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PROPELLANT MANAGEMENT GUIDE

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FORGING A STRONG DEFENSE

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U.S. ARMY INDUSTRIAL OPERATIONS COMMAND
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PROPELLANT MANAGEMENT GUIDE

JUNE 1998

1. In this guide, the U.S. Army Defense Ammunition Center is presenting methods and procedures to aid in the application of the various propellant test programs applicable to our storing installations.

2. We've derived information contained in this publication from U.S. Army Supply Bulletins and Technical Manuals; from the Army Propellant Program Manager at U.S. Army Industrial Operations Command, Rock Island, Illinois; the U.S. Army Propellant Surveillance Laboratory at Picatinny Arsenal, New Jersey; and the U.S. Navy's Naval Surface Warfare Center – Indian Head Division, Indian Head, Maryland. We do not intend for this publication to supersede, contravene, or modify any of these publications or information sources.

3. This publication's intent is to provide the user at a storing installation with essential information for the effective and safe management of propellant and propelling charges. We encourage your comments and suggestions regarding this publication. Furnish your comments to Director, U.S. Army Defense Ammunition Center, ATTN: SIOAC-AV, Savanna, IL 61074-9639, or via E-mail to: gravese@dac-emh1.army.mil.

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Major General, USA
Commanding

31 JUL 1998

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CHAPTER 1

INTRODUCTION

1-1. PURPOSE

This guide provides information and methods for the safe and efficient storage and management of propellants and propelling charges. It supplements information contained in SB 742-1, SB 742-1300-94-895, TM 9-1300-214, SW020-AE-SAF-010 and other sources. Rocket/Guided Missile propellants are not addressed.

1-2. SCOPE

The guidance contained herein may be used by U.S. Army installations which have a receipt, issue and storage mission for Class V materiel.

1-3. BACKGROUND

a. The mere physical presence of propellant at a given location creates interest and concern. Among commonly stored energetic materiels, only nitrate ester-based propellants (principally nitrocellulose-based ones) have the propensity to self-ignite (autoignite) without warning while in static storage; catastrophic losses can result. Artillery and Small Arms propellants are perhaps the most dangerous and suspect materials that Army installations regularly and routinely handle and store. Propellant can be unpredictable, decomposing into an unstable condition within four or five years of manufacture. Inadequate propellant safety programs have contributed to several self-ignition incidents at U.S. Army installations.

b. When grains, sticks or sheets of propellant inside a container ignite, sufficient heat and flame is produced to ignite the remaining propellant material in that container. If unstable propellant is present in the smallest amounts (even a single container), its combustion will probably ignite the contents of the entire structure. The propellant burns at a very rapid rate in a process that is known as *deflagration*. Deflagration differs significantly from *detonation* in that deflagration involves very rapid combustion that takes place on the surface and proceeds into the grain; it proceeds the same as normal burning, but at a very accelerated pace. Detonation, on the other hand, occurs due to a completely different process which involves a shock wave moving at supersonic speeds through the explosive material, thereby causing its decomposition. Therefore, *deflagration* operates on the basis of heat transfer, while *detonation* operates on the basis of a shock wave.

(1) During the period 1984 through 1989, five propellant self-ignition events occurred at U.S. Army Materiel Command (AMC) installations. These deflagrations began with the Lake City AAP accidents in 1984 which resulted in the loss of two storage magazines and contents. Other incidents of propellant autoignition resulting in total magazine loss include the 1985 Blue Grass Army Depot event, and a 1987 accident at Lone Star AAP. Another self-ignition accident

at Hawthorne AAP in 1989 involved a relatively small number of Navy separated charges and resulted in damage to, but not destruction of the storage magazine.

(2) Seven years separated the last of the '80's fires with those of the '90's: the 1996 autoignition of M10 powder at Red River Army Depot, and almost exactly one year later, in 1997, a deflagration at Hawthorne Army Depot which was much more devastating than the self-ignition incident which they experienced in 1989.

1-4. ENDORSEMENT FOR USE

Information in the following pages provide the essentials for safe management of your propellant. This LRTAO Information Pamphlet, endorsed by the Propellant Safety Surveillance Board (a Joint Services organization), offers reasonable procedures and guidelines for responsible organizations to effectively manage and safely control in-storage assets of bulk propellant and propelling charges.

CHAPTER 2

PROPELLANT STABILITY PROGRAM

NOTE: Most of the instructional provisions of Chapter 2 do not apply to Navy-owned/developed gun propellants. Special provisions for Navy propellant are found in Chapter 4.

2-1. THE PROPELLANT STABILITY PROGRAM

The Propellant Stability Program (PSP) is a sub-program of the Stockpile Laboratory Test Program (SLTP). The SLTP is one of the three major sub-programs of the Department of Army-directed Ammunition Stockpile Reliability Program (ASRP).

The purpose of the PSP is to provide surveillance of propellant stability through:

a. Constant predictive laboratory surveillance

b. Periodic chemical analysis of stabilizer content

2-2. DEFINITION: STABILIZERS

STABILIZERS are chemical ingredients added to propellant to prevent autoignition during the the propellant's expected useful life.

...EXPLANATION: As nitrate ester-based propellants decompose, they release nitrogen oxides. If the nitrogen oxides are left free to react in the propellant, they can react with the nitrate ester, causing further decomposition and additional release of nitrogen oxides. The reaction between the nitrate ester and the nitrogen oxides is exothermic, i.e. the reaction produces heat. The exothermic nature of the reaction creates a problem if sufficient heat is generated to initiate combustion. Chemical additives, referred to as *stabilizers*, are added to propellant formulations to react with free nitrogen oxides to prevent their attack on the nitrate esters in the propellant. The stabilizers are scavengers that act rather like sponges, and once they become "saturated" they are no longer able to remove nitrogen oxides from the propellant. At this point self-heating of the propellant can occur unabated. Once begun, the self-heating *may* become sufficient to cause *autoignition.*

2-3. COMPONENT PROGRAMS OF THE PSP

Propellants which are known to be in the ammunition stockpile stored by the Army are monitored and tested for stability. Installations are provided with the information necessary to make sound storage decisions. The PSP produces this information through its two component programs, the *Master Propellant Program* and the *Stockpile Propellant Program*.

2-4. MASTER PROPELLANT PROGRAM (MPP)

a. The oldest continuous Class V laboratory test program within the Army, the Master Propellant Program (sometimes referred to as the Master "Sample" Program) has operated continuously at Picatinny Arsenal for over 75 years, having begun in 1921.

(1) Producers of Army propellant are required to submit a 5-pound master sample within 6 months of manufacture to the Armament Reasearch and Development Center (ARDEC) at Picatinny Arsenal. Until the mid-1990's, a tiny portion from each of the newly received samples would be placed under continuous monitoring inside one of eight large, circular ovens as part of the 65.5 degree Celsius Accelerated Aging Test (AAT). Today, a new Safe Interval Prediction (SIP) test, also conducted at 65.5^{0}C, is replacing the time-honored AAT due to the new test's capability to provide usable predictive safe storage intervals for the propellant. Predictive evaluation wasn't possible under the old 65.5^{0}C AAT.

(2) For many years, all types of single and double base propellant were subjected to the 65.5^{0}C AAT. The samples bottles were usually checked during each duty day for the presence of reddish-brown fumes which indicated that the end of the propellant's stable life was near and could, in fact, be approaching a state of autoignition. Underappreciated during this period was the tendency of many propellant compositions to produce the red fumes and continue to decompose, but after the initial fuming, the fumes would fade and not reappear. So, if a bottle was not checked frequently enough, it was possible that the fuming event would go unobserved. Ultimately this operational shortcoming caught up with Picatinny during the 1970's, when an explosion occurred in a test chamber. The subsequent investigation revealed that each bottle inside each chamber must be visually checked seven days per week, and operational adjustments were implemented. This makes the AAT quite labor intensive. A study of fume times and propellant age revealed that there was no predictive value in those data. The pattern of fume times could not be used to predict propellant safe life or the onset of propellant failure. The test was simply a pass or fail test. The propellant either remained safe or it was no longer safe depending upon a fume time of greater or less than 30 days. Finally, the lack of responsiveness to the AAT by triple base propellant types meant that they could not be tested by the standard procedure. *All* propellant types respond favorably to the new SIP test.

(3) *MPP LABORATORY ACTIVITIES.* The Master Propellant Program generates minimal activity for storing and/or using organizations. Even though it operates seven days per week, personnel at the storing installation level have little contact with the Program, because the test sample quantity seldom requires replenishment, as the initial sample supplied by the manufacturer is usually a sufficient test quantity for the entire stockpile life of the propellant.

b. **65.5^{0}C ACCELERATED AGING TEST CYCLE:**

(1) Although the test protocols were developed in the 1910's, the Navy AAT facility at Indian Head was established after the First World War in 1921, while a sister program for the Army followed at Picatinny Arsenal later that same year. It was expected that the AAT could be used to predict a propellant's safe storage life by simply "plugging in" the proper ratio of

days-to-fume in the heat chamber to the actual days storage in the ambient environment. Various attempts over the years to impart a predictive meaning for the AAT have met with frustration. In practice, the AAT has not been used successfully in any predictive manner; it is only used to provide a pass/fail stability determination. Attempts to make the test predictive still occur, and someone may eventually be successful.

(2) The AAT is still used to establish a "base line" for newly received propellants. All new master samples are accelerated aged for 160 days to observe fume behavior. This test assures that newly manufactured propellant has no incompatibility or inhomogeneity present that would affect long term stability.

(3) All propellants which are nearing the end of their safe life are AAT'd for 45 days to observe for possible 30 day fume failures. This procedure allows full compliance with existing Tri-Service criteria.

(4) If the fume time is short (30 days or less) or an unusual result is indicated on an individually tested sample, the propellant lab conducts an analysis of the propellant to determine the percentage of remaining effective stabilizer (RES) to better determine the safety status of the propellant.

(5) If this test, in conjunction with the 65.5^{0}C results, confirms the impending instability of the propellant, the program manager at IOC, Ammunition Surveillance Division, is immediately notified.

c. **SAFE INTERVAL PREDICTION TEST:**

(1) The SIP test uses zero order reaction kinetics to assess the safe storage condition on all of the Army's 30-plus types of propellant in its inventory. The test generates its own safe storage and retest interval on a lot-to-lot basis.

