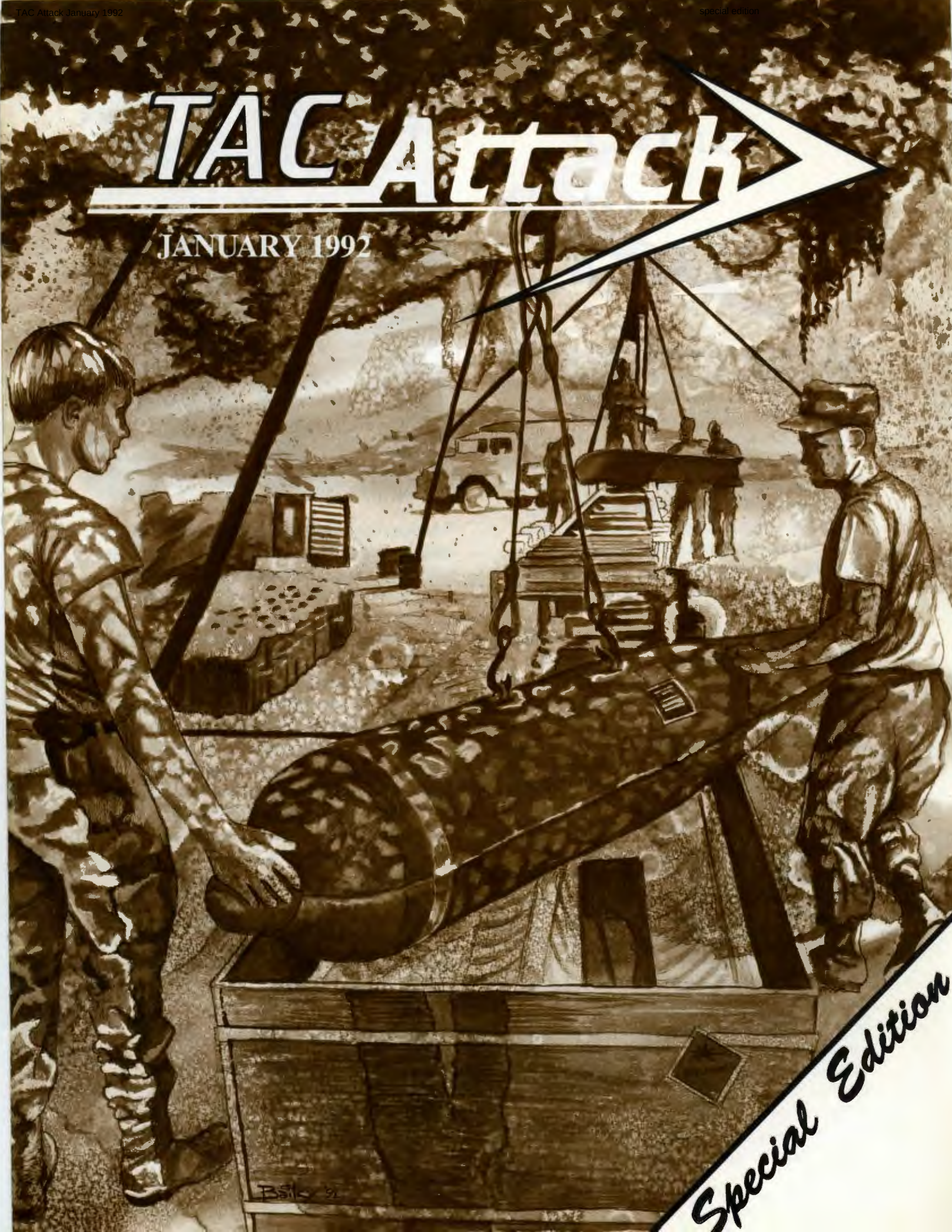
TAC Attack

JANUARY 1992



Special Edition

ANGLE OF ATTACK

Where were you a year ago? More than 21,500 of you were in or preparing to deploy to Southwest Asia. Twenty-one hours after the President said, "Go," TAC aircraft were in the air heading for a war zone.

They didn't have time to rethink procedures. They didn't have time to rewrite their checklists. They didn't have time to practice anything new. They were ready to fight because TAC maintains sound, combat-worthy standards in every phase of operations every day of the year. Our next call to action could be just as sudden. It's time to get ready now.

A year after Desert Storm began, we are devoting this issue of ***TAC Attack*** to weapons safety. It is one of the keys to protecting our people and resources and maintaining our combat capability.

A single mishap in this area can trigger a catastrophe. It can kill our people and destroy our aircraft, devastating our combat capability and leaving us vulnerable to attack. We don't need to do the enemy's job for him.

The hours of hard work we put into weapons safety were evident in Desert Storm. Our record was superb. Despite handling over 85 million pounds of net explosive weight, there were no class A mishaps, one class B mishap, and four class C mishaps.

That correlates to our consistent improvement in weapons safety throughout the Command. We have reduced the total number of incidents by 59 percent over the last five years. Results like these are impressive and provide hard evidence of the exceptional culture of safety in TAC. But we can't let success go to our heads. Relaxing our standards would send the accident rate back to where it was - and we can get even better.

Good weapons safety doesn't happen overnight. It comes from training our people thoroughly in all weapons-related skills and thorough knowledge and understanding of procedures, and it's honed through constant practice. There are no shortcuts or work arounds. When working correctly, the culture of safety permeates our entire working environment and causes us to do more than simply think about safety; it prompts us to view safety as an automatic and natural part of everything we do all the time.

Each commander is accountable for his or her unit's adherence to munitions hazard classification standards and weapons system safety rules, regulations and procedures. As people and assets move to new bases, commanders must ensure that our standards don't slip due to changes in the routine. The existing culture of quality explosive safety programs must be continually nurtured to remain healthy.

We can improve on what is already a quality program by anyone's standards. By focusing on continuous improvement and developing a sense of ownership at every level of the organization, we can keep the TAC Team on top!

JOHN M. LOH
General, USAF
Commander

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FEATURES

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GBU-28 *Desert Storm* RAPID RESPONSE

Maj Richard Wright
GBU-28 Program Manager
ASD/YHP
Eglin AFB FL

Question: Can you convert Army artillery barrels into the most potent conventional weapon conceived? Just as importantly, can you do it safely? Oh, by the way, you've got less than a month to do it. These were the questions asked of Eglin's bomb developers during the Gulf War. Their answer—the GBU-28—was right on.

Once the air war began, it was obvious Iraq had buried facilities beyond the capabilities of our 2000-lb BLU-109 penetrator. Destroying these targets with conventional weapons would require penetrating more earth and reinforced concrete than ever before. The resulting program condensed the design, development, test, and fielding of a new weapon into less than one month.

The key to the rapid development was using existing components; not just to simplify the development but to build on established operational and safety considerations. The final solution was to integrate existing laser-guided kits onto a stretched version of the BLU-109.

To improve the BLU-109, its weight was doubled and its

Destroying these targets with conventional weapons would require penetrating more earth and reinforced concrete than ever before.

length increased 56 inches, to 152 inches. Unfortunately, materials to make 4000-pound bombs are not readily available. That's where Lockheed and the Army came in.

