USMC AMMUNITION QUARTERLY

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From the PM Ammunition

Mr. Jerry L. Mazza
MARCORSYSCOM- AM

Welcome to this edition of the USMC Ammunition Quarterly (AQ). With some changes in mind for the AQ, I believe you may find a slight twist in future editions to better communicate what we are doing within PM Ammo and more importantly, what our ammo community as a whole is doing.

We all have heard much about Operational Risk Management (ORM) that certainly carries over into explosives safety. Mr. Jeff Wilson, MARFORPAC Explosives Safety has provided an informative article on ORM processes for explosives related operations. In a related article, is an initiative on Explosives Safety Officer (ESO) training, which PM Ammo will host. We have recognized the need to fill some perceived gaps in our ESO competency training. I believe it is critical, especially in dealing with the hazards of our commodity, that we ensure our ESO community has the requisite skills, tools, and resources to adequately execute their explosives safety mission.

Inside This Issue…

You may be aware of the challenges in the 40MM family of ammunition, especially with the 40MM HEDP, B542. Mr. Ron Riley, former Ammunition Officer, has provided an update on this cartridge emphasizing potential causes of malfunctions and the importance of malfunction reporting, as well as efforts by my staff and our In- Service Engineering Agent to increase reliability. In addition, Mr. Miller, one of my Assistant PM's, provides the latest on a new 40MM Target Practice round for the MK19 Grenade Machine Gun. I am enthused in that this non-dud producing cartridge has the potential to replace two current TP rounds while increasing reliability and visible signature. This will be a win for training within our Operating Forces and has interest from the U.S. Army, which would further reduce costs of procurement.

We are making progress on our Knowledge Management (KM) Portal, which will be accessed via the PM Ammo Web page. With additional functionality and resources such as the "Field Returns Inspection" tool already resident on our page, the KM "data mining" portal prototype is anticipated to be available by the end of FY01. My intent is to ensure a web based, user friendly, singular stop for our community and those who have need for ammunition data. More to come!

Finally, I extend a challenge to our MOS, Officer or Enlisted, to develop OUR logo and/or emblem. Specifics are provided in Major Ratliff's COLTRAP article. This is an opportunity to define ourselves and to enhance the professional growth of one of our Marines. I look forward to the submissions.

Semper Fi

Ammunition Update: Cartridge, 40mm HEDP M430/M430A1 Linked

Mr. Ron Riley
Crane Army Ammunition Plant

For those Marines who remember the high frequency of malfunctions related to firing 40mm High-Explosive Dual-Purpose (HEDP) M430/M430A1 Linked (DODIC B542) from the MK 19 Mod 3 Grenade Machine Gun (GMG), here is an update. Several actions have been taken to minimize the occurrence of weapon stoppages that lead to damage to the MK 19 Mod 3 GMG and degraded confidence in the weapons system. The MK 19 Mod 3 GMG fires 40mm grenades with anti-personnel fragmentation light anti-armor capabilities and target practice loads. The problematic round is the M430, HEDP (B542) cartridge. It is a high explosive, dual purpose, impact type round designed to penetrate two inches of armor and inflict personnel injury inside the target area.

In 1996, production related defects were discovered in the B542 cartridges that resulted in reclassification of all stocks to emergency combat use only. Production was halted and a joint service investigative Blue Team assembled. The investigation uncovered production shortfalls that rendered the ammunition unreliable as well as dangerous. These shortfalls included improperly assembled cartridges and missing components that were critical to cartridge performance. Most of the defects discovered were internal, therefore not visually detectable.

Improperly assembled cartridges resulted in B542 projectiles becoming lodged in the barrel of the MK 19 Mod 3 GMG. When this occurred, the next round fired would collide with the lodged projectile and the results varied. Worse cases ended in premature in-bore detonations with injury. Other occurrences resulted in short rounds and weapon stoppages.

A radiographic inspection procedure was developed to identify and eliminate cartridges assembled with incorrect propellant loads and other known defects. The inspection consisted of processing rounds through a motion synchronized x-ray inspection system. An image of each cartridge was developed that provided a clear indication of piece part orientation along with allowing for a computerized measurement of the propellant level. Known defects were easily identified and the cartridge segregated. An image of each cartridge was recorded in order to facilitate investigation of further incidents. Figure (1) is an extract from TM 43-0001-28 and is provided to aid in component identification of the x-rayed cartridge.