(2) The test measures the decrease of virgin stabilizer using High Performance Liquid Chromatography (HPLC) at regular intervals. The test is run at 65.5^{0}C, like the AAT. Each sample also is tested prior to aging and the level of remaining effective stabilizer (RES) is determined.

(a) The SIP test is designed to provide the retest intervals normally provided by the certain, yet often capriciously unpredictable fume event. The kinetic calculations estimate the time required to deplete the effective stabilizer to zero concentration. Routinely, fume times for a single propellant lot vary greatly from one cycle to another; the intervals can decrease over time and then increase before failure occurs. The *advantage* of the SIP test is that predictable behavior is being measured that relates chemically to what we understand to be the onset of instability.

(b) The SIP test avoids the problems associated with wide variations in the change in the rate of a reaction for each 10 degree change in reaction temperature by using the kinetic

data it produces to establish reasonably conservative retest intervals (similar to the widely-accepted NATO method). These intervals are fractions of the typical shelf life of the propellant tested. The SIP test data provides an estimate of the time for the effective stabilizer to be depleted at the aging temperature.

(c) Using this SIP information, plus the known average life of propellants under ambient storage conditions, a reasonable factor is used that provides multiple retests over the life of the propellant. For example, a single base propellant generally has a life of 50 to 75 years. The safe interval predicted by the SIP method is not allowed to exceed 15 years. The method then establishes three to five intervals or more over the life of a typical single base propellant. More and closer intervals are usually required as the propellant ages because the predicted safe interval becomes smaller.

(3) No attempt to predict the entire shelf life of a propellant is made. The retest interval represents a period of time where the rate of reaction is such that the effective stabilizer cannot be brought to a dangerously low level. Sufficient stabilizer will be present at the end of the interval, thus no self-ignition can occur.

(4) The largest test interval allowed is 15 years. The safe storage and retest interval decreases over the life of the propellant, increasing the test frequency as the propellant approaches instability. Additional control measures include:

(a) All Stability Category "C" propellant is tested each year for remaining effective stabilizer level and 30-day fume failure; they are not SIP tested.

(b) Propellants with retest intervals of 3 years or less are not SIP tested.

d. *WHEN MPP STABILITY FAILURE OCCURS.* In the case of indication of stability failure for any of the test methods used on the Master Sample, the IOC, Ammunition Surveillance Division is notified. Normally, one of two actions will occur:

(1) IOC will permanently suspend the propellant lot and transmit a Notice of Ammunition Reclassification (NAR) message which will require *immediate destruction* of that lot when packaged as bulk propellant, bulk component charges, or as separate loading propelling charges.

(2) IOC will review the storage records and determine the impact on the stockpile if the lot is destroyed. If the Master Sample test results are considered to *not* be reflective of actual stockpile conditions, a sample (or samples) may be selected from a storing installation for special test. Any action concerning destruction of the lot will be held in abeyance pending stockpile test results.

NOTE: Master Sample test failure usually results in the destruction of a propellant lot, and the second option is seldom taken.

e. *Storing Installation Surveillance Responsibilities* for the Master Propellant Program are quite limited and usually consist of nothing more than the infrequent preparation of a specified quantity (3-5 pounds) of propellant for shipment to Picatinny Arsenal to replace a depleted or missing Master Sample. This action may involve the disassembly of a propelling charge. Assure the Depot Surveillance Record (DSR) card is annotated to the effect that:

(1) the sample was selected and shipped for the Master Propellant Program

(2) *no action* on the propellant lot is pending; sample selection and shipment for the MPP is simply a shipment. You will *not* receive test results or other feedback.

NOTE: The condition code of the parent lot will *not* change due to the sampling. Do *not* apply "CC-D pending test results" unless specifically directed by IOC.

2-5. STOCKPILE PROPELLANT PROGRAM (SPP)

a. The SPP is the more visible arm of the PSP with which the storing installations have the greatest contact. This test program uses small sample quantities which are provided from propellant lots actually in storage. The samples are packaged and sent to Picatinny Arsenal for laboratory analysis of remaining effective stabilizer. Samples are prepared at the request of the IOC Ammunition Surveillance Division, normally on a once-per-year basis in order to limit the workload burden to the storing installations .

(1) The remaining effective stabilizer (RES) level is determined in duplicate for both the field sample and for the Master Propellant sample. A comparison of the results for the two storage sites for the propellant lot identifies errant behavior in the fielded propellant and provides the basis along with SIP testing of the Master Propellant sample for establishning the next field sampling date for the IOC. This next sample date is based on kinetic data and is a true prediction of future behavior. Testing based on the field retest date is less frequent than past criteria and represents a decreased burdon to the storing installations.

(2) The current RES, safe storage category, and next field test date for all the lots in the Stockpile Propellant Program are available through the World Wide Web. This data base is provided to the IOC by the Army Propellant Surveillance Laboratory and is available through the IOC web site.

b. *Selection, Preparation and Shipment of Samples* will always be as instructed by SB 742-1, SB 742-1300-94-895, or as directed by special instruction (usually received with sample nomination letter) from HQ IOC. Since those instructions are quite specific, this Pamphlet will not elaborate further, except to point out the following:

(1) Most samples will consist of separate loading propelling charges, normally one complete charge per lot requested, although samples will also be requested from bulk propellant and bulk-packed component charges. Some charges (such as the 105mm M67 charge) are of dual-granulation. Dual granulation charges contain two individual lots of propellant per

propelling charge lot. Ammunition Data Cards should be checked to verify if a loaded charge is/is not a dual grain charge.

(2) It is likely that only a few individual propellant grains will be used for test purposes out of the entire one-pound or complete charge which consists of hundreds to thousands of grains. Good sampling techniques should be used. When removing propellant grains from a bulk container or from charge bags, select the sample from a *single location*, and identify that location on the sample baggie for lab personnel (e.g., "Sample Selected from Top of Drum," "...Center of Drum," "from Charge 3 where it abuts Charge 4," etc.). On occasion the excess material provided is used to supplement the Master Sample when it is expended in testing, thus adding to the importance of good sampling, packing and shipping procedures.

(3) You will want to remark on your DSR card that a sample has been selected and prepared for the SPP.

(4) Samples are often held up for shipment for an indefinite period, resulting in a number of samples sitting idle. These samples are sometimes ignored and/or forgotten. This is unacceptable, and the guidance immediately below should be followed.

(5) *Recommend* samples be tracked by a local suspense so that if Materiel Release Orders are delayed or cancelled, the local Surveillance organization will be "flagged" to take some type of closing action on the sample quantities (i.e., local destruction, request disposition from IOC, etc.).

(6) *Immediate destruction of residue is recommended.* If you have generated propellant residue from your sample preparation, assure the residue (remains of propelling charge) is properly repackaged and identified on stock records if returned to storage. Due to recent changes in procedures for disposition of unwanted/unserviceable ammunition items due to the Military Munitions Rule, be sure that your procedures are consistent with the instructions from the appropriate NICP as well as those of the state or U.S. territory in which you are located. Destruction (after authorization) is usually accomplished by burning, if allowed by local environmental quality rules.

CHAPTER 3

MANAGING YOUR LOCAL STABILITY PROGRAM

When used in conjunction with published references and direction from IOC, the guidance which follows will help you create a well managed Propellant Stability Program which will assure the safety of your propellant stocks.

3-1. SPP SAMPLE TEST RESULTS

Test results will usually be submitted by the IOC to individual installations for the specific samples prepared and shipped by that installation. The DSR cards for those lots must be annotated with the test results.

a. SPP results for lots in Stability Categories "C" and "D" are sent from IOC via electronic message worldwide: Cat "C" for informational purposes and Cat "D" as a NAR suspension message.

b. Test results for other propellant lots in storage but not submitted by your installation for test (or in Cat "C" or "D") will be included in the listing of all stockpile test results (titled "Propellant Stability Printout") which is published and distributed annually each October by IOC. This all-inclusive list is of *critical importance* to the safe management of your propellant stocks.

3-2. PROPELLANT STABILITY PRINTOUT

The following actions should be taken by each installation upon receipt of the Propellant Stability Printout.

a. Within 5 (five) working days, the Printout should be examined and **EVERY** lot which is listed as Stability Category "C" or "D" should be highlighted and cross-checked against your installation's stock records to see if any of the lots listed are on hand at your location.

b. If there are no Category "C" or "D" lots found at your installation, then no other immediate action regarding the Printout is required.

c. If a *Stability Category "D"* lot is found in your local lot file:

(1) Check the DSR card to see if Stability Category "D" status has previously been identified.

(2) Confirm that action has been taken to destroy the lot ASAP *or* that destruction has already occurred.

(3) If action has *not* been taken or completed, or if the lot has *not* been previously identified as a Category "D" lot, *immediately* begin taking steps necessary to assure rapid destruction of this propellant.

d. If a *Stability Category "C"* lot is found in your local lot file:

(1) Check the DSR card to see if Stability Category "C" status has previously been identified.

(2) Confirm that proper actions IAW SB 742-1300-94-895 have been taken to obtain disposition from IOC; if Cat "C" propellants or propelling charges are not used or sold within 6 months, IOC will take action to destroy these stocks. *You* must identify these assets properly to assure this IOC disposition action occurs.

(3) If available, review previous test results on Category "C" material to check for possible rapid depletion of stabilizer. If a significant (greater than 25%) loss of stabilizer has occurred since the previous test, then *there may be some cause for greater concern* than that which would be afforded a lot with a more gradual deterioration rate. For example, the lot tested at 0.75% RES in 1993, but in 1998 the RES is 0.52%. While we do not advocate local trend analysis of propellant stability, such indication of rapid stabilizer loss warrants increased local concern.

e. *Stability Category "A" Lots:* The remainder of your propellant and propelling charge lots in storage can be checked against the Propellant Stability Printout at a time which is convenient with *your* schedule, because you have already confirmed the presence or absence of potentially hazardous lots. In the interest of timeliness, the review of propellant lots against the Printout should be completed within 60 days of Printout receipt.