Lockheed Missiles and Space Company was already on contract researching penetrators and potential solutions to hardened facilities. One of their employees, retired from the Army, previously proposed using shot-out howitzers to make bomb cases. He called the Army's Watervliet Arsenal in New York and found 8 inch howitzers on a scrap pile.

On Feb 1, Watervliet was given the go-ahead to manufacture the BLU-113 bomb case. They striped off chrome plating, drilled the inside diameter to 10 inches, machined the outside diameter to 14.5 inches, and welded on a nose. Except for the length, the outside dimensions were kept the same as the BLU-109 to match existing GBU-27 laser seekers and tail units.

The first two bombs were finished by Watervliet on Saturday, Feb 16. These were immediately turned over to the New York Air National Guard 109th TAG, and flown to Eglin AFB by 139th TAS C-130s. They arrived Saturday afternoon and were given to the Wright Laboratory Armament Directorate's High-Explosive Research and Development (HERD) facility to fill.

To fill a bomb, explosive material is first melted in a kettle and then poured into a bomb case stood on its nose. Normally, the HERD would pour directly from the kettle into the bomb, but this bomb was too big to fit inside their building. Instead, a makeshift pit was dug outside, and a platform erected to help the workers reach the top of the bomb.

This gave birth to Eglin's "Bucket Brigade." The explosives were prepared in the kettle, poured into buckets, handcarried outside, and handed up to workers on the platform. In turn, they would pour the explosive into the bomb case and wait for another bucket until the bomb was full.

Safety considerations were observed throughout the filling process. Protective gear was worn by the explosive handlers and only those properly trained performed the critical filling tasks. Also, since Florida is the lightning capital, weather conditions were constantly monitored—explosives and lightning just don't mix. Fortunately, February was a mild month.

At the same time bombs were being prepared, GBU-27 laser guidance kits were being reprogrammed by Texas Instruments. New guidance software was required to control the larger bomb and provide the right fin control to guide it with precision. This required two days of wind tunnel testing and four days of hardware-in-the-loop simulations with actual flight hardware. Before the one—and only—guided flight test could be done, Eglin's 3246th Test Wing flew captive tests to assess handling qualities with the bomb on F-15E and F-111E aircraft. The schedule was so tight, the first bomb flown, Wednesday, Feb 20, was still warm from the explosive filling process.

The bomb penetration depth was well beyond anything demonstrated before. In fact, the inert bomb remains buried more than 100 ft below the Tonopah Test Range, too deep to economically recover.

Under Tactical Air Warfare Center (TAWC, Eglin) direction, operational crews from the 422d Test and Evaluation Squadron, Nellis AFB, and the 431st TES, McClellan AFB, had already begun flying practice missions on Feb 16. Their aircraft were flown to assess delivery platform capabilities and operational procedures. The first reprogrammed guidance kit arrived at Nellis on Saturday, Feb 23. Since only one test weapon was available, this test

would have to satisfy both safe separation and operational employment objectives.

On Sunday morning, Feb 24, an F-111F, piloted by the 431st TES, took off from Nellis to launch the first GBU-28 ever. Photo chase video from a Test Wing F-15E, showed the weapon cleanly separated from the F-111. The impact conditions matched simulations. Safe separation and operational concepts were "proven."

The bomb penetration depth was well beyond anything demonstrated before. In fact, the inert bomb remains buried more than 100 ft below the Tonopah Test Range, NV, too deep to economically recover.

Two days later, Tuesday, Feb 26, a sled test was ran by the 6585th Test Group at Holloman AFB, to test concrete penetration capability.

The Test Group assembled a target from left over 16x16-ft reinforced concrete slabs, 2 to 3 feet thick. A 4-ft thick, 8x8-ft slab of concrete was added to make the total thickness 22 ft. A BLU-113 bomb was rocketed down the sled track by an Improved Honest John motor, and in a matter of seconds the test was over. The bomb cut through the concrete like butter, and continued down range over a half-mile before coming to rest.

Earlier the same day, two "production" GBU-28s were picked up from Eglin for special delivery to Saudi Arabia. Accompanying the bombs was the F-111F WSO from the 431st TES, a weapons loader from TAWC, and contractor personnel from Lockheed and Texas Instruments.

The weapons were flown into combat within five hours of arriving in theater. Returning cockpit video showed the GBU-28 enter an Iraqi underground facility and a large explosion rip through one of the side entrances.

The bombs arrived in Saudi on Wed, Feb 27—the last day of the War. The WSO carried a VCR tape of the Tonopah test and immediately began to brief F-111 aircrews. The weapons loader and Lockheed technician assisted in assembly and loading of the bombs. The biggest roadblock was crowd control; everybody wanted their picture taken with the bomb, or to sign it.

The weapons were flown into combat within five hours of arriving in theater. Returning cockpit video showed the GBU-28 enter an Iraqi underground facility and a large explosion rip through one of the side entrances. The previously impenetrable target was eliminated.

The GBU-28 program was the essence of team work at its best. The Air Force proved it could respond quickly to any threat, and never sacrifice safety along the way. And the message to potential adversaries: You can run, but you can't hide!

IT'S A MATTER OF INTEGRITY

Maj Gen John D. Logeman
HQ TAC/LG
Langley AFB VA

Integrity has long been an integral part of the munitions community. It includes the safe handling of munitions, to the utmost of one's ability even when no one is watching. In the munitions business, the job must be done right the first time--anything less could result in serious injury or even the loss of life.

Desert Storm provided our munitions community an opportunity to demonstrate an awesome war fighting capability. Despite the challenges of bare base operations, adverse weather, and the usual "fog of war," munitions personnel persevered and supported over 65,000 combat sorties, expended nearly 75,000 tons of explosives, and helped defeat the fourth largest army in the world. For their part, munitions personnel can be justifiably proud of their efforts.

Unfortunately, with the end of the war came a tendency for some personnel to relax their attention to detail and their combat discipline that just won a war. The most notable example of this was the handling of empty munitions containers. In one instance alone, 19 AGM-65 missiles arrived at a CONUS seaport (not a munitions handling port) in containers marked empty. This resulted in the closing of the port and the diversion of another ship at sea. This one mistake exposed innocent people to needless risk and cost the Air Force a great deal of money. Regardless of the reason these missiles were accidentally shipped--an honest mistake, the confusion of war, or just a bad case of "get-home-itis"--the incident was preventable and it should never have happened!

Incidents caused by improperly certified empty containers are not limited to Desert Storm and the heat of battle. There have been peacetime instances. For example, a MK-20 Rockeye in a supposedly empty container was discovered by a scrap metal department just moments before the container was to be crushed. The container had been sent to DRMO after being "certified" as empty.

The active involvement of supervisors and technicians in certifying empty containers is an absolute must. Procedures for container certification are quite explicit in governing regulations. One of the most important of these procedures is for a munitions inspector to sign a statement certifying that a container does not contain any explosive items. This signature is more than a certification or simple compliance with a regulation...it is a matter of integrity.

