FY97	FY96
CLASS A MISHAPS	2	7	4	1	2	2	0	3	2	1	2	0
AIRCREW FATALITIES	0	11	0	0	0	0	0	1	0	0	10	0
* IN THE ENVELOPE EJECTIONS	2	5/0	2/0	0	0	1/0	0	3/0	1/0	2	2/0	0
* OUT OF ENVELOPE EJECTIONS	0	0	1/0	0	0	0	0	0	1/0	0	0	0

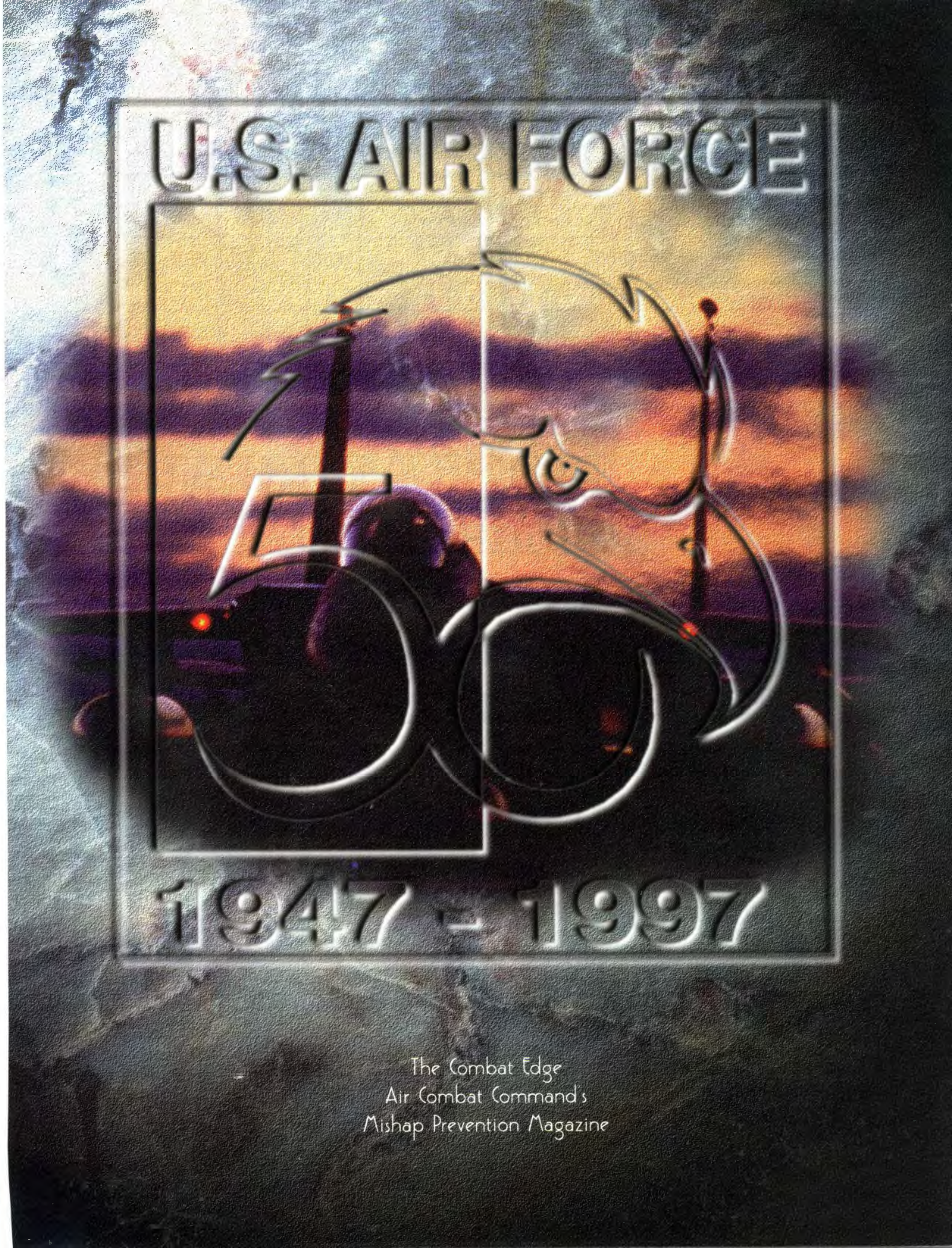
* (SUCCESSFUL/UNSUCCESSFUL)

CLASS A MISHAP COMPARISON RATE

(CUMULATIVE RATE BASED ON ACCIDENTS PER 100,000 FLYING HOURS)

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
ACC	FY 96	0	1.1	0.8	0.6	0.9	1.2	1.0	0.9	1.0	1.4	2.1	2.0
	FY 97	0	0	0	0.6	1.0							
8 AF	FY 96	0	0	0	0	0	0	0	0	1.2	1.0	1.7	1.5
	FY 97	0	0	0	0	0							
9 AF	FY 96	0	0	0	0	0	1.1	1.0	0.8	0.8	2.1	1.9	1.8
	FY 97	0	0	0	1.7	1.4							
12 AF	FY 96	0	3.4	2.4	1.8	2.9	2.3	2.0	1.7	1.5	1.4	3.1	2.9
	FY 97	0	0	0	0	0							
DRU	FY 96	0	0	0	0	0	0	0	0	0	0	0	0
	FY 97	0	0	0	0	5.7							
CANG	FY 96	0	1.9	1.3	2.2	1.8	2.2	1.9	1.7	2.0	1.8	2.0	1.9
	FY 97	0	3.8	2.6	3.3	2.7							
CAFR	FY 96	0	0	0	0	0	0	0	0	0	0	0	0
	FY 97	0	6.3	4.2	3.1	5.2							
TOTAL	FY 96	0	1.3	0.9	1.0	1.1	1.4	1.2	1.0	1.2	1.1	1.9	1.8
	FY 97	0	1.9	1.3	1.7	1.9							
MONTH		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP

(BASED ON HOURS FLOWN)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