NOTE: As stated in paragraph 3-2d.(3) above, if the new test result is *significantly* lower than the previous result (loss of 25% or more RES), it is possible that this particular lot is a "bad actor" and may require special attention from the SPP manager at IOC. You should identify these lots, with your concern, to the IOC as they are identified. *Always* insist upon a closing action from the IOC for your local documentation.

f. *Lots Not Found on the Printout:* If a bulk propellant or propelling charge lot (except Navy Materiel; see Chapt. 4) on hand at your installation *is not listed on the Printout*, it may not be included in the Propellant Stability Program as required. ***You must:***

(1) First check TB 9-1300-385 "Munitions Restricted or Suspended" to look for possible inclusion of the lot in PART 1 "Munitions Restricted or Suspended."

(2) If the lot does not appear in the TB or if further guidance is desired, call the Ammunition Surveillance Division at IOC for specific guidance. The IOC will probably do one of three things:

- provide you with current stability status of the lot
- make arrangements to have the lot tested
- direct that the lot be destroyed

g. Assure the DSR card for each propellant or propelling charge lot is properly annotated with the latest stabilizer test information.

(1) Keep the DSR remark as short as possible if lot remains in Stability Category "A". If you still maintain a non-automated "hard card" DSR system, a minimal rubber stamp entry is sufficient, perhaps with the text:

"Propellant Stability Test performed (date), nn.n% RES, Stab Cat A".
(Underlined areas constitute blank lines for handwritten completion.)

(2) It is not necessary to fully annotate the results of the same test more than one time per DSR card. A proper DSR annotation for "repeat" test information could be a minimal entry consisting of remark date and a comment to the effect of **"Stab checked, Previous Entry Applies"** ...this will be sufficient to document your annual stability review.

(3) The entries may be as elaborate as you choose, but the information in 3-2g.(1) & (2) above is the minimum necessary. Entries for Stability Categories "C" and "D" will require considerably more detailed information.

3-3. DOCUMENTATION

a. Your review of installation stocks against the Printout must be documented. While the DSR entries consist of valid documentation, review of so many different records is impractical should you or someone else wish to double-check or confirm adequate review. Your working copy of the Printout should have some type of annotation or tick mark next to each lot entry reviewed which serves as confirmation that your complete review occurred.

(1) A *memorandum* should be prepared which attests that a complete and thorough review of the specific dated Propellant Stability Printout was conducted against all local assets in all owner accounts which are subject to the provisions of the Propellant Stability Program.

(2) This document should be *dated and signed by the QASAS conducting the review* and by the **QASAS in Charge**.

b. This memorandum, together with the DSR cards and your annotated working copy of the Printout, will serve as adequate assurance to anyone interested that you have taken all steps necessary to assure maximum safety of your installation's propellant stocks.

CHAPTER 4

NAVY GUN PROPELLANT SAFETY SURVEILLANCE

4-1. BACKGROUND.

Note: SW020-AE-SAF-010, Technical Manual "Safety Surveillance of Navy Gun Propellant", Policy and Procedures, 31 August 1996, is the best source for detailed information beyond the scope of this chapter.

a. The history of the Navy propellant surveillance program is very similar to that of the Army. Established at Indian Head, Maryland during the immediate post-World War I period, the Navy program was physically and technically a virtual twin of the Army program, which was begun just months later than that of the Navy in the year 1921. The oldest physical remains of both program's early days, the large, circular propellant heat chambers, appear to be built from the same design, during the same time period (1940-1941). Neither set of chambers at Indian Head nor at Picatinny are the "original" 1920's-vintage structures, which were based on steam heated chambers which proved to be insufficiently reliable.

b. Autoignition of propellant in the powder magazines aboard ship has caused the loss of many warships from the navies of various nations, most losses having occured in the first few decades of the 20th century. The risk of unstable propellant aboard ship was so great that, even after more effective stabilizers were introduced during the second decade of this century, close monitoring of all the fleet stocks was considered essential. In fact, prior to 1963, each activity and ship had its own testing oven and was required to run a 65.5^{0}C surveillance test for 60 days each year on every lot of propellant in stock. Propellants in many configurations which would be considered safe for use by the Army (such as propellant loaded into fixed rounds) were and are routinely condemned and destroyed by the Navy as too hazardous to be aboard ship, where even a minor deflagration can cost the lives of the sailors and marines aboard, such as that which occurred in the powder magazine of the USS KEARSARGE, killing 10 sailors.

c. Information necessary to assure the safety of Navy propellant stocks (and the vessels upon which they are stored) is provided to the fleet as well as storage installations (Navy coastals and SMCA locations) through the monitoring and testing of all existing Navy propellants. The Navy Gun Propellant Safety Surveillance program produces this information through its two programs, the **Master Sample Program** and the **Fleet Return Program.**

4-2. MASTER SAMPLE PROGRAM.

a. For the purposes of this Pamphlet, it is sufficient to say that the Master Sample Program is the same as the Army Master Propellant Program prior to the adoption of the Predictive Aging Test. Test procedures for the 65.5^{0}C test and minimum days to fume time are identical or virtually identical. The following are the most significant differences in the Navy Program vs Army:

(1) The term **"propellant index"** is used by the Navy *instead of* **"propellant lot"**. Do not be confused by the use of "index" when refering to Navy propellants; each index is a unique number which applies to only one lot of propellant. Use it as you would a lot number.

(2) The Navy maintains the 65.5^{0}C Accelerated Aging Test for most Navy propellants in a variety of configurations, and affixes the same *sentence* (disposition) for failed indices or lots which are loaded into fixed rounds as for bulk pack or separate loading propelling charges. Triple-base propellants are tested for stabilizer determination in lieu of the AAT. Other propellants which are *not* routinely included in the AAT are those propellants used for any calibers below 20mm, as well as some 20mm, 25mm, 30mm, and some Navy-owned ammunition that is designed and used by the Army (and included in the Army MPP)

(a) It has been demonstrated theoretically that unstable propellant in cartridge cases with a d*iameter as small as 10mm are capable of autoignition!* Aboard ship, any possibility of a magazine fire or explosion is an unacceptable risk.

(b) For example, if a lot of propellant fails the fume test (fumes in less than 30 days) but is loaded into Army 20mm rounds, the Army will take no action against these fixed round assets. If the propellant is loaded into Navy 20mm rounds, the fixed round lots into which that propellant is loaded will either be ordered destroyed by the Navy, or a retest on propellant extracted from fleet stocks may be ordered to assure that needed assets are not destroyed prematurely.

(3) The Navy maintains detailed records for each lot or index of propellant produced by or for them which identifies the final end item into which the propellant has been loaded (with the inevitable instances of information voids). The Navy is usually able to identify where their unstable propellant is located and into which end item lot it is loaded. Of course, accountability and/or inventory errors do occur, which makes the system less than 100% reliable.

b. The Navy conducts the Master Sample Program in relative anonymity, much like the Army MPP. Again like the Army, the results and records of the Master Sample Program are not disseminated to individual storage installations or the fleet, but rather are used by the chemists and technicians at Naval Surface Warfare Center, Indian Head, Maryland (IHDIV).

4-3. FLEET RETURN PROGRAM

a. While similar to the Stockpile Propellant Program in that "fielded" stocks are actually tested in addition to Master Samples, the Fleet Return Program is not nearly so extensive in operation as is the SPP. Like the SPP, individual samples are tested for remaining effective stabilizer using High Performance Liquid Chromatograph testing which is comparable to that at Picatinny Arsenal.

(1) Indian Head has been conducting an increasingly greater number of the stabilizer tests for this program using a mobile laboratory facility in conjunction with the MAERU team.

The mobile lab (a modified MILVAN) produces valid results quickly on-site, reducing the time from initial sampling to test result from several weeks to a few days.

(2) Less reliance is placed on the Fleet Return Program by the Navy than that which the Army places upon the SPP. To the Navy, this program is an adjunct to the Master Sample Program, which has amassed an impressive record in allowing the Navy to avoid any autoignition of propellant in a ship's magazine.

b. The likelihood of being called upon to prepare samples for the Fleet Return Program at the present time is not great. This program may grow, but the limited scope of the program today makes the likelihood of interaction small.

4-4. ADMINISTRATION OF NAVY PROPELLANTS

a. It may seem inconsistent that the requirement to maintain, at the installation level, known stability information does not apply toward Navy-tested propellants. Although the Navy's propellant stability management system is quite different from that of the Army, it *is* a system that works.

b. Because of their low reliance on testing which provides “percent stabilizer” for individual lots, the Navy does not routinely assign “Stability Categories” to their propellants. Don't be looking for Navy propellants on the IOC “Propellant Stability Printout”; you'll find them there on an exception basis only.

c. Be assured that the Navy, through its Gun Propellant Safety Surveillance organization at NSWC, Indian Head (IHDIV), continues to apply effective safety surveillance on its propellant assets. When an index is found to be unstable or nearing the end of its storage life, the Navy's action is very much like that of the Army.

(1) IHDIV will provides recommendations for ammunition reclassification to the Program Managers of the the various Naval ammunition programs (NAVSEA, NAVAIR & USMC). The appropriate Program Manager then makes a reclassification decision and directs the Naval Ordnance Center, Inventory Management and Systems Division (NOC/IMSD) Mechanicsburg, PA to issue a Notice of Ammunition Reclassification (NAR) for the affected index and/or complete round lots into which the propellant is loaded. You must treat this sentencing to destroy these stocks as seriously as you would an Army NAR which orders immediate destruction of Army bulk or bag charge propellant.

(2) The NAR information will be included in the next version of TWO 24-AA-ORD-010, “Ammunition Unserviceable, Suspended and Limited Use”, the Navy's suspension and restriction manual. The propellant suspension information will remain a part of the publication for several years, until the Navy is confident that no traces of the propellant remain.

4-5 DOCUMENTATION OF STABILITY LEVELS

Actual annotation of individual stabilizer levels for Navy propellant is fairly simple for the storing installation: *it isn't done*. The Navy system forces you to assume that, unless you receive notice to the contrary, the propellant lot or index is stable. There is no NSWC-Indian Head equivalent to the IOC Propellant Stability Printout. Although this system is simpler than that of the Army, it lacks the installation-level safeguards which may be more likely to assure that unstable propellant is identified and removed from storage.

a. When shipping Navy propellants, it is very important to check the TWO/suspense manual, since this will be your only source to guard against shipping unstable propellant (no DSR card annotation).

b. You should conduct an *annual review* of all Navy propellant stocks on hand (includes SMCA stocks which are under the Navy propellant program) against the TWO/suspense manual and unincorporated NARs as a "reverse" means of assuring the stability of Navy propellants.

c. **DOCUMENT** your review of Navy owned/Navy tested stocks by listing each lot reviewed and attesting that lots so listed were not found in the TWO or NAR. This document should be dated and signed by the QASAS conducting the review and by the QASAS in Charge.