The Air Force munitions community has earned an enviable reputation for excellence. Let's continue to build on this reputation by enforcing meticulous empty container inspection certification practices. And remember, above all else--let's expend munitions on the enemy, not on ourselves--AMMO!

EXPLOSIVES SAFETY
AN EYE TO THE FUTURE

Brig Gen James L. Cole, Jr.
HQ USAF/SE
Washington D.C.

The capability to store, maintain, handle, transport, upload/download, and employ large quantities of conventional munitions is essential to meeting mission requirements. Likewise, explosives safety standards are an essential element in mishap prevention during these tasks. Explosives safety standards complement the mission superbly in that they help conserve Air Force resources in the event of an explosives mishap and they support the "survive to operate" objective of maintaining warfighting capability during hostilities. But our future explosives safety efforts must reach beyond our present impressive successes, and achieve even greater levels of effectiveness. I believe this can be accomplished through focusing on reducing human factors as a causal factor in mishaps and promoting enhanced cooperation with the Airbase Operability (ABO) program.

The Air Force has developed an explosives safety program which is integral to the provision of quality munitions support. Explosives management policies and technical requirements have proven very effective in ensuring the safety and reliability of our munitions assets. However, the most concise policy statements and explicit technical data requirements are only as good and effective as the people who are expected to follow them. Our people are proficient and professional in performing their duties, yet personnel error remains the most prominent cause of explosives mishaps. As technology continues to improve the safety and reliability of Air Force ordnance, we should intensify our efforts to eliminate the human factors that so often are the underlying causes of mishaps. Better understanding, definition, and recognition of human factor causes will yield big dividends in future explosives mishap prevention efforts.

Though the explosives safety program is not an ABO issue per se, our safety objectives are virtually inseparable from the aims of the ABO program. Appreciation of explosives safety standards from this perspective is a relatively recent development, yet it has always been an important part of it. The explosives safety community has now become a key partner working ABO issues and the result has been a much wider recognition of the relevance of explosives safety standards to airbase survivability during combat. The overall goal of both programs is the conservation of Air Force resources so that they are available to fulfill mission requirements.

These are exciting and challenging times for the safety community. Force reductions and restructuring; budgetary constraints; base closures; and the uncertainty of events on the global level make conservation of Air Force resources all the more important. During this decade, a better understanding of human factor issues and closer interaction with agencies with whom we share mutual interests are required to produce the necessary continued improvements in our mishap prevention programs. We are doing very well in the explosives safety arena, but we can and must do better. I solicit your support, ideas, and initiatives for even better results as we approach the twenty-first century. If we don't try hard, it just won't happen.

DRAWING TO AN INSIDE STRAIGHT

Colonel Alan C. Graham, Jr.
Director of Weapons and Space Safety
Air Force Safety Agency
Norton AFB CA

Those folks who like to pick up the pasteboards once in a while, sip a little sour mash whiskey and wager a bit of pocket change with a few friends know the folly of drawing to an inside straight. The odds are just against you all the way, and you'll be money ahead to fold the hand and try again. Yet lots of folks just can't stand to throw away the potential for a big winner, especially if the missing card would make a Royal Flush. And lightning does strike occasionally; just often enough

to continue to whet their appetite for this losing bet.

There are other folks who insist on drawing to an inside straight when they deal with explosives. But in this case, they are betting that the missing card will NOT come up. The odds are with them, but in this case, the penalty for losing the hand may be catastrophic. Let's look at the cards we were holding during Desert Shield and Desert Storm.

Card One: In the press to get ammunition to the operational units, huge quantities of ammunition (in some cases five million pounds, NEW) accumulated at water ports, downtown airports and in stacks waiting for the construction of earthen storage modules.

Card Two: Inadequate ramp space to park the aircraft at the required intermagazine separation placed the entire force in jeopardy. For example, we had some munitions—loaded F-16s parked with less than 50 feet separating the MK82 bombs on adjacent wings (the required separation is 64 feet). Even those places which were able to provide minimum separation risked propagation of explosions in a domino effect.

Card Three: Frequent, last-minute frag changes forced the maintenance troops to keep additional loads of ammunition on the line, once again in violation of intermagazine separation.

Card Four: Units constructed tent cities beside the combat aircraft parking areas. This kept the troops near their work areas and reduced the effort to provide security, but sleeping, dining, support and recovery facilities, and personnel were at constant risk.

Card Five: Munitions assembly operations took place at separation distances which provided little or no protection for workers at other locations, including totally nonrelated operations.

The cards were clearly stacked against the deployed units, yet there was compelling operational need to prepare for combat and execute the tasking. In many respects, we were lucky that no catastrophic mishap occurred. However, many units did take extraordinary measures to limit their exposure to unnecessary risk.

Base ammo stocks were limited to a seven-day supply at one base due to the lack of adequate storage space. Once senior leadership understood the risks, they agreed with safety's recommendation for weekly resupply.

RED HORSE teams constructed earthen modules for ammunition storage and steel bin revetments to provide fragment protection for the aircraft.

CENTAF developed a central ammunition storage depot to handle the increased munitions stockpiles which could not be safely stored at the operational unit level.

We can take justifiable pride in our success in Desert Storm, but could more have been done to reduce the risk of a catastrophe? In retrospect, most units will be able to identify some areas where they took unnecessary risks, considering how the odds were stacked against them. We need to take a hard, honest look at every aspect of the operation, from deployment to combat operations and the trip home, and include those lessons learned in our war planning and unit training.

Safety is not a peacetime luxury which we discard when we go to war. It is the force preservation tool that ensures commanders have the resources necessary to accomplish the mission. And as always, when we go into battle, **AMMO MAKES THE MISSION!**

COMBAT ENGINEERS & BOMB BUILDERS:

A Compatible Combination

Brig Gen Michael A. McAuliffe
HQ TAC/DE
Langley AFB VA

When Air Force Engineering forces are thrust into a bare base environment and tasked to provide expedient munitions storage, they usually have to use existing or "scrounge" contingency assets for help.

As the title suggests, these two groups can have much in common. In fact, when it comes to constructing munitions storage in a bare base environment, they best become close friends because planning and coordinating are key ingredients for the safe and successful construction of a munitions storage area (MSA). When Air

Force Engineering forces (Prime BEEF and RED HORSE Squadrons) are thrust into a bare base environment and tasked to provide expedient munitions storage, they usually have to use existing or "scrounge" contingency assets for help. The first and most important step should never be overlooked--**READ THE INSTRUCTIONS**. So note the guidance and criteria contained in Air Force Regulation 127-100, Explosives Safety Standards and Air Force Pamphlet 93-12, Contingency Response Procedures. With available assets and a close working relationship with munitions ("ammo") and safety personnel, an effective and safe MSA can be designed and constructed under the most severe conditions.