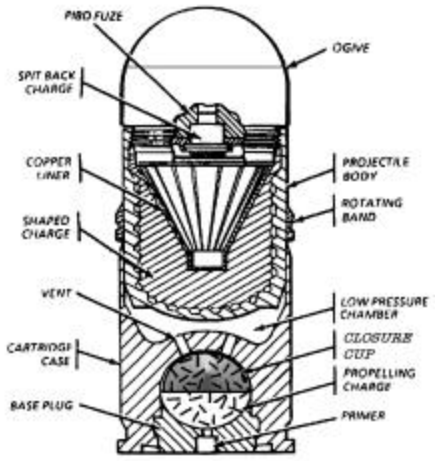

Figure 1

Efforts to increase reliability of the B542 cartridge and confidence in this weapon system continue. Performance of the B542 cartridge is being monitored closely. Weapon stoppages, misfires, stuck projectiles; short rounds and premature down-range detonations are of great interest to PM-AM (QA). Recent malfunction reports indicate the presence of continued defects in the cartridges, including instances of projectiles being lodged in the barrels of the MK 19 Mod 3 GMG. Reports of debulleting (projectiles separating from cartridge cases) short rounds and other incidents are also beginning to surface. These are indicators of continued problems. It is imperative that all incidents, ammunition related stoppages and anomalies discovered during MK 19 GMG shoots are reported. Seemingly insignificant occurrences may be of great interest to the supporting technical community. The Marine Corps has invested substantial resources in an attempt to remove defective cartridges from the stockpile. Feed back from users is

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40MM HEDP…continued from Page 2

our most effective means for monitoring performance. Representatives from Crane and Fallbrook are conducting site visits, observing MK 19 Mod 3 GMG shoots, investigating malfunctions and talking to Marines in hopes identifying performance shortfalls. They are fielding all questions and concerns.

The following points of interest are offered:

1. Malfunction: Malfunction reports should completely describe the event. Residue from the malfunctioned cartridge is very important during an investigation and should be recovered whenever possible. A good example of what components to collect could be made in the case of a lodged projectile. The removed projectile, cartridge case and metal container are valuable residue. In a case where the exact cartridge case cannot be identified, every casing around the gun or in the gun pit should be collected, marked for investigation and returned to the Ammunition Supply Point. The rule of thumb should be "upon experiencing any malfunction or stoppage due to ammunition, every effort should be taken to recover the salvageable components of the malfunctioned cartridge". As with any explosive component, safety is an issue. EOD should be notified and presented the unexploded projectile. Prior to destruction, any available data should be recorded. A photograph should be taken. Every effort to increase reliability of the B542 cartridge and confidence in this weapon system continues.

2. Effects of known production defects:

a. Insufficient propellant: The effect of improper propellant loading varies. Less than the specified amount of propellant leads to short rounds. Critically low propellant usually leads to projectiles becoming lodged in the barrel of the MK 19 Mod 3 GMG. Results of excessive propellant are less critical. It is an indication of a flawed propellant loading process. Extreme cases could lead to base plug separation. This is indicated by excessive smoke emitting from the ejection port.

b. Missing Closure Cup: A brass alloy closure cup is positioned in the high-pressure chamber to prevent propellant from migrating through vent holes into the low-pressure chamber prior to firing. The thin material of the closure cup is designed to submit to pressures of burning propellant at the vent holes and allow the expanding gases to escape, enter the low-pressure chamber and subsequently propel the projectile through the barrel. When the closure cup is missing and the propellant has migrated to the low-pressure chamber during storage, cartridge performance is significantly degraded. The result is usually a lodged projectile or short round, dependent upon how much propellant has escaped from the high-pressure chamber.

c. Double Closure Cup: An extra closure cup increases the time required to burn through at the vent holes and delays transition of the expanding gases into the low-pressure chamber. The result of this condition is usually a ruptured cartridge case or blown base plug. When either of these conditions occurs, the result is usually a lodged projectile.

Ammunition Information Notices 25-91,03-98, 33-00 and 4-01 address concerns related to the handling of B542 cartridges. Strict compliance with these guidelines and TM 08521A-10/1A (November 1996) will increase the probability of safe and successful training. No shortcuts are recommended or authorized. Ammunition technicians must ensure MK 19 users are thoroughly versed on these advisories, assist with retrograde of malfunctioned residue and ensure malfunction reports accurately describe the event. Conditions and occurrences not previously described and/or reportable can be informally discussed with the following technical points of contact:

PM-AM (QA):
CWO2 Liller, Quantico
DSN 278-9494

Malfunction Investigations:
Mr.Esteban Flores, MCPD
DSN 873-3479

In-service Engineering Agent:
Mr. Ron Riley, Crane
DSN 482-6889. ?