CHAPTER 5

PROPELLANT REASSESSMENT PROGRAM

5-1. PROGRAM DEFINITION AND APPLICATION

a. The Propellant Reassessment Program is defined by SB 742-1300-94-895 as a program which "involves the test and evaluation of stored propellant to determine functional serviceablity prior to loading into a major item." Because most installations store little if any of the propellants which are subject to the Program, Surveillance personnel occasionally forget to apply the special provisions of this program to the limited propellant items the Program affects.

b. The Program applies to Army-owned stocks of bulk propellant and to finished but unassembled component propelling charges (such as charges for mortar and semi-fixed howitzer ammunition).

c. Prior to becoming a part of a major end item, the Army wishes to be certain the propellant meets functional performance requirements in order to avoid the possible performance failure of the complete round lot of which it will become a part. The reassessment test determines functional suitability quickly and inexpensively.

d. Propellants which are subject to reassessment testing are also included in the Propellant Stability Program and are cyclically sampled for stabilizer analysis through stockpile testing.

-- NOTE --

The stability test sometimes misleads installation personnel who forget that stability tests and reassessment tests are conducted for two different purposes and are not interchangeable.

5-2. PROPELLANT REASSESSMENT TESTS:

a. Are conducted only by request of IOC based upon requirements for future LAP or maintenance projects.

b. Consist of a variety of laboratory tests and may include a functional firing test at a proving ground.

c. Result in approval or denial of LOADING AUTHORIZATION which is valid for a finite period of time, normally two or five years.

5-3. LOADING AUTHORIZATION

a. As documented by IOC Form 210-R "Propellant Acceptance Sheet," Loading Authorization is the key element and controlling factor in the Reassessment Program. Only with

valid loading authorization may bulk propellant or component charges be assembled to complete round configuration.

b. The loading authorization affects the *Condition Code* of each lot as follows:

(1) *With* a current, valid loading authorization, the condition code of the propellant lot should be based upon results of visual inspection.

(2) When the lot has an **EXPIRED** or **UNKNOWN** loading authorization, the lot must be placed into **CC-D**, unless visual inspection warrants an unserviceable condition code.

5-4. DETERMINING NEED FOR LOADING AUTHORITY (YES or NO)

a. **NO**. Separate loading propelling charges (FSC 1320) are finished, complete end items in themselves and therefore **DO NOT** require further loading authority prior to use.

b. **NO**. Propellant which is loaded into complete rounds (such as propellant loaded into 120mm tank ammunition or *assembled* to mortar rounds) requires no further validation prior to issue or use.

c. **YES**. Loading Authority prior to use *is required* for *bulk propellant* and *component propelling charges* in FSCs **1310, 1315** and **1376**.

5-5. CONDITION CODES

Be alert and suspicious of Condition Codes assigned to propellant lots which are subject to the Reassessment Program.

a. Condition Code "D" for this material means that the Loading Authorization, as indicated on the IOC Form 210-R, has expired.

b. Any other *serviceable* Condition Code indicates that the lot *is currently authorized* for loading and use.

c. Failure to properly match the condition code with current load authority status can mislead ammunition planners when they are projecting stored assets for use.

5-6. STEPS for ISSUE or USE

a. **Receipt of Materiel Release Order from NICP**. If the item requested is propellant or a propelling charge, check first to see if the item is subject to the Propellant Reassessment Program. If the answer is yes, there is a good possibility that you will have already pre-arranged the MRO through a telephonic query from the NICP; you will have been expecting this MRO. Whether pre-arranged or not, *first* confirm upon MRO receipt that the lot requested is subject to the Program and is actually on hand in the requested condition code at your installation.

b. **Review DSR file**. The DSR card will indicate the loading authority expiration date. This in itself is not sufficient to allow issue. You must additionally have on file (with the DSR card if hard copy system is still in use) a copy of the IOC Form 210-R (Propellant Acceptance Sheet) which is the authenticating document for loading authority.

(1) *Assure* lot has current Cyclic inspection to meet shipping or use requirements.

(2) *Review* date of loading authority on IOC Form 210-R. Loading Authority must be valid for a length of time sufficient to meet the lot's intended purpose.

-- For example, if only seven months remain on the loading authorization and you believe the item will not reach its intended destination in time for use, then you must coordinate with the appropriate Item Manager at IOC or with the Ammunition Surveillance Division at IOC (who will in turn coordinate with the item manager).

(3) *Locally validate* loading authority expiration date on the IOC Form 210-R. On occasion, incorrect dates are annotated on the forms, or they are not specific as to level of pack (which affects expiration date). Remember that loading authority **NEVER** exceeds **FIVE YEARS** from date of original assessment or reassessment and, if the propellant is composition type M5, M10, or M26-series, the time limit never exceeds **TWO YEARS**.

(a) Lots stored in metal containers (cans or drums) or in metal lined wood containers (Level A pack) are authorized for loading for **FIVE YEARS** from date of test. (Except for propellants noted in para 5-6b(3) above)

(b) Lots stored in fiber drums (Level C pack), regardless of propellant composition, are authorized for loading for **TWO YEARS** from date of test.

(c) Your validation will consist of running a “sanity check” against the assigned expiration date (i.e., a date greater than five years from assessment, or one which doesn't meet time standards in (a) and (b) above).

(4) **All OCONUS shipment** of bulk propellant or component charges **MUST** be cleared through IOC Ammunition Surveillance Division prior to release for shipment.

(5) Should loading authority for the lot be expired or have insufficient time remaining to meet user requirements, place lot into the appropriate condition code (CC-D if expired loading authority) and contact IOC Ammunition Surveillance Division for instruction.

(6) Processing for shipment, after the above requirements have been met, *can now continue* as per any “normal” item shipment.

5-7. TEST INITIATION

Reassessment test will *always* be initiated by IOC, not the storing installation. It is very important that bulk propellant and component charges for which loading authorizations have expired be identified by the proper condition code (CC-D) and informative Defect Code in your Standard Depot System (SDS) input. Whenever a lot is selected for reassessment test, the Ammunition Surveillance Division at IOC will provide you complete instructions, to include sample selection, packing/marking, and shipping instructions.

5-8 REVIEW OF RECORDS

a. At least *once every two years* the DSR and SDS (or other automated format) records for all bulk propellant and component charges should be reviewed. You may wish to do it annually during reconciliation with the propellant stability listing.

(1) Confirm that the assigned condition codes match the load authority status of each lot.

(2) Confirm that the most recent copy of the IOC Form 210-R, Propellant Acceptance Sheet, is available and on file. If it is not, request a copy from IOC, Ammunition Surveillance Division.

(3) Assure the result of the most recent propellant stability test is annotated. If any of this material is in a Stability Category other than "A", it will probably not be considered for use in loading. IOC should be queried for possible disposal action.

b. The date for loading authorization may be tracked on SDS by using the Shelf Life Code or Date of Next Inspection block to automatically prompt you when it expires. If this method is used, be sure it is documented in your local propellant procedures.

CHAPTER 6

GENERAL PROPELLANT MANAGEMENT

6-1. PROPELLANT TYPES OF GREATEST CONCERN

a. Some propellant types are more likely than others to become unstable during their expected normal storage life. Propellant formulations which historically have proven to be the most dangerous due to instability are types M10 and various versions of IMR powders. This does *not* mean that little concern should be shown for other propellant types. It *does* mean that both M10 and IMR powders have repeatedly proven themselves to be "bad actors" and have self-ignited on multiple occasions at a variety of storage locations. Pay particular attention to these types, particularly when stored in bulk pack configuration; **NEVER** allow them to be retained at your installation without a current, valid stability test. Since test intervals are generally undefined, proper stock retention may require the judgement of the QASAS in Charge.

b. *Single Base Propellants.* Formulations M10 and IMR are the single base propellants which are known to exhibit the greatest depletion of stabilizer (DPA for these and most single-base types). While not commonly stored in bulk configuration away from a LAP plant, they are still occasionally found in storage at non-manufacturing facilities, and they remain the most likely types to ever reach Stability Category "D". (Remember that Navy propellants also degrade, but the Navy generally does not assign Stability Categories; See NAVY Chapter 4).

c. Bulk storage or bulk-packed component storage of these items are of particular concern. Inspect the condition of the packaging for these items to be certain of package integrity and that they have not been exposed to moisture. Both these conditions may lead to rapid degradation of the propellant. Such conditions should prompt a request for testing the stability of such propellants.

6-2. OTHER PROPELLANTS AND PROPELLING CHARGES

a. As a general rule, single base propellant types M6 and M1 will exhibit similar aging profiles. The Army continues to maintain a large volume of aged M6 propellant which results in many more lots of M6 with lower levels of stability.

b. *Propelling Charges.* Most of the propellant lots which installations are required to monitor are assembled to separate loading propelling charges. Most propelling charges consist of M1 or M6 single base propellant, although triple base (such as M30) is common in some charges. Be sure to determine if the charge is of single or dual granulation. Check the ADC, too!

c. *Mortar Propellants.* When reviewing ammunition lot files, don't fail to look closely at FSCs 1310 and 1315 for bulk packaged mortar propellants.

(1) Mortar propellants (usually double base) are normally found already assembled to complete rounds and *WHEN SO CONFIGURED* require no special concern for stability.

(2) When packaged in bulk, mortar component charges require the same stability monitoring as do separate loading charges or bulk propellants.

d. Bulk packaged artillery component charges, such as the M67 charge for 105mm semi-fixed rounds (FSC 1315), also require stability monitoring.

6-3. RELEASE OF PROPELLANT FOR SHIPMENT

Propellant in bulk or that which is loaded/prepared into any configuration which makes it subject to the requirements of the Propellant Stability Program (propelling charges, component charges, bulk increments, etc.) *must* be verified with its current safe stability level prior to release for shipment beyond your installation boundary.

a. *Any* exceptions to the above policy must be authorized in writing from the Ammunition Surveillance Division, IOC.

b. Exceptions may include very low NC content propellants such as LOVA, or other composite types.