Once the need for a MSA has been established, a site needs to be selected and agreed upon by a horde of vital team players including host nation, safety, munitions, and civil engineering personnel. Things get technical real quick: Size and proximity of the MSA and the number of munitions facilities to be constructed are functions of consumption rates, required days-of-supply, Net Explosives Weight, storage density of munitions items, and quantity-distance (Q-D) separation distance from surrounding facilities. Upon site selection, design efforts begin immediately. Working closely with inputs from safety and munitions personnel, and taking time to follow the instructions in AFP 93-12 and AFR 127-100, civil engineering forces can begin developing the area layout.

During Operation Desert Shield/Desert Storm, Central Command Air Forces (CENTAF) tasked both Prime BEEF and RED HORSE Squadrons to site and construct a central theater munitions depot to support all Southwest Asia.

The type of munitions facilities to be constructed at a bare base is dependent upon available existing resources, organic resources deployed with the engineering forces, and the urgency of mission. It is extremely realistic to have the capability to construct any of the above types of munitions storage facilities with organic resources. Open storage of munitions is perhaps the quickest and easiest storage option available in a contingency environment. However, this option limits the type of munitions which can be stored to those insensitive to direct rain and sunlight. Open storage even with barricades, requires a much larger geographical area than earth covered/barricaded storage due to larger Q-D requirements between individual munitions storage sites. This can be an extremely important factor depending on the amount of real estate available at the deployed location.

Sensitive munitions with electronic and mechanical components, including missiles, guided bombs, and cluster bomb units need covered storage to preserve reliability. Engineering forces have the capability to provide covered storage or Combat Zone Type storage in various forms, including the use of buried concrete or steel culvert and the relatively new mobile manufacturing steel arch

systems (K-SPAN type). In most contingencies requiring construction of a MSA, a combination of both open and covered storage is used. This was clearly evident during Operation Desert Shield/Desert Storm.

During Operation Desert Shield/Desert Storm, Central Command Air Forces (CENTAF) tasked both Prime BEEF and RED HORSE Squadrons to site and construct a central theater munitions depot to support all Southwest Asia. Although on a large scale, this was the classic tasking which a deployed engineering force could expect to receive in a bare base environment. So during construction of a bare base in central Saudi Arabia (only runway and water source existed), the order to provide a large central theater munitions depot, capable of storing over 30 million pounds of ordnance, was passed on to CENTAF engineers.

The tasked Prime BEEF and RED HORSE Squadrons began siting and designing this mammoth munitions depot. In close coordination with CENTAF safety and munitions personnel, a site was selected near the new bare base. Knowing what types of munitions were coming and the quantity of each type became an extremely important part of the design phase. Again working closely with the CENTAF munitions personnel, engineering forces designed and surveyed a one mile by one and one-quarter mile MSA complete with over 14 miles of interior asphalt roadway, a 1.6 mile entrance road, and 17 mobile manufactured steel arch storage facilities. All of the steel arch facilities were sited and oriented in an east-west direction to shield the openings from prevailing winds and blowing sand. Due to the time constraints to support mission requirements and the available resources, the engineers and munitions personnel decided to use non-barricaded open and covered storage. Engineering personnel ensured the entire site configuration satisfied the 875 ft quantity-distance criteria road circles of different radii, same center. The entire design effort, accomplished with organic personnel, was completed in four days.

The entire design effort, accomplished with organic personnel, was completed in four days. Construction of the complex was completed in 143 days at a cost of only $3.2 million using mostly organic equipment.

Construction of the complex was completed in 143 days at a cost of only $3.2 million using mostly organic equipment. The construction effort included a huge earth-moving requirement to stabilize the roads and all of the storage sites by hauling tons of select clay fill excavated from a borrow pit 15 miles away. Even before the construction was complete, munitions began to arrive and be stored. This allowed ships arriving from the CONUS and other areas to be down-loaded quickly at the port, instead of being delayed waiting for requirements from each deployed location to materialize.

Construction of this large MSA is just one example of Air Force engineering capabilities in a bare base environment. These capabilities, coupled with a close working relationship with munitions and safety, will ensure quality, expedient, and safe munitions storage in the future. The mixing of the rough and tough construction folks with the tough and technically precise "ammo" troops resulted in **COMPATIBILITY - TEAM WORK!**

Training and Discipline

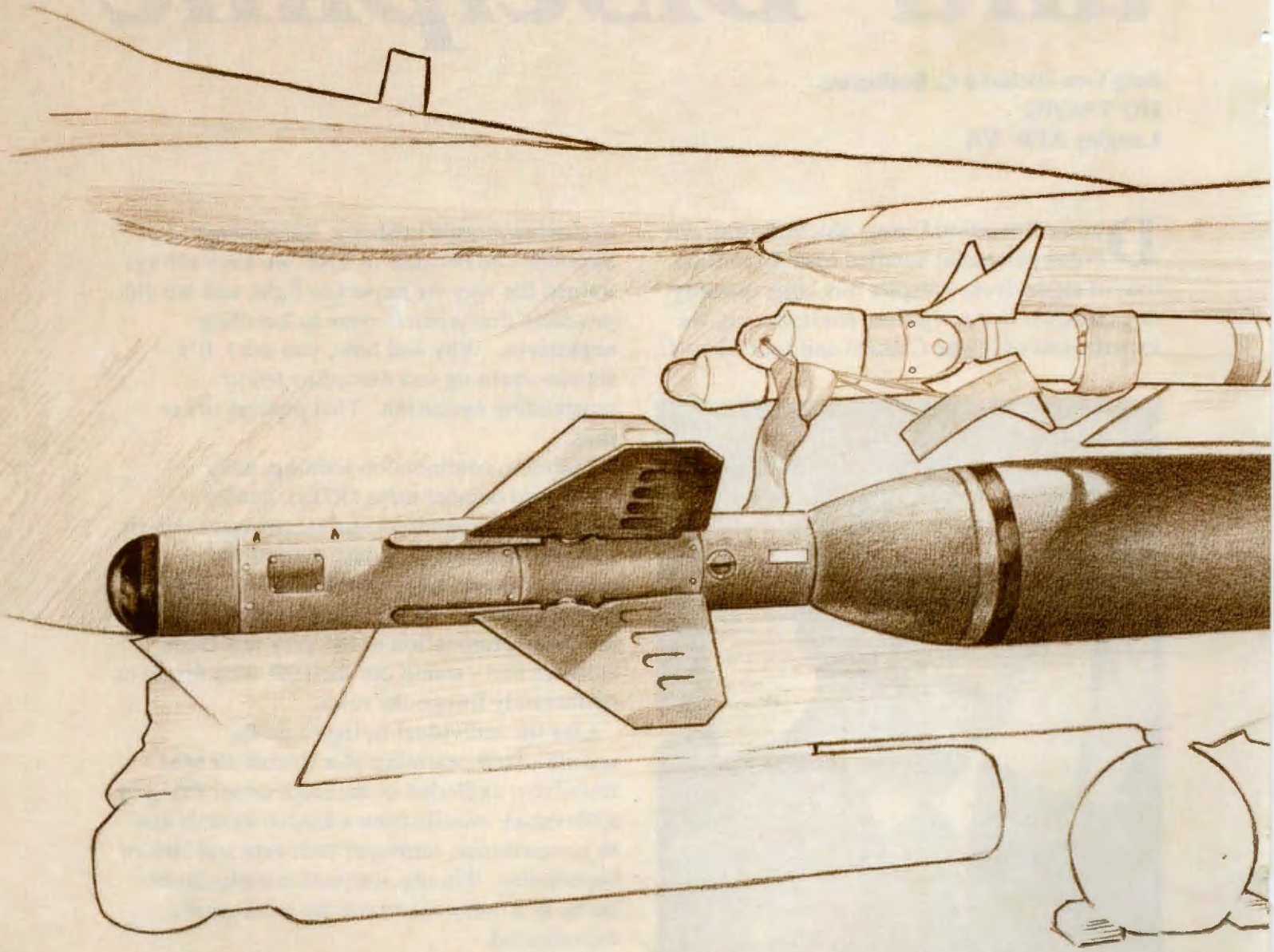
Brig Gen Richard C. Bethurem
HQ TAC/IG
Langley AFB VA