Mr. Riley is assigned to NAVSURFWARCENDIV, Crane (Code 4033) and may be reached at commercial (812) 854-6889 or DSN 482-6889.

Collaboration and Training Program (COLTRAP)

Major Richard A. Ratliff
MARCORSYSCOM (AM-PLNS)

The Program Manager for Ammunition (PMAM) is embarking on Collaboration and Training Program (COLTRAP) designed to effect change in the ground ammunition field. Several opportunities will be forthcoming for ammunition personnel who wish to participate. As an incentive for participation, personnel who are judged to have made the greatest contribution to the program will merit special consideration in participating as an augmentee to that or related programs. Selection and participation in this program will be subject to command approval and other factors that may normally prohibit participation. The following programs will require qualified ammunition personnel who must be able to represent, either as an individual or as a member of a group, the Program Manager for Ammunition in that selected program. Participants must be willing and able to participate fully in these programs, as well as provide personal or electronic debriefings to the Program Manager for Ammunition.

- ?? Norway Air-Landed MEB Prepositioning Program, Norway (1-25 June 01)
- ?? Explosive Safety Team Observer (various world-wide locations and times)
- ?? MPS Download Observer, Charleston, SC (Open)
- ?? National Defense Industry Association (NDIA) Symposium (various locations and times)
- ?? Defense Institute Security Assistance School (DISAMS) (various times)
- ?? MPF Planners Course, Norfolk, VA (22-27 Jul--subject to quota availability)
- ?? NALMEB Orientation, Norway (approximately September 01)

The first challenge is to enhance our image as a community. As we here at PM Ammunition continue to revise and mature our web site in efforts to hone and enhance our customer support, it has become evident that we, as a community, lack a clear designator appropriately reflecting our mission in support of the Marine Corps. We have typically used the bursting bomb in various logos and emblems.

However, the PMAM feels it is time to modernize the antiquated cannonball. As such, we would challenge the collective and creative ammunition community in developing an ammunition emblem that would serve the entire Ground Ammunition team regardless of installation, function, and/or unique mission. In short, the emblem would be synonymous with USMC Ground Ammunition and all that we do. We offer no more criteria than that, as we do not want to stifle the creative process. If you have the desire, ability, and pride of your MOS, please submit any nominations by 1 June 01 to:

Marine Corps Systems Command (PMAM)
Attn: Major Ratliff
2033 Barnett Ave, Suite 315
Quantico, VA. 22134-5010

The winning entry will be determined by the senior ammunition officers and will either become the official emblem or will be used to develop the final product in concert with the person whose submission was used. The PMAM fully believes that this and any ensuing opportunities will help foster collaboration, provide valuable training for our personnel, and fulfill Marine Corps commitments by MARCORSYSCOM (PMAM). O

Major Ratliff is currently assigned to MARCORSYSCOM/AM-PLANS, and may be reached at DSN 278-9170, email: ratliffra@mcsc.usmc.mil

40mm Target Practice, Linked, XM1023 (DODIC BA12)

Mr. Mike Miller
MARCORSYSCOM (AM), RDA Branch

The Marine Corps is currently leading an initiative to procure a new linked 40mm Target Practice (TP) cartridge for use in the Mk19 Grenade Machine Gun (GMG). This cartridge, designated the XM1023 and assigned DODIC BA12, is intended to replace both the 40mm linked TP cartridges; the M385 variant (DODIC B576) and the M918 (DODIC B584).

DODIC B584 uses a fuze escapement mechanism to produce a visible signature on impact that in the past has been prone to malfunctioning and is dud producing. The dud rate of the B584 cartridges led to the re-procurement of B576 for training on the Mk19 GMG. While B576 does not produce duds, it has a major shortcoming of not producing a visible signature on impact.

In an effort to eliminate duds on training ranges and to obtain a cartridge that produced a visible signature, MARCORSYSCOM (AM) initiated a Foreign Comparative Test (FCT) program to identify a cartridge that produces a visual signature and is friendly to the environment. This effort, completed in August of 2000, tested two potential manufacturer's products. Initial selection was BA12. The BA12, as tested, performed very well during the FCT and produced a visible impact signature at ranges in excess of 1500 meters. The projectile contains no energetic material and therefore does not produce duds. The cartridge uses the same M2 propellant and primer as the existing TP round. The non-explosive compound used to produce the signature has passed all environmental and safety tests. The cartridge will be packaged in the same configuration as DODIC's B576/B584.