6-4. PROPELLANT GENERATION-DEMILITARIZATION

a. Generation of propellant as a result of demilitarization operations requires careful planning and close monitoring.

b. Propellant which has been uploaded in fixed rounds for many years may not have been retained in the Master Propellant Program, and it is highly unlikely to have had stockpile samples drawn for test.

c. Chances are good that the propellant to be generated from demil will have an absolutely *unknown stabilizer content*.

c. Within the IOC, the Commanding General's Policy Memo #41 (19 June 1998) explains the "Demilitarization Priorities for Excess and Obsolete Conventional Ammunition." Figure 1 graphically explains the decisions which must be made regarding propellant generation in order to comply with that policy. It is highly recommended that the Figure 1 Decision Chart be used at Non-IOC locations as well.

PROPELLANT DOWNLOAD DECISION CHART

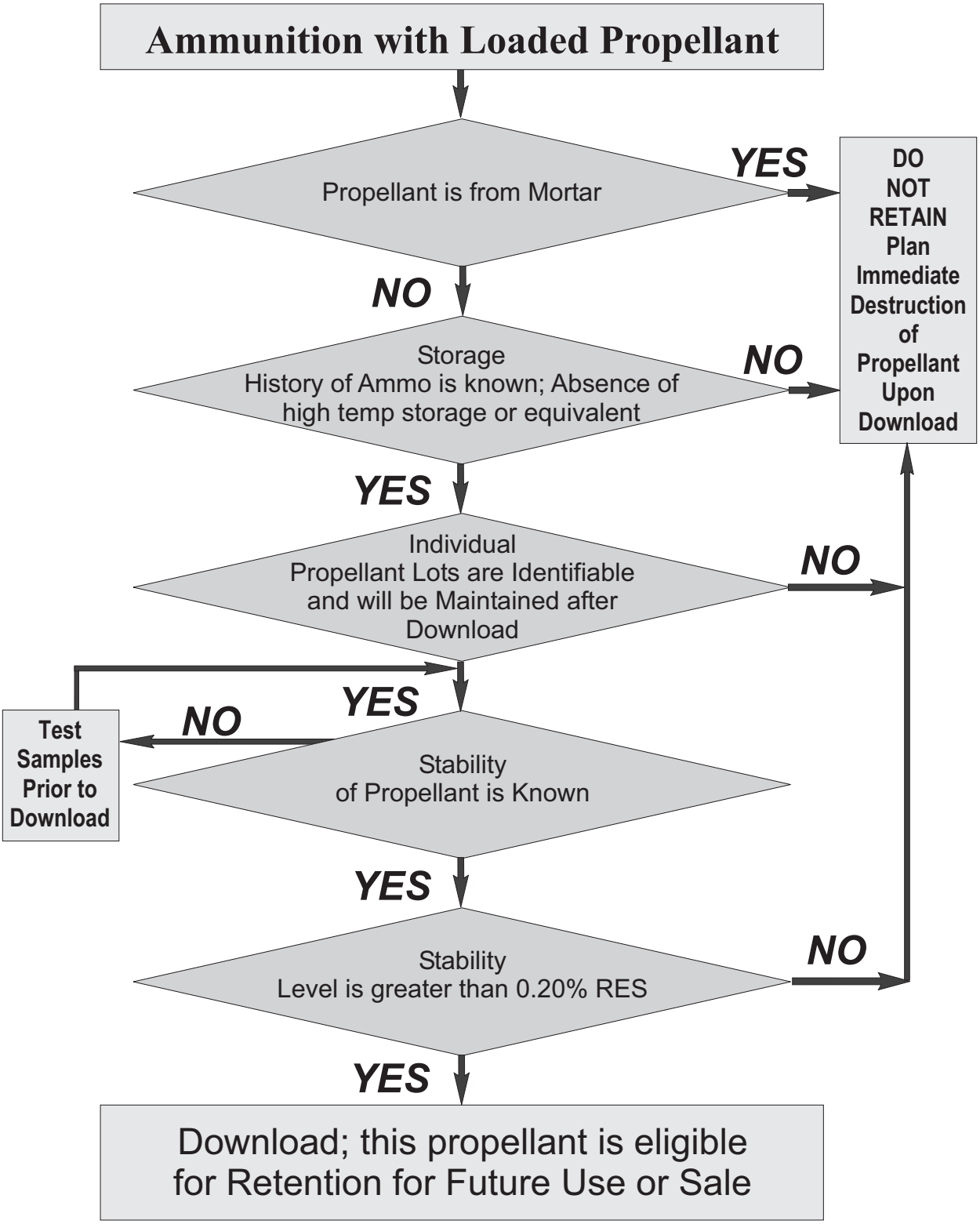

Figure 1

6-5. DEMILITARIZATION PLANNING ACTIONS.

a. Recommended actions prior to the start of any demil operation which results in the generation of propellant include:

(1) Review DSR cards of complete round lots to determine the propellant type, age, and lot number. Check the ADC to verify information and to ascertain if bag charges are/are not dual granulation.

(2) Compare lot numbers with Propellant Stability Printout. If listed, take further action regarding lot retention based on known stability. If not listed in Printout (which is probably the case), determine disposition of generated propellant in advance. The likely planned action for the propellant will be to destroy locally on a regular (daily, weekly, etc.) basis until completion of demil operation.

(a) If propellant stability cannot be determined prior to operation and propellant is to be destroyed locally as it is generated, assure the destruction takes place within 60 days of collection from breakdown of complete rounds.

(b) If propellant stability cannot be determined prior to operation and propellant is to be retained for greater than 60 days for any reason (reuse, nitrocellulose extraction, shipment to another location for destruction, destruction delay, etc.), a request for Stability Test must be made to IOC, Ammunition Surveillance Division prior to start of operation.

-- WARNING --

Remember to take special care if generated propellant is of types M10 or IMR. These propellants have been known to self ignite soon after reconstitution into bulk pack configuration.

b. *Funding* to pay for the costs associated with propellant stability management for demilitarization operations should be derived from the demil job itself. Ammunition Surveillance personnel must assure that these requirements and costs are included in installation planning for all demil operations which result in the generation of propellant.

6-6. SALE OF PROPELLANT TO COMMERCIAL VENDOR

a. Propellant may not be released from government custody unless stability level is known to be be safe for continued storage or use (Stability Categories A and C).

(1) If original lot or index numbers are not known, propellant cannot be sold or shipped because stability level cannot be verified. Lot integrity must be maintained for propellant which leaves government custody.

(2) New developments regarding the reuse and reprocessing of propellant may result in a *special situation* which will require specific guidance from IOC or higher headquarters. For example, a *special situation* may exist if propellant of unverifiable stability level is to be processed by a commercial vendor within the boundaries of the propellant's current government storage area.

b. As a rule of thumb, single and double base propellants should have been tested for stability within one year of sale or release to commercial vendor. A period of two or three years is sufficient for triple base and composite propellants. If in doubt, the suitability of most recent test will be determined by the Propellant Stability Program manager at IOC.

APPENDIX A

ABBREVIATIONS/ACRONYMS

AAP . . . . . Army Ammunition Plant
AAT . . . . . Accelerated Age Test
AMC . . . . . U.S. Army Materiel Command
ARDEC . . . . . Armament Research and Development Center (Picatinny Arsenal)
ASRP . . . . . Ammunition Stockpile Reliability Program
CC . . . . . Condition code
CONUS . . . . . Continental United States
DPA . . . . . Diphenylamine
DSR . . . . . Depot Surveillance Record
EC . . . . . Ethyl Centralite
FSC . . . . . Federal Supply Class
IOC . . . . . Industrial Operations Command
IMR . . . . . Improved Machine Rifle
LOVA . . . . . Low Vulnerability Ammunition
LRTAO . . . . . Logistics Review and Technical Assistance Office
MAERU . . . . . Mobile Ammunition Evaluation and Renovation Unit
MPP . . . . . Master Propellant Program
MRO . . . . . Materiel Release Order
NAR . . . . . Notice of Ammunition Reclassification
NC . . . . . Nitrocellulose
NG . . . . . Nitroglycerin
NQ . . . . . Nitroguanidine
NICP . . . . . National Inventory Control Point
NSWC/IH . . . . . Naval Surface Warfare Center, Indian Head
OCONUS . . . . . Outside Continental United States
PAS . . . . . Propellant Acceptance Sheet
PI . . . . . Periodic Inspection
PRP . . . . . Propellant Reassessment Program
PSP . . . . . Propellant Stability Program
QASAS . . . . . Quality Assurance Specialist (Ammunition Surveillance)
RES . . . . . Remaining Effective Stabilizer
SIP . . . . . Safe Interval Prediction
SMCA . . . . . Single Manager for Conventional Ammunition
SPP . . . . . Stockpile Propellant Program
TB . . . . . Technical Bulletin
TM . . . . . Technical Manual
USADAC . . . . . U.S. Army Defense Ammunition Center

APPENDIX B

RULES FOR PROPELLANT MANAGEMENT

1. SPECIAL WARNINGS

a. Be constantly aware that PROPELLANT MAY BE THE MOST DANGEROUS COMMODITY on your installation.

b. Carefully monitor the status of bulk pack quantities of M10 propellant and IMR powder at all times. Assure tests are timely and rate of deterioration is not too rapid. When in doubt, call IOC.

c. Require that stabilizer data be maintained for ALL propellant (except Navy), even that (ESPECIALLY that) belonging to various 11-series account holders. ALL must be included in the Propellant Stability Program.

d. Remember that Navy propellant is monitored for stability but uses a different reporting system than the Army. Navy Propellant indices should be checked against the Navy Suspense and Restriction manual and latest NARs.

e. During Magazine Inspections, be on the lookout for unreported stacks of bulk propellant or propelling charges. Be particularly cautious of RDT&E stocks and other "Special Purpose" accounts.

f. Prior to release of any propellant or propelling charge lot for shipment, confirm current stability level

2. LOT IDENTIFICATION

a. Identify ALL propellant stocks on hand at the installation, regardless of owner.

b. Request demil authorization for lots "UNKNOWN" and "NONE". These lots represent a potential safety hazard since stabilizer levels cannot be determined. There are NO stockpile requirements for these lots.

c. "LOT MIXED" as an identifier for propellant or propelling charges is a potentially unsafe practice and is *prohibited* from use.

d. Lot numbers are prone to transcription errors; information on Ammunition Data Cards is occasionally incorrect. *Assure* that any lot which lacks stability information is properly researched for correct identification; the container or charge bag is usually marked with the *correct* lot number.