During Operation Desert Shield/Storm, Air Force personnel handled over 85 million tons of explosives. Despite this large quantity of explosives and a wartime environment, we experienced only one Class B and four Class C explosive/missile mishaps. Surprising? Shouldn't be because in TAC we have always trained the way we expect to fight, and we did precisely that when it came to handling explosives. Why and how, you ask? It's simple--training and discipline led to outstanding execution. That process never fails.

Training, continuation training, daily integrated combat turns (ICTs), quality assurance, inspections against stringent criteria and standards all went into peacetime preparation so that in wartime we "walked the way we talked." What else could you ask for? Answer - elimination of the very few close calls we had - stamp out the 10% who forget or deliberately forego the rules.

Like the individual trying to do an unauthorized dearming of a British 30 MM round that exploded or the inadvertent firing of a Maverick missile from a loaded aircraft due to inexperience, improper tech data and lack of supervision. Finally, dropped missiles from being in a hurry round out the mishaps we experienced.

So give yourself an outstanding, but let's look for continuous improvement in the future. Continuous improvement in weapons safety will give us even more combat capability.



GBU-28

Bomb Body Length	152 inches
Overall Length	229.31 inches
Net Explosive Weight	660 lbs HE Tritonal
Bomb Body Weight	4,414 lbs
Overall Weight	4,672 lbs

The Wartime Duties of Weapons Safety

Capt Eugene I. Doremus
9 AF/SEW
Shaw AFB SC

Are things different in war? I'm sure at one time or another everyone has wondered if what they're doing in peacetime has any connection to what they would be doing in a "no-kidding" contingency. I, for one, need not wonder any longer. As Chief of Weapons Safety for the Headquarters USCENTAF throughout Desert Shield and Desert Storm, I had the golden opportunity to learn, firsthand, what the difference is.

Take, for example, program management. Duties such as issuing or reviewing licenses, doing annual inspections, checking lesson plans and OIs, training additional duty folks, monitoring MDRs, and a host of other similar duties all became virtually nonexistent. These duties, which take up the vast majority of a weapons safety officer/NCO's time and energy, simply did not make it across the water.

What about mishap prevention duties—things like observing operations for unsafe practices, or checking for such things as the absence of tech data and fire extinguishers? Verifying mishap reporting procedures and cross-feeding mishap reports from other units must certainly be "go-to-war" duties. Surprisingly, the answer is "not necessarily." This is not to say that these things are not important or that they were never accomplished—it's just that the reality of our Desert Shield/Storm experience showed us other taskings took priority over these duties and we continued to rely on supervisors to ensure safe practices and procedures were utilized.

What could possibly be more important than mishap prevention?

We were carving bases out of the sand, from which we would be fighting a war; these would most assuredly be targets for our enemy.

How about combat survivability? We were carving bases out of the sand, from which we would be fighting a war; these would most assuredly be targets for our enemy. Explosives safety quickly went beyond preventing a missile from being dropped or a cart from being misfired. What explosives safety really meant was preserving a unit's capability in the event of an explosion. Concepts like "sympathetic detonation" and "propagation" became our primary concern.

In other words, **the single-most important task of our deployed weapons safety officers and NCOs was to assist their commander in positioning explosives in accordance with established explosives safety standards so that in the event of a mishap or terrorist act our "mission" assets would survive.**

NOTHING, I repeat, NOTHING could distract them from that task. This is the heart and soul of "combat survivability" to a weapons safety officer (WSO). In many cases, he was the only person at the deployed location with the technical knowledge for applying the explosives safety standards.

OK, I'll admit for the first week or so, the WSO had to be in a QD (Quantity-Distance) frame of mind, but, after that, would he not resume normal weapons safety duties? I would have thought so also, but, once again, the reality of Desert Shield/Storm proved otherwise. The following is a list of reasons why working QD issues was an ongoing process, requiring constant attention:

1. The amount of explosives on a base was continually increasing as the logistics mission was performed.

2. At most bases, the number of aircraft doubled in the second quarter of Desert Shield. (Again increasing munitions requirements.)

3. Available aircraft parking ramps changed due to new construction or the arrival of additional units.

4. Uncoordinated construction of support facilities popped up inside clear zones throughout the deployment period.

5. At one location, the entire wing picked up and moved to another location in the fourth month of Desert Shield.

6. QD violations were being continually worked.

7. Documentation, i.e., an explosives site plan, was required.

8. Complicated waivers required thorough staffing.

The difficulty of performing contingency explosives safety duties cannot be overstated. Our deployed safety officers and NCOs learned quickly that nothing is simple, nothing is cut and dried, nothing will be fixed immediately, and nothing will be the same tomorrow.

The safety rules are difficult to apply in the best of circumstances—applying them in the Desert Shield experience gave new meaning to the term "flexibility."

We made it through, though. Storage pads were adequately separated, support facilities kept their distances, aircraft were parked as safely as possible, and the host of other separations were, for the most part, met.

Was all of this necessary? After all, we didn't have a major accident, so all this QD business was an exercise in futility, right? Perish the thought! We did, will continue to, and must operate on the notion that an accident can happen. At times, we were a pain in the $!#, not appreciated, and even ignored but continued to do what the Air Force was paying us to do: **ENSURE COMBAT SURVIVABILITY.**

OUR REASON FOR EXISTENCE

Mr. Paul D. Price, P.E.
Chief, Explosives Safety Division
Directorate of Weapons & Space Safety
Air Force Safety Agency
Norton AFB CA

Ammo makes the mission. We've all heard that statement, said in a somewhat jesting manner by our ammo troops at one time or another. Another one is "Without ammo, this would just be one more unscheduled airline." If you think about both of these statements for a minute, you have to conclude there's more truth there than fiction. Actually, the first should read "Ammo IS the mission." The second is absolutely correct as the sole purpose for the existence of the Air Force is for the delivery of munitions. Why then, do so many people treat this most essential commodity with such indifference and, in fact, consider the safety rules, which are intended to protect our capacity to perform our mission, as a big "pain in the butt."