While additional testing is still required to obtain approval of the Weapon System Explosives Safety Review Board (WSESRB) and the Insensitive Munitions (IM) Board, the prospect of procuring BA12 appears very good. The completion of the safety certification tests is scheduled for the summer of 2001; fielding of the cartridge is scheduled for late 2001 or early 2002.

In summary, the BA12 provides a low cost alternative to two existing 40mm TP cartridges for the Mk19 GMG; reduces the number of configurations in the inventory; eliminates the danger with duds on training ranges; and provides an enhanced capability to the Marine in the field. O

Mr. Miller is currently assigned to MARCORSYSCOM/AM-RDA, and may be reached at DSN 278-9176.

Operational Risk Management (ORM)

Mr. Jeff Wilson
COMMARFORPAC, Explosives Safety

NAVSEA OP 5 Vol 1 and NAVSEAINST 8023.11, The Navy and Marine Corps Explosive Safety Program, requires the development of standard operating procedures (SOPs) with emergency procedures. The purpose of this requirement is to ensure that workers have the information required to perform the task safely and that practices and procedures to minimize accident risks are incorporated into the operation to ensure its safe completion. MCO 3500.27, Operational Risk Management (ORM) requires the completion of a risk management work sheet prior to execution of the operation, utilizing SOPs to reduce the risk to an acceptable level.

Emergency Destruct detonation at Sea with ATF, EOD, and Explosive Safety Officer (jointly wrote ORM write up)

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A risk assessment consists of a systematic, step-by-step, document review of the entire ammunition and explosives evolution. It is used to identify credible hazardous conditions for the purpose of assigning compensating measures and controls to completely eliminate or reduce them to an acceptable level. Risk assessment codes (RAC), as discussed in MCO 3500.27, are assigned to each hazard before and after compensating measures are applied (much of which we forget until after the fact). These compensating measures (specific procedures to follow, personal protective equipment, engineering controls, training, supervision, etc.) must be included at the step of the operation to which they apply.

Explosive Operation conducted during range management

Personnel conducting the ORM write up must be knowledgeable in ammunition and explosive safety, the task to be performed, and methods used in the ORM write up. A widely used format for the ORM write up is of the columnar type. It consists of several columns describing the operation (or step) being performed, the type of hazard(s), its cause(s), resulting effects, RAC before abatement procedures, and RAC after abatement procedures. The completed ORM write up must be provided to the organization Hazard Analysis Working Group (HAWG) for their evaluation. (Ordnance/Ammunition Officer, SNCOIC, Explosive Safety Officer, etc.) They review the document for content adequacy and suitability and make necessary changes to complete the ORM write up. The write up becomes a permanent part of the SOP after Staffing. O

Mr. Wilson is currently assigned to MARFORPAC, Tactical/Explosives Safety, and may be reached at DSN 477-8392. Photos provided by the author.

MARCORSYSCOM Hosts Explosives Safety Officer (ESO) Training

Mr. Thierry Chiapello and Mr. George Morrison
MARCORSYSCOM (AM-EES)

Recently, PMAM-EES conducted a root cause analysis to determine the reasons Marine Corps installations experienced increasing explosives safety inspections failures and findings since 1999. The analysis revealed several causative factors to include: differing levels of training, lack of access to installation authorities concerning explosives safety issues, and varying degrees of emphasis placed on training installation ESO's.

MARCORSYSCOM, and specifically the Program Manager for Ammunition (PMAM) is responsible for implementing and monitoring the Marine Corps explosives safety program per MCO 5100.2G. To meet that responsibility, increase operational readiness, and reduce the overall number of inspection failures and findings, PMAM developed the Marine Corps Explosives Safety Officer Course.

Once completed, MC ESO's will have the required tools to effectively address the explosives safety programs at their installations. Additionally, ESO's will have to meet annual refresher training requirements to remain certified as MC ESO's.

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The initial MC ESO course will be held from 4-15 June 01. ESO's from all Marine Corps installations, both CONUS and OCONUS, have been invited to participate.

This course serves several purposes. The next publication of MCO P8020.10 (due out within the next few months) contains expanded training requirements for USMC ESO's beyond those currently published in NAVSEA OP 5, Volume 1. Current training requirements do not cover the scope of USMC Explosives Safety Program responsibilities. MC ESO training will provide our ESO's a head start in meeting the new standards.

Also, the course provides training in the areas of environmental and risk management. ESO's that may have missed previous environmental or risk management training will be current and up-to-date.

PMAM will host the MC ESO course on a recurring basis to ensure ESO's not only meet Qual/Cert requirements, but also stay abreast of new developments in this ever-changing arena.