3. PROPELLANT STABILITY PRINTOUT

a. Upon receipt of the "Propellant Stability Printout" from IOC, check ALL Stability Category "C" and "D" lots against your propellant stock records.

b. Assure all propellant and propelling charge lots have known stability levels, and that they are annotated on the DSR cards.

c. Maintain sufficient documentation to verify that all required stability reviews and annotations have been completed.

4. REASSESSMENT/LOADING AUTHORIZATION

a. Remember to differentiate between stability testing and reassessment testing. Stability Category "A" propellant can still be Condition Code "D" requiring reassessment.

b. Place into Condition Code "D" those bulk propellants and component charges for which the Loading Authorization has expired (but are otherwise serviceable).

c. If unserviceable for visual/physical reasons, place propellant and component charges into the appropriate unserviceable condition code REGARDLESS of loading authority date. If loading authority has expired and lot is in unserviceable code, assure defect code is included to indicate expired load authority.

d. Request a copy of the latest PAS (IOC Form 210-R) from IOC, Ammunition Surveillance Division, if unavailable at your installation.

e. When shipping bulk propellant or component charges, be sure to include the Propellant Acceptance Sheet along with the DSR card.

5. DEMILITARIZATION

a. Determine stabilizer level of lots to be generated prior to demil or teardown operation.

b. Maintain lot identity for propellant generated from fixed rounds.

c. DESTROY propellant generated in bulk from demil operations as quickly as possible (within 60 days), unless stability is known and at a safe level.

APPENDIX C

PROPELLANTS & CHARGES IN THE SPP

The following list contains identification of most of the bulk propellants, separate loading propelling charges, component charges, and incidental propellant-bearing components which may be in the SMCA inventory that are subject to the rules and direction of the Stockpile Propellant Program.

NSN	DODIC	NOMENCLATURE
1145-00-103-8071	DX23	CHARGE,PROPELLING,155MM
1145-00-140-6685	DX28	CHARGE,PROPELLING,155MM
1145-00-140-6779	DX29	CHARGE, PROPELLING, 155MM
1310-00-028-4981	B622	CHARGE, PROP. INCR , M3A1 BAG (M8PROP)F/60MM
1310-00-826-5395	BX14	CHARGE, PROPELLANT INCR(M8 PROP)M182F/60MM
1310-00-837-2906		PROPELLANT INCREMENT
1310-00-854-6648	BX08	CHARGE,PROP INCR M181 F/60MM M302E1
1310-01-050-8896	ZZDT	CHARGE, PROPELLING, M10 PROP F/60MM M204
1315-00-028-4982	C240	CHG, PROP INCR, M1A1 FULL(BAG 6) F/81MM M1 & M29
1315-00-028-4983	C239	CHG, PROP INCR, M2A1 FULL (BAG 4) F/81MM M301A2
1315-00-028-5009	C709	CHARGE, PROPELLING, 4.2 INCH 25.5 RINGS/ CHARGE (M6)
1315-00-038-4983	C239	CHARGE, PROPELLANT INCREMENT, M2A1 & HOLDER, M3
1315-00-126-9035		PROPELLANT POWDER, M6 F/90MM CTG, M82
1315-00-128-4952	C241	PROPELLANT INCREMENT, M5 F/81MM
1315-00-141-0237	C773	CHG, PROP, 120MM, M45, FULL NFL (BAGGED 6) F/GUN M58
1315-00-152-9912	C437	CHARGE, PROPELLING, 105MM M121 (XM121) ZONED
1315-00-220-2362		CHARGE, PROPELLING, 81MM
1315-00-351-7910	ZARG	HALF INCR,M8 PROP F/PROP CHG M36/M36A1 F/4.2 INCH
1315-00-351-7911		FIVE INCR BUNDLE F/PROP CHG M36/36A1A1 F/4.2 INCH
1315-00-351-7912		INCREMENT, SINGLE F/CHG, PROP. M36/36A1 F/4.2 INCH
1315-00-351-7914	CX30	BAG LOADING ASSY 5 INCR. BAG F/CHG PROP M36 F/4.2 INCH
1315-00-370-3548	C021	INCREMENT A, M9 PROP, F/ CHG PROP M90A1 F/81MM
1315-00-378-9841	C022	INCREMENT B, M9 PROP, F/ CHG PROP M90A1 F/81MM
1315-00-425-0725	C020	CHARGE, PROPELLING, M185, M9 PROP F/81MM
1315-00-425-6040	C873	CHARGE PROPELLING, M36A1, M8 PROP, F/4.2 IN
1315-00-431-3444	C872	CHARGE, PROPELLING, M82 NFL F/90MM CTG
1315-00-434-5508	C279	CHARGE, PROPELLING, M90A1 FULL F/81MM
1315-00-821-6665	CX69	HALF INCR F/PROP CHG, M36/M36A1 F/4.2 INCH
1315-00-821-6685	CX30	BAG LOADING ASSY. M9 PROP F/CHG PROP M36A1
1315-00-825-1384	C436	CHARGE, PROPELLING,M67, WHITE BAG F/105MM
1315-00-825-1401	C434	CHARGE, PROPELLING,M1, FULL, WHITE BAG F/105MM
1315-00-826-5393	CX02	PROP FIVE INCR BUNDLE F/PROP CHG M36/ M36A1 F/4.2 INCH
1315-00-826-5401		INCREMENT, M1A1, M8 PROP F/81MM
1315-00-826-5404	C239	CHG PROP ,M2A2 FULL M2A1 INCR F/81MM
1315-00-826-5422		INCREMENT, CHARGE, PROPELLING, M36 SERIES
1315-00-828-7444	C873	CHG, PROP, M36A1, M8 PROP F/4.2 IN

NSN	DODIC	NOMENCLATURE
1315-00-828-7465	C435	CHARGE, PROPELLING, M6 WHITE BAG F/105MM
1315-00-837-3246		CHARGE, PROPELLING F/75MM
1315-00-854-6645	C019	CHARGE, PROPELLING, M5,M9 PROP F/81MM
1315-00-854-6646	CX47	CHARGE PROPELLING,M9 PROP F/81MM, M90 INCREMENT
1315-00-883-1472	CX46	CHARGE PROPELLING, M90, INCR A F/81MM
1315-00-965-0841	C239	CHARGE, PROPELLANT,M2A1 INCR, M8 PROP F/81MM
1315-00-A01-0740	C019	PROPELLANT INCREMENT M5 F/81MM
1315-00-D00-5278		PROPELLANT, M8, FRONT ASSEMBLY
1315-00-D00-8438		CHARGE, PROPELLING,105MM,PXR200
1315-00-D00-8589		BASE CHARGE ASSY, JA-2 PROP., 19 & 7 PERFORATION
1315-00-D00-8693		CHARGE, PROPELLING M230 F/120MM MORTAR
1315-00-D00-8733		CHARGE, PROPELLING F/120MM M57 WHITE BAG
1315-00-D00-8734		CHARGE, PROPELLING F/120MM M57 BLUE BAG
1315-00-D00-9891		CHARGE, PROPELLING, MODIFIED M230
1315-01-030-0442		PROPELLANT GRAIN, M5 FLAKE PROP,F/90MM
1315-01-050-8882	C043	CHARGE, PROPELLING M205, M10 PROP F/81MM
1315-01-050-8906		BAG LDNG ASSY, M9 PROP F/ PROPCHG M36A2 F/4.2 IN
1315-01-055-5519		CHARGE, PROPELLING F/90MM CTG M590
1315-01-055-8590	C716	CHARGE,PROPELLING,M36A2,M8 PROP F/81MM
1315-01-066-2790	C427	CHARGE, PROPELLING, M1 PROP, BAGGED,FULL, F/105MM
1315-01-122-8591		CHARGE PROPELLING,M1 PROP F/105MM
1315-01-223-7299		CHARGE PROPELLING F/120MM M830/831
1315-01-233-2316		CHARGE, PROPELLING, M30 PROP F/105MM
1315-01-237-9775	C436	CHARGE, PROPELLING, M67 F/105MM
1315-01-255-9037		PROPELLANT GRAIN F/105MM HERA XM912
1315-01-290-1597		CHARGE, PROPELLING, M219 F/CTG 81MM
1315-01-290-1598		CHARGE PROPELLING,M218 (M38 prop)F/81MM SMK M819
1315-01-329-2575	C044	CHARGE, PROPELLING, M220 F/81MM
1315-01-336-7185	C436	CHARGE, PROPELLING, M67 F/105MM
1315-01-337-8940	C436	CHARGE, PROPELLING, M67 F/105MM
1315-01-363-6509		CHARGE PROPELLING, W/REDUCER F/105MM CANNON
1315-01-413-9822	C436	CHARGE, PROPELLING, M67 F/105MM
1320-00-006-9654	D479	CHARGE, PROPELLING, M189 W/PRIMER F/152MM
1320-00-009-5316	D018	CHARGE ASSEMBLY,EXPULSION, M10 PROP F/155MM
1320-00-014-2451	D661	CHARGE, PROPELLING,XM188E3 F/ 8 IN 55 CAL
1320-00-028-4369	D480	CHARGE, PROPELLING,M19 W/O PRIMER F/155MM
1320-00-028-4371	D480	CHARGE, PROPELLING,M19 W/PRIMER F/155MM
1320-00-028-4374	D675	CHARGE, PROPELLING, M1 W/O PRIMER F/8 IN
1320-00-028-4375	D676	CHARGE, PROPELLING, M2,W/O PRIMER F/8 IN
1320-00-028-4378	D676	CHARGE, PROPELLING, 8 INCH M2, 2 INCR W/PRIM F/HOW
1320-00-028-4381	D715	CHARGE, PROPELLING, M43 W/PRIMER F/280MM
1320-00-028-4873	D540	CHARGE, PROPELLING, M3 W/PRIMER F/155MM
1320-00-028-4876	D540	CHARGE, PROPELLING, M3 W/O PRIMER F/155MM
1320-00-028-4877	D541	CHARGE, PROPELLING, M4 F/155MM