It's no secret—it doesn't take a rocket scientist to conclude that explosives safety rules are complicated. This is because in actuality, they are a list of exceptions. Explosives safety would be very easy if we simply determined the safe separation distance for the most hazardous munition item and used that distance for everything. Obviously, this is not a practical approach; however, in our attempt to provide relief where it is prudent to do so, means we create another exception (complication).

Explosives behave according to a very strict set of laws, the laws of physics. Unfortunately, that is one body of law that can neither be broken nor changed by regulation. Our principle task in explosives safety is to attempt to better understand the physics associated with an explosive event for a given weapon. In that way, we can provide meaningful guidance on how to prevent an accidental explosion in the first place and, should one occur, on how to mitigate the damage to some acceptable level.

What's the point of all this? There are several. First and foremost, since munitions are such an important, integral part of the mission, everyone must be more cognizant of munitions requirements and peculiarities. This means such things as: early on in the decision process about

where to bed-down an aircraft, munitions support requirements and capability must be considered; during exercises, the WSO/NCO needs to be on the commander's battle staff to provide timely risk assessments of the alternatives being considered, which is absolutely essential for making informed decisions; including the weapons safety shop on predeployment surveys; and mobilizing the WSO/NCO in time to assist with the initial beddown of munitions and aircraft. Contrary to popular opinion, the job of the WSO/NCO is not to be an obstructionist, but rather to provide timely and accurate information on the potential consequences of a given action. Usually, if asked in advance, they can provide satisfactory alternatives to promote timely generation of sorties in a manner that does not jeopardize the complete loss of mission capability.

In summary, I'd like to leave you with these thoughts:

—The delivery of ammunition is the purpose for the existence of the Air Force.

—Explosives behave according to a very rigid set of physical laws.

—Explosives safety people are the "interpreters" (I'd use "lawyers" if it didn't have such a negative connotation) that help us understand these physical laws.

—Their help in understanding this complex subject is essential to making intelligent, informed decisions.

—Explosives safety is both a science and an art. The science involves the determination of the appropriate physical laws. The art involves convincing others that it is in their interest not to break these laws.

—Quantity-Distance rules are particularly important when the enemy is trying to cause our accidents.

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WEAPONS SPECIAL ISSUE CONTRIBUTING EDITOR

The HQ TAC Weapons Safety Division Chief, Major Jonny "JJ" Hepler, provided invaluable editorial assistance to the regular magazine staff throughout the preparation of this month's special issue. Major Hepler's qualifications are not only reflected by his staff position with the Office of Safety here at Langley AFB, but are also highlighted by a recent seven-month tour in SW Asia during Desert Shield/Desert Storm. There he commanded the largest ammo supply facility in the AOR after assisting in its design and construction. His in-depth knowledge of ammo handling and storage regulations and procedures, along with this recent involvement in a real-world combat arena have given Major Hepler essential insight into the do's and don'ts of this indispensable career field. The ***TAC Attack*** staff wishes to express its gratitude for the many hours spent by Major Hepler in the conception, coordination and final production of this unique issue. **AMMO!** (Did we say that right "JJ"? By the way, just what does **IYAAYAS** mean?)

A NEW PERSPECTIVE

Maj Len Olson
Air Force Liaison
Crane Army Ammunition Activity
Crane IN

In the two-and-a-half years I've been working in an Army munitions manufacturing complex, watching and learning how munitions are produced, I've been exposed to a lot of weapons safety precautions that I think are worth sharing, particularly those dealing with pyrotechnics.

Our pyrotechnics complex bristles with safety measures rarely seen in Air Force munitions areas. The entire area is surrounded by lightning arrester poles. The buildings have temperature and humidity controls and conductive floors or mats in all work areas. The workers wear 100 percent cotton clothing and conductive safety shoes to eliminate static charges. Nearly all of the mixing, blending, screening, pressing and extruding operations are done in protective cells with the operator running the equipment remotely. Video systems are used to monitor these operations, which helps reduce worker exposure to pyrotechnic hazards. Sprinkler systems and automatic deluge systems are present everywhere water is a suitable firefighting agent. Fire alarms and emergency exits can be seen everywhere you go. All electrical equipment is explosion-proof and all tools are made of nonsparking materials. It's all pretty impressive stuff, but what impresses me the most is the way these materials are handled. Fuels and oxidizers are stored and handled separately until the last possible moment. Material quantities are always kept as small as possible —if a large quantity is needed, we'll make several small batches rather than one or two large ones. When materials are moved from one cell to another, they go in closed metal containers placed on carts, which the workers push in front of them. You NEVER see anyone carrying a container of pyrotechnic composition in their arms. If anything goes wrong with a process, the material is scrapped and we start over.

Not all of these precautions translate directly to the kind of environment seen in an Air Force munitions storage area or flightline, but seeing these kinds of safety measures will teach you very quickly that pyrotechnics can be extremely hazardous.

Perhaps a new perspective on the dangers of pyrotechnics can

help you build a better weapons safety program. I suggest starting with some basic questions about the hazards you face. For example: What do you think the chances of injury are for the person carrying a box of decoy flares in their arms versus a person pushing a cart with the box on it, if the flares ignite? If you load or handle pyrotechnic items, do you ever hold them close to your face so you can see what you're doing? Have you ever considered using a lexan shield for the more hazardous operations? When is water the preferred fire extinguishing agent and when is water dangerous to use? Did you know that the M17-A1 chemical warfare mask provides little or NO protection against some kinds of smoke producing munitions? And what about static electricity? How do you ground yourself while wearing the Chemical Warfare Ensemble and rubber gloves? If you knew how many fires occurred in plants that make these items, you'd take these questions very seriously.

Electrical grounding has long been the standard practice for dissipating static charges from munitions, equipment and personnel. Sometimes situations arise that make grounding a little more complicated than you might think. How to ground yourself while wearing a chemical warfare ensemble and rubber gloves sometimes appears as a trick question on weapons safety tests— the answer is you do it the same way as you would with bare hands, by grasping a properly grounded metal object. The rubber gloves used with the chemical warfare gear will dissipate a static charge just like your bare hand does, even though they have a higher electrical resistance. Now for the complicated part. Because of the higher resistance, it may take longer to get rid of the charge—instead of a microsecond, it may take a full second or two to dissipate the charge. And it makes a difference whether you're in the munitions storage area or on the flightline. Grounding systems in the storage area have a very low resistance, usually 25 Ohms or less. This allows munitions and personnel to be grounded as work proceeds, preventing static charges from accumulating. On the flightline, grounding points may have a comparatively high resistance, as much as 10,000 Ohms. The reason is that aircraft often return from flight with a strong static charge, and a high resistance allows the charge to bleed off slowly and thus avoid a spark.