Website of Interest

For those students of Ammunition and Explosives history, or those who may have asked, "who dreamed up those magazine designs, anyhow?", I suggest you check out the DDESB's recently published Technical Paper 15, "Approved Protective Construction (Version 1.0)" at their website:

http://www.hqda.army.mil/ddesb/esb.html

This paper is a well-researched documentary on the history, development, testing, design, and requirements of explosives storage facilities dating from 1910 to the present. It is a wealth of storage facility information and the answer to numerous FAQ's on explosives storage magazines.
GEM.

The Defense Ammunition Center and School (DACS) will conduct the MC ESO training. DACS will present Explosives Safety Program Management (Ammo-32), a comprehensive 80-hour overview of major program management areas with a Marine Corps flavor. This course covers such topics as SOP's, Inspections, Quantity Distance, Storage, Transportation, Waivers, Lightning protection, and will constitute the bulk of the two-week session. APT Research, Inc., the contractors responsible for development of SAFER risk assessment model, is presenting 12-hour hands on training class in the use of this risk assessment program. SAFER training will be conducted at the Quantico computer-learning center.

This two-week course, in addition to other training requirements contained in the new MCO P8020.10, forms the basis of the ESO Qualification and Certification (Qual/Cert) Program.

The newly developed Qual/Cert Program, explained in MCO P8020.10, Chapter 10 contains both initial training requirements, and continuing refresher courses. Extensive use has been made of available DACS classes and computer based training to provide a robust program for our career professionals. The intent of the Qual/Cert Program is to provide all MC ESO's with a basic level of training and to ensure they remain current in the continuously changing regulatory environment. While Qual/Cert programs are nothing new to the Ammunition community, this is a substantial change for Marine Corps Explosives Safety managers. We are confident that the program will enhance training, raise the level of professionalism, and contribute to a stronger ESO cadre.

MARCORSYSCOM (AM-EES) will manage the Qual/Cert program; track individual ESO training needs, monitor progress, and assist in scheduling any necessary training. This central oversight does not relieve ESO's of the responsibility for maintaining awareness of their Qual/Cert status or training requirements. The new MCO P8020.10 requires all MC ESO's to maintain Qual/Cert status.

In addition to this basic 80-hour course, the program will also include Explosives Safety for Officers/Managers/Supervisors (AMMO-49) with refresher at 3-year intervals, Electrical Explosives

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Safety for Naval Facilities (AMMO-29), with refresher at 4-year intervals, and Explosives Safety for Naval Facility Planning (AMMO-36), with refresher at 5-year intervals. SAFER training will also be provided as changes in the program occur.

PMAM-EES, in cooperation with DACS, is in the early stages of assessing several other existing DACS CBT courses for possible inclusion in the ESO Qual/Cert program. These courses may require some modifications to give them a Marine perspective. This long-range effort will further strengthen our training program.

Root cause analysis demonstrated that Explosives Safety programs with the greatest degree of long-term successful performance had a common thread. The ESO had previous training and/or experience in the ammunition career field. While it is not reasonable or feasible to expect our ESO's to be "ammunition experts", some degree of familiarity with ammunition/explosives functionality and operations is clearly a positive factor in managing a successful Explosives Safety program. Therefore, as part of long-range program development, we are also considering brief courses, possibly CBT, on families or stock classes of ammunition items. These courses might include explanation of how the item functions, manufacturing processes, special storage/transport characteristics, associated environmental considerations, and safety hazards/concerns.

Another factor highlighted in root cause analysis was that, in general, the more "ammunition active" an installation is (installations with the most storage, high levels of daily ammo operations, high levels of training) the more successful the Explosives Safety program. This factor translates into ESO experience and daily involvement with ammunition operations. Obviously we cannot directly impart this kind of mission tempo to all our installations. Since we can't bring the mission to the ESO, perhaps we should consider bringing the ESO to the mission, at least briefly exposing him/her to a broader range of duties than ordinarily experienced or performed. This could take the form of sending ESO's from less operationally active installations TAD to installations with high levels of activity (possibly for a week) to work under the supervision of the host ESO, thereby gaining experience not normally available at home station. This "on the job training" is conceptual at this point, however, it is illustrative of another type of training opportunity that could be provided to our ESO's.

This initial ESO training course is just the tip of the Explosives Safety program iceberg. In line with the Commandant of the Marine Corps top priority (Safety), resources are being directed to enhance the capability of the single most important program element, our people. O

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Ammunition Quarterly

Marine Corps Ammunition Information Publication

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