NSN	DODIC	NOMENCLATURE
1320-00-028-4878	D541	CHARGE, PROPELLING, M4A1 WB W/O PRIMER F/155MM
1320-00-028-4879	D541	CHARGE, PROPELLING, M4A1 W/PRIMER F/155MM
1320-00-070-4485	D662	CHARGE, PROPELLING, M188A1 WHITE BAG F/8 IN
1320-00-106-8549	D362	CHARGE, PROPELLING, XM199 F/175MM
1320-00-113-8006	D676	CHARGE, PROPELLING,M2, WB, W/O PRIMER F/8 IN
1320-00-143-6847	D533	CHARGE, PROPELLING, M119 , W/O PRIMER F/155MM
1320-00-182-3030	D361	CHARGE, PROPELLING, M86A2 W/PRIMER F/175MM
1320-00-308-5539	D676	CHARGE, PROPELLING, M2 F/8 IN
1320-00-308-5555	D676	CHARGE, PROPELLING, M2 F/8 IN
1320-00-451-4907	D536	CHARGE, PROPELLING, M124,M6 PROP, F/175MM
1320-00-542-0132	D675	CHARGE, PROPELLING, M1 W/PRIMER F/8 IN
1320-00-628-7741	D674	CHARGE, PROPELLING M80 F/8 IN
1320-00-767-9441	D534	CHARGE, PROPELLING, XM119 W/PRIMER F/155MM
1320-00-775-1533	D536	CHARGE, PROPELLING, M124 W/PRIMER F/175MM
1320-00-783-7980	D017	CHARGE ASSEMBLY, EXPULSION,M10 PROP F/8 IN
1320-00-892-4201	D361	CHARGE, PROPELLING, M86 W/PRIMER F/175MM
1320-00-926-3986	D361	CHARGE, PROPELLING, M86A2 W/PRIMER F/175MM
1320-00-935-1922	D540	CHARGE, PROPELLING, M3A1 W/O PRIMER F/155MM
1320-00-935-1923	D541	CHARGE, PROPELLING, M4A2 W/O PRIMER F/155MM
1320-00-995-8022	D537	CHARGE, PROPELLING, XM115 F/155MM
1320-00-D00-2569		CHARGE, PROPELLING, XM224 MOD REAR F/155MM
1320-00-D00-2570		CHARGE, PROPELLING, ,XM224 MOD FWD F/155MM
1320-00-D00-7858		CHARGE ASSEMBLY,EXPULSION,M10 PROP
1320-00-D00-7858		EXPULSION CHARGE ASSEMBLY
1320-00-D00-9441		EXPULSION CHARGE ASSEMBLY F/XM982
1320-00-D00-9876		CHARGE, PROPELLING, L6A1 W/O PRIMER F/155MM
1320-00-D01-0012		CHARGE, PROPELLING, XM232 W/XM231 CASE
1320-00-D01-0051		PROPELLANT GRAIN, AFT F/XM982
1320-00-D01-0063		EXPULSION CHARGE ASEMBLY
1320-00-X11-0326		CHARGE,PROPELLING, M203E2 F/155MM
1320-00-X11-0355		CHARGE, PROPELLING, XM216A F/155MM
1320-00-X11-0359		CHARGE, PROPELLING, XM216B F/155MM
1320-00-X11-0609		CHARGE, PROPELLING, XM224 BASE INC.F/ 155MM
1320-00-X11-0610		CHARGE, PROPELLING, XM224 FWD INC F/155MM
1320-00-X11-0718		CHARGE, PROPELLING, FH70, CHG 7 F/155MM
1320-01-014-2451	D661	CHARGE, PROPELLING, M188E3 FULL F/ 8 IN 55 CAL
1320-01-015-6243	D010	CHARGE ASSEMBLY, EXPULSION F/8 INCH PROJ XM172
1320-01-020-8938	D532	CHARGE, PROPELLING,M203 SERIES RB F/155MM
1320-01-033-9394	D532	CHARGE, PROPELLING, M203 W/O PRIMER F/155MM
1320-01-041-9890	D531	CHARGE, PROPELLING, XM201E5 F/155MM
1320-01-051-4132	D533	CHARGE, PROPELLING, M119A F/155MM
1320-01-052-1317	ZZKC	CHARGE ASSEMBLY, EXPULSION, M10 PROP, F/155MM
1320-01-054-5107		PROPELLANT GRAIN F/155MM RAP M549
1320-01-057-8440		PROPELLANT GRAIN, F/155MM M549

NSN	DODIC	NOMENCLATURE
1320-01-070-4485	D662	CHARGE PROPELLING, M188A1 WB W/O PRIMER F/ 8 IN
1320-01-070-4486	D662	CHARGE, PROPELLING, M188A1 WB W/O PRIMER F/8 IN
1320-01-077-1312		PROP GRAIN, XM650E5 F/HERA 8 IN M650 (1320-D624)
1320-01-093-6856	D533	CHARGE, PROPELLING, M119A2 W/O PRIMER F/155MM
1320-01-112-1624	D032	CHARGE ASSY, EXPULSION, M10 PROP F/155MM
1320-01-152-5613		CHARGE PROPELLING WB F/155MM
1320-01-164-3486	D030	CHARGE ASSY, EXPULSION, M10 PROP F/155MM PROJ.
1320-01-186-5653		PROP GRAIN F/FWD RKT MTR F/155MM M549A1 2CLASS
1320-01-186-6564		PROP GRAIN F/AFT RKT MTR F/155MM M549A1 2CLASS
1320-01-187-7651		PROP GRAIN F/FWD RKT MTR F/155MM M549A1 1CLASS
1320-01-187-7652		PROP GRAIN F/AFT RKT MTR F/155MM A549A1 1 CLASS
1320-01-202-3989	D532	CHARGE, PROPELLING,M203 SERIES, RB F/155MM
1320-01-202-8938	D532	CHARGE, PROPELLING, M203A1 F/155MM
1320-01-231-7231	D662	CHARGE, PROPELLING, M188A1 WB W/O PRIMER F/8 IN
1320-01-285-0134	D471	CHARGE, PROPELLING, XM216 F/155MM
1320-01-285-3066	D470	CHARGE, PROPELLING, XM215 F/155 MM
1320-01-285-6415	D472	CHARGE, PROPELLING, XM 216, INCR B F/155MM
1320-01-307-3952	D540	CHARGE, PROPELLING, M3A1 GB W/O PRIMER F/8 IN
1320-01-307-3953	D541	CHARGE, PROPELLING M4A2 WB W/O PRIMER F/155MM
1320-01-310-4857	D533	CHARGE, PROPELLING, M119A2 F/15MM
1320-01-312-9058		CHARGE PROPELLING,M119A1 F/155MM
1320-01-312-9059		CHARGE PROPELLING,M3A1 GB W/O PRIMER F/155MM
1320-01-317-2382		CHARGE PROPELLING,M4A2 W/O PRIMER F/155MM
1320-01-320-0966		CHARGE ASSEMBLY, EXPULSION, M10 PROP F/155MM
1320-01-334-9448		CHARGE ASSEMBLY, EXPULSION, M10 PROP F/155MM
1356-01-106-5985		PROPELLANT, INITIATING F/TORPEDO, MK48 MOD 0
1376-00-006-9652		PROPELLANT POWDER , M6 F/ 75MM
1376-00-006-9653		PROPELLANT POWDER, M6 F/105MM
1376-00-009-0041		PROPELLANT POWDER, M1,SP F/105MM, M67 PROP CHG
1376-00-009-0042		PROPELLANT POWDER, M1,MP F/105MM, M67 PROP CHG
1376-00-009-0043		PROPELLANT POWDER, M10,SP F/57MM WEB 0,025
1376-00-009-0044		PROPELLANT POWDER,M10,SP F/57MM
1376-00-009-0045		PROPELLANT POWDER,M30E1 F/155M PROP CHG XM123
1376-00-009-0046		PROPELLANT POWDER,M30A1, MP F/ 8 IN PROP CHG
1376-00-053-9367		PROPELLANT POWDER,M30 F/ 90MM CARTRIDGE M431
1376-00-053-9371		PROPELLANT, POWDER,M30 F/105MM M728E1
1376-00-068-5086		PROPELLANT POWDER, M30,MP F/105MM M392A2
1376-00-084-5010		BENITE POWDER, SMOKELESS
1376-00-126-9035		PROPELLANT POWDER, M6 F/CARTRIDGE 90MM
1376-00-279-8760		PROPELLANT POWDER, M6 F/90MM CARTRIDGE
1376-00-432-2101		PROPELLANT POWDER, M30 F/90MM CTG
1376-00-432-2191	XX10	PROPELLANT POWDER, M30 F/CTG 90MM M318/M353
1376-00-451-2881		PROPELLANT POWDER, M1 RECLMED F/155MMPROP CHG
1376-00-451-2882		PROPELLANT M2,MP, RECLAIMED F/165MM M123A1