Infrared decoy flares, intended to divert heat-seeking missiles away from an aircraft, produce temperatures well over 4,000 degrees only microseconds after igniting. They will burn just about anything and are virtually impossible to extinguish. Try to keep that in mind whenever you work around a loaded aircraft. Most of these flare systems are located on the bottom side of the aircraft and are downward ejecting. Common sense says to avoid walking or working under such a hazard and even to avoid placing any kind of equipment under them. However, I don't believe these kinds of precautions have received the kind of emphasis that forward firing ordnance has. Walking under a loaded flare dispenser should be viewed as just as dangerous as walking in front of a loaded gun. Some aircraft, such as the B-1B, have upward ejecting flare systems located on the back (top) of the aircraft which present a somewhat different hazard. For one thing, they undergo more heat stress when the aircraft sits in the hot sun. Anyone who loads or unloads such flare systems should avoid positioning themselves directly in the path of ejection. Get to the side if possible.

Now combine this knowledge with a requirement to load decoy flares into an aircraft dispenser on the flightline when no spare dispensers are available. How can it be done safely? This is an example of the kind of issues your safety program may have to address. You should be asking some tough questions about the necessary precautions as you search for a solution, and your answer should be based on a healthy respect for the hazards involved.

We've had at least four fires in pyrotechnic operations at our plant in the last two years. Most never progressed beyond a spark before the automatic deluge system activated, but the last one gutted an $83,000 facility and burned $250,000 worth of inventory. Nobody was hurt, but needless to say, we take the subject very seriously at Crane.

IN THE RIGHT PLACE AT THE RIGHT TIME

Lt Col William D. B. Swezey
ASD/ALZ
Eglin AFB FL

When the Air Force Combat Ammunition Center (AFCOMAC) was created almost seven years ago in the remote, high desert region of northern California, little did any of us realize just how incredibly fortunate the selection of that isolated real estate was to become. Unfortunately, none of us could see the future and frankly, we chose Sierra Army Depot, Herlong CA, as the home for AFCOMAC because it offered us the land mass, facilities, and explosives operating potential for the first school dedicated to teaching munitions people about munitions breakout, buildup and delivery in support of actual combat scenarios and air tasking orders.

Created in August 1985, AFCOMAC was the result of a Tiger Team effort sponsored by Lt Gen Leo Marquez, AF/LE. That Tiger Team confirmed what General Marquez and many of the senior Air Force leadership feared--a glaring shortfall existed in our ability to support sortie generation on a sustained basis in combat. Our munitions people simply lacked the know-how to mass generate ordnance in the quantities necessary to match OPLAN sortie rates. Day-to-day support of flight operations revolved around the buildup and delivery of 25 pound practice bombs and blue tipped AMMO. Full scale ordnance was rarely exercised for reasons which make absolutely perfect sense in peacetime--live ordnance costs too much, adequate ranges and buildup locations are extremely limited and delivery and loading of real munitions disrupt routine flightline operations.

These limitations, however valid in peacetime, did not negate the very real need for providing our munitions people the realistic training they so desperately required to keep pace with wartime sortie rates. AFCOMAC was established to fill that void. And fill it - it did. In less than six months after the Secretary of the Air Force approved the AFCOMAC organization, the first class of 70 AMMO people, representing MAJCOMs throughout the

world, graduated from the most intensive munitions training program in the Air Force.

AFCOMAC concentrates on developing the combat skills of career 461 and 465 munitions/ munitions operations personnel and junior maintenance and munitions officers. It was designed to teach combat techniques, theory and principles in order to properly plan, manage and actually support a practical generation of live munitions against actual OPLAN tasking. AFCOMAC teaches people to think on the balls of their feet, anticipate and fix real world problems, recognize and select options, understand the latitudes and flexibilities of choice and its impact on technical order compliance or explosives safety. Students learn proven skills and experiment with new initiatives to generate munitions quicker and smarter to beat the frag. Each succeeding class learns from the mistakes of its predecessors. Lesson plans and practical exercises are changed constantly to reflect the most current MAJCOM wartime scenarios. Since it has been in operation, AFCOMAC has successfully trained over 3,200 AMMO folks, in 46 classes, handling and assembling over 68,000 complete rounds of ordnance without an explosives incident. This equates to generating sufficient munitions to configure over 10,000 tactical and strategic combat sorties.

During Desert Storm, the lessons learned at AFCOMAC contributed significantly to our ability to handle and generate literally hundreds of thousands of short tons of explosives in a safe and professional manner. A solid cross section of our deployed forces were AFCOMAC trained. They hit the ground running and made a difference. They were familiar with the high tempo of mass munitions generation over time, with different methods of combat assembly, with the orchestration of people and the proper use of equipment. They were accustomed to air tasking orders and frequent frag changes. When they ran into trouble, they improvised but they did it smartly with the calm, practiced acumen of a seasoned combat veteran. When the "Book" did not clearly spell out instructions or cover a given set of circumstances, they knew what options were available and the advantages, limitations or risks associated with each one. What AFCOMAC provided the Air Force was a location where mass assembly of live munitions could occur on a closely supervised basis in a controlled environment. Where mistakes in management or procedures (not impacting safety) were allowed to proceed until recognized and corrected by the class without impacting people, equipment or combat capability. Everyone we spoke with concerning the value of AFCOMAC training was consistent in response. It helped prepare them for the most rigorous 43 days of munitions operations in the history of the Air Force. New records were set at every state of munitions generation. But the culmination of expending over 177 million pounds of ordnance in support of 66,000 combat sorties without a single explosives mishap during the munitions generation is truly a commendable achievement.

AFCOMAC has been a success story in the logistics business because of the support it continues to receive from the Air Staff and all using commands. But, the true value of AFCOMAC can best be measured by its graduates and their performance under actual combat conditions in one of the most incredibly difficult environments on earth. They made it happen for AMMO, for the Air Force. **IYAAYAS.**

Combat Munitions Road Maps

Col Eric L. Redifer
HQ TAC/LGM
Langley AFB VA

"IN ACCORDANCE WITH OPORD XXXX, THE XX TFW WILL DEPLOY TWO SQUADRONS TO YYYYYYYYY SAUDI ARABIA, DEPARTING NLT 0600Z, 248 DAY . . ."

Similar words ran throughout most of TAC's and other commands' units, announcing the deployment of Desert Shield forces. One thing became perfectly clear: This was **THE REAL THING, NOT AN EXERCISE.** Base support plans, briefings, and local exercises helped prepare those units lucky enough to deploy to their CHECKERED FLAG locations. AMMO troops had an even better picture from the comprehensive munitions employment plans (MEPs) they had developed and practiced. Unfortunately, most units did not deploy to a predetermined location. How could AMMO troops, who would be some of the first to deploy, prepare for such an unforeseen event? They could still plan, even if they had ZERO INFORMATION about the area.

GENERIC MEPS

If a unit is tasked in a general OPlan without a specific location, or information is not available about a specific location, a MEP can still be developed. The end result may not be complete, but it will be a good start in establishing a munitions storage area (MSA). AMMO personnel all over the world perform essentially the same basic functions of receiving, inspecting, assembling, transporting, storing, and accounting for munitions. Each of these actions must be performed in locations that meet the specific quantity distance (QD) separation standards of AFR 127-100, *Explosives Safety Standards*. The separation of these actions, of course, will depend on the quantity of munitions that will be required to meet the unit's mission.

Combat planning factors are available; the **UNIT COMMITTED MUNITIONS LIST (UCML)** and **WAR MOBILIZATION PLAN (WMP)** are good places to start. Compile the planning factors, calculate the munitions requirements, then sketch the MSA to scale. The result will be a "picture" of the area required to support an initial combat effort. Whether such an area will be available at the deployed location will not be known until arrival, but it's a start. Additionally, if you end up at a base collocated with other units (which occurred frequently during Desert Shield) you will be able to articulate your storage and build-up requirements to the commander.

WHY???

The use of a road map to travel through unknown and unfamiliar surroundings is no guarantee that a driver will complete a trip successfully. It's a tool that, if used correctly, can increase the odds of success. It's the same with a MEP. This provides the guidance to meet

critical **QD STANDARDS** while producing safe and reliable munitions operations. The "old warriors" that say all standards go "out the window" during war have ignored some well documented tales of death and destruction—on ourselves rather than our adversaries.

There are times when all the standards cannot be met. Obviously this involves an element of risk. Risks can be minimized if thorough planning and analysis are done ahead of time. It's better to take calculated risks than to **REACT TO THE HEAT OF BATTLE.**

FUTURE COMBAT CONTINGENCIES

There were many unknowns during Desert Shield/Storm, but our people reacted well. While the movement of over 262,000 tons of munitions was not always smooth, incidents were minimal. The good results we achieved were not just good luck. Instead, we had professional, well-trained people doing the work. **TO BE EVEN BETTER NEXT TIME, MAKE MEPS AN INTEGRAL PART OF YOUR PREPARATION!**

POSTSCRIPT

There's a booklet available that contains all the specifics of developing a comprehensive MEP: *CONVENTIONAL MUNITIONS PLANNING GUIDE*. The Air Force Logistics Management Center developed it for our command. It was compiled, published, and distributed after many consultations with professional AMMO troops. We still have a limited supply if anyone has a need for one. **AMMO! HUHH!!**

Results of an airstrike on an Iraqi convoy fleeing Kuwait City.

THE FIGHTER PILOT IN THE LOOP

Maj Gen Lawrence E. Boese
HQ TAC/DO
Langley AFB VA

"Train like you're going to fight." Those words are often heard from commanders concerning our day-to-day operations. Training rules contained in our current operating regulations help us achieve the required character during our flying operations. One area requiring just as much discipline in order to successfully execute our mission is the preflight. Proficiency is easy to obtain when it comes to aircraft, BDU-33s, and captive carry missiles. Maintaining that same proficiency with live ordnance is more difficult. Since proficiency is hard to achieve, two tools are available to make up for our shortfalls: checklists and attention to detail.

The starting point for the required preflight procedures is the checklist. It is the product of engineers, maintainers, and operators. It continues to evolve, as better/more efficient ways of operating are discovered. It is not a cookbook that can be picked up, carried out to the jet and used having never seen the weapon. Knowing what to expect before you get there is half the battle.

Once you are at the jet, attention to detail is the key. When you're not as proficient or knowledgeable about what you're doing, it is easy to assume that the person before you must have known what they were doing. Today's advanced weaponry will only work as advertised if properly wired and armed. This can only be assured by a thorough preflight. Detailed wiring diagrams for numerous varieties of the same bomb can be confusing. If it doesn't look right - ask.

You may think this sounds very basic and in some ways it is. However, keep in mind where we were less than one year ago. Most of us had spent our entire Air Force career preflighting aircraft and munitions in a training

environment. Faced with Desert Storm combat, we were thrown into an unfamiliar and hostile arena, often working long hours at night, and employing live ordnance that for years had only been discussed during Friday afternoon weapons academics. In those situations, what carried us through? The answer was: checklist reliance and no kidding attention to detail. It mattered, it was important, it was the way we did business. Lest these lessons learned are forgotten, we must redirect our attention today toward training the way we fought during last spring's conflict. You are the quality control; the fighter pilot in the loop. It's your life on the line. The real tragedy is always: You fought your way to the target, and released your ordnance, and the end result was an unguided weapon. Now you have to do tomorrow what you should have finished today. That is, if you have a chance.

Example of the pin-point accuracy of laser guided bombs employed against hardened aircraft shelters.


Fleagle
YOU DON'T THINK FLEAGLE'S REALLY GONNA TRY THIS, DO YOU GRIFF?
YOU KNOW HOW HE IS. HIS BRAGGIN' SOMETIMES CONVINCES HIM THAT HE CAN DO JUST ABOUT ANYTHING.
BUT IT'S BEEN A LONG TIME SINCE HE DONE ANYTHING CLOSE TO WHAT HE GONNA TRY T'DAY.
I KNOW.
LET'S GO DOWN TO TH' AIRSTRIP AND SEE HOW HE'S MAKING OUT.
IF I CAN FIGURE SOME *@☆-* WAY TO STRAP THIS MOTHER ON, I KNOW I CAN GIT IT OFF TH' GROUND.
GOOD LORD!!
HARRISON

TAC TALLY

	TOTAL			TAC			ANG			AFR		
	OCT	THRU OCT		OCT	THRU OCT		OCT	THRU OCT		OCT	THRU OCT	
		FY92	FY91		FY92	FY91		FY92	FY91		FY92	FY91
CLASS A MISHAPS	4	6	1	0	2	0	3	3	1	1	1	0
AIRCREW FATALITIES	4	5	2	0	1	0	2	2	2	2	2	0
* IN THE ENVELOPE EJECTIONS	1/1	2/1	0/0	0/0	1/0	0/0	1/1	1/1	0/0	0/0	0/0	0/0
* OUT OF ENVELOPE EJECTIONS	0/0	0/0	0/2	0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/0	0/0

* (SUCCESSFUL/UNSUCCESSFUL)

CLASS A MISHAP COMPARISON RATE

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

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TAC	FY 91	0.0	0.0	0.7	1.8	2.2	2.2	2.2	1.9	1.7	1.8	1.8	2.0
	FY 92	4.3	2.2										
ANG	FY 91	3.8	2.0	1.3	3.9	3.2	4.0	5.2	5.0	4.9	4.8	4.3	4.3
	FY 92	0.0	5.8										
AFR	FY 91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	FY 92	0.0	10.4										
TOTAL	FY 91	1.2	0.6	0.8	2.3	2.4	2.6	2.9	2.7	2.5	2.5	2.4	2.5
	FY 92	1.6	4.0										

TAC'S TOP 5 thru NOVEMBER 1991

1st AF

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

70	57 FIS
30	325 FW

9th AF

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

53	1 FW
32	56 FW
24	31 FW
23	33 FW
17	354 FW

12th AF

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

55	479 FG
47	355 FW
46	366 WING
41	27 FW
27	49 FW

ANG

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

466	119 FIG
442	147 FIG
252	110 TASG
226	138 TFG
205	112 TFG

AFRES

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

183	301 TFW
157	482 TFW
124	924 TFG
112	906 TFG
87	507 TFG

DRUs

"COMMAND-CONTROLLED CLASS A MISHAP-FREE MONTHS"

182	552 AACW
73	28 AD
52	USAFAWC
1	USAFFWC