NSN	DODIC	NOMENCLATURE
1376-00-451-2883		PROP POWDER M6,SP, RECLAIMED F/CTG 90MM
1376-00-451-4906		RECLAIMED PROPELLANT F/SMALL ARMS (IMR) (M1)
1376-00-451-4907		PROPELLANT POWDER, M6 F/175MM PROP CHG M12M4 GB
1376-00-476-9357		PROP POWDER,M10 F/57MM, 75MM AND 105MM RECLAIMED
1376-00-653-9822		PROPELLANT, BALLISTITE,BULK, N-1 SHEETS
1376-00-653-9825		PROPELLANT, BALLISTITE,BULK, N-5 SHEETS
1376-00-694-2017		PROPELLANT POWDER F/PISTOL P4768
1376-00-772-1370		PROPELLANT POWDER F/EXPL SCENT KIT,CANINE
1376-00-854-6659		PROPELLANT POWDER,M17, TYPE 2 F/90MM, M318A1
1376-00-854-6710	CX52	PROPELLANT POWDER,M26 F/CTG 106MM HEAT M344A1
1376-00-871-2829		PROPELLANT POWDER,M1,MP F/VARIOUS TYPES
1376-00-871-2889		PROPELLANT POWDER F/155MM M4A1
1376-00-937-3922		PROPELLANT POWDER, BENITE 9 IN. LENGTH
1376-00-937-3940		BENITE 10 IN. LENGTH F/PRIMER, M83
1376-00-937-3978		PROPELLANT POWDER BENITE STRANDS 11.437 IN LENGTH
1376-00-937-3995		BENITE 17 IN. LENGTH F/PRIMER, M80A1
1376-00-979-6091		PROP POWDER, PYROCELLULOSE, STANTON, STARTER
1376-00-979-6092		PROP POWDER, PYROCELLULOSE, STANTON, STARTER
1376-00-987-6802		PROPELLANT GRAIN, 10 IN. LENGTH
1376-01-030-0442		PROPELLANT,M5, SP,FLAKE, F/90MM CHG, M82
1376-01-048-9868		PROPELLANT POWDER,IMR 5010, F/ CTG CAL .50 BALL M33
1376-01-049-1448	C558	PROPELLANT POWDER, WC 846 F/7.62MM TRACER M62
1376-01-049-1449		PROPELLANT POWDER, WC846 F/7.62MM BALL M80
1376-01-049-1450		PROPELLANT POWDER, WC846 F/7.62MM MATCH M118
1376-01-049-1451		PROPELLANT POWDER, IMR 8028 F/5.56MM TR, M196
1376-01-049-1452		PROPELLANT POWDER, IMR 7383 F/50 CAL SP TR, M48A2
1376-01-049-1453		PROPELLANT POWDER,IMR 8097 F/7.62MM GRN RIFLE M64
1376-01-049-1454		PROPELLANT POWDER,IMR 5010 F/CTG, CAL 50 TR M17
1376-01-049-1455		PROPELLANT POWDER,IMR 4895 F/CTG, CAL 30 BALL, M2
1376-01-049-1456		PROPELLANT POWDER,IMR 4895 F/CTG, CAL 30 TR
1376-01-049-1457		PROPELLANT POWDER,IMR 4895 F/7.62MM MATCH, M118
1376-01-049-1458		PROPELLANT POWDER,HPC-4 F/7.62MM CTG GR RIFLE M64
1376-01-049-1459		PROPELLANT POWDER,HPC-8 F/7.62MM FRANG., M160
1376-01-049-1460		PROPELLANT POWDER,HPC-13 F/5.56MM BLANK, M200
1376-01-049-1461		PROPELLANT POWDER,SR4900 F/CTG CAL 30, BLNK M1909
1376-01-049-1462		PROPELLANT POWDER,SR 8231 F/CTG, 7.62MM BLNK, M82
1376-01-049-1463		PROPELLANT POWDER,CMR 100 F/CTG, CAL 30, BALL, M2
1376-01-049-1464		PROPELLANT POWDER,WC 820 F/CTG, CAL 30, BALL, M1
1376-01-049-1465		PROPELLANT POWDER,HPC-5 F/CTG, CAL 30, BALL, M1
1376-01-049-1466		PROPELLANT POWDER,HPC-2 F/7.62MM BLANK, M82
1376-01-049-1467		PROPELLANT POWDER,WC 818 F/7.62MM BLANK, M82
1376-01-049-1468		PROPELLANT POWDER,WC 852 F/CTG, CAL 30, BALL, M2
1376-01-049-1469		PROPELLANT POWDER, WC 870 F/CTG, 20MM
1376-01-050-7209		PROPELLANT POWDER,M26E1 F/152MM PROP CHG M189

NSN	DODIC	NOMENCLATURE
1376-01-053-0362		PROPELLANT POWDER,M6 TYPE1 F/105MM CTG M494
1376-01-053-9358		PROPELLANT POWDER, M1
1376-01-053-9359		PROPELLANT POWDER, M30, TYPE 1 F/105MM CTG
1376-01-053-9360		PROPELLANT POWDER, M1, TYPE 1 F/105MM CTG
1376-01-053-9362		PROPELLANT POWDER,M6, MP, TYPE 1 F/105MM CTG
1376-01-053-9363		PROPELLANT POWDER,M9 FLAKE F/105MM CTG
1376-01-053-9364		PROPELLANT POWDER,M9, FORM A F/4.2 IN PROP CHG
1376-01-053-9365		PROPELLANT POWDER,M9, FLAKE F/81MM INCR.M185
1376-01-053-9366		PROPELLANT POWDER,M9, FORM A F/4.2 IN PROP CHG
1376-01-053-9367		PROPELLANT POWDER,MIXTURE M30 F/CTG, 90MM
1376-01-053-9368		PROPELLANT POWDER, M5 MIXTURE, FORM A
1376-01-053-9369		PROPELLANT POWDER,M26 F/CTG 106MM RIFLE
1376-01-053-9370		PROPELLANT POWDER,M6,MP F/175MM M86 SERIES
1376-01-053-9371		PROPELLANT POWDER,M30 F/ 105MM
1376-01-053-9372		PROPELLANT POWDER, M6,MP F/155MM M119 SERIES
1376-01-053-9373		PROPELLANT POWDER,M9, FORM A F/40MM CTG
1376-01-053-9373		PROPELLANT POWDER,SHEET 33 IN LENGTH
1376-01-054-1577		PROPELLANT POWDER,M1MP F/155MM M4A2 WB
1376-01-054-5157		PROPELLANT POWDER,CR8325 F/20MM CTG, M139
1376-01-054-5158		PROPELLANT POWDER,WC875 F/20MM CTG M99A1
1376-01-054-5171		PROPELLANT POWDER,IMR4475 F/7.62MM, M60, HPT
1376-01-055-0993		PROPELLANT POWDER,HPC F/CAL 38 CTG,BALL
1376-01-055-0995		PROPELLANT POWDER F/7.62MM GRENADE CTG, M64
1376-01-055-0996		PROPELLANT POWDER F/CAL .30 M1909 BLANK
1376-01-055-0997		PROPELLANT POWDER,WC860 F/CAL 50 BALL M33/AP M2
1376-01-055-0998		PROPELLANT POWDER,WC844, F/5.56MM, M193 BALL
1376-01-055-0999		PROPELLANT POWDER,WC,F/7.62MM FRANGIBLE, M160
1376-01-055-1000		PROPELLANT POWDER,SR, F/7.62MM FRANGIBLE, M160
1376-01-055-1001		PROPELLANT POWDER,IMR, F/5.56MM HPT
1376-01-055-1551		PROPELLANT POWDER, M30A1, MP
1376-01-055-1555		PROPELLANT POWDER,M30A1,MP,F/105MM PROP CHG
1376-01-055-2772		PROPELLANT POWDER,WC844, F/5.56 BALL M196 TR
1376-01-055-2783		PROPELLANT POWDER,M6+2, MP F/GUN 76MM
1376-01-055-2784		PROPELLANT POWDER, NACO, F.5IN 54 CAL
1376-01-055-3436		PROPELLANT POWDER,M1 F/105MM M724A1
1376-01-055-3437		PROPELLANT POWDER,M30,MP, F/105MM M735, M392
1376-01-055-5971		PROPELLANT GRAIN, SHEET STOCK, 15 IN CARPET ROLLS
1376-01-055-8597		PROPELLANT POWDER,M1,SP F/8 INCH CHG, PROP M2
1376-01-055-8598		PROPELLANT POWDER,M10 FLAKE F/155MM & 8IN
1376-01-055-8599		PROPELLANT POWDER, M30A2, MP F/8 IN PROP CHG, M188
1376-01-055-9903		PROPELLANT POWDER, MIXTURE M5
1376-01-055-9904		PROPELLANT POWDER,M10 FLAKE F/81MM M205 INCR
1376-01-056-0768		PROPELLANT POWDER,M1 F/90MM M71
1376-01-056-2671		BENITE 14 IN. LEMGTH F/PRIMER XM120

NSN	DODIC	NOMENCLATURE
1376-01-058-1652		PROPPELLANT POWDER,IMR F/CAL 30 TR/7.62MM M118
1376-01-058-1653		PROPELLANT POWDER (WC) F/CAL .30 TR M27 CARBINE
1376-01-058-5086		PROPELLANT POWDER,M30
1376-01-059-4572		PROPELLANT POWDER M9 FLAKE F/81MM M90A1 A/B CHGS
1376-01-063-0140		PROPELLANT POWDER,M1,SP F/155MM M3A1
1376-01-064-7316		PROPELLANT POWDER,M6 PROP FORM C TYPE 1
1376-01-065-9849		PROPELLANT POWDER,M30,MP F/76MM CTG
1376-01-065-9850		PROPELLANT POWDER,M5 PROP F/90MM CTG M37E1/M371
1376-01-066-4179		PROPELLANT POWDER,M2 PROP
1376-01-066-4180		PROPELLANT POWDER,M30,MP F/105MM M735
1376-01-066-5003		PROPELLANT POWDER,IMR F/CAL .50 API-T, M20
1376-01-068-5086		PROPELLANT POWDER,M30,MP F/105MM M735
1376-01-068-5087		PROPELLANT POWDER,M1 COMP F/ 105MM M724E1
1376-01-073-7529		PROPELLANT POWDER,WC872 F/20MM BALL
1376-01-076-2607		PROPELLANT POWDER, M30A1,SP F/105MM M85,M121
1376-01-078-4062		PROPELLANT POWDER,M6, MP F/76MM M496 HEAT
1376-01-078-8199		PROPELLANT POWDER,WC 680 F/7.62MM BALL
1376-01-082-2105		PROPELLANT POWDER,M9 FLAKE F/81MM INCR M90/90A1
1376-01-084-4229		PROPELLANT POWDER,M30A1,MP F/155MM M203
1376-01-085-1882		PROPELLANT POWDER,M10FLAKE F/60MM M204 INCR
1376-01-085-7243		PROPELLANT POWDER,M2 F/40MM
1376-01-086-2973		PROPELLANT POWDER,M31A1,MP F/8 IN PRPCHG M188E1A1
1376-01-099-0236		PROPELLANT POWDER,M9 F/60MM IGNITION CTGS
1376-01-107-5378		PROPELLANT POWDER,M9 FLAKE F/60/81MM IGN CTG
1376-01-110-5580		PROPELLANT POWDER,M30A1 F/8 IN
1376-01-120-0956		PROPELLANT POWDER F/NAVAL GUNS ITYPE
1376-01-120-0957		PROPELLANT POWDER F/PROP CHG F/CANNON
1376-01-120-4100		PROPELLANT POWDER,M31 PROP F/120MM PROP CHG M45
1376-01-120-4560		PROPELLANT POWDER,IMR 4903 F/20MM CTG
1376-01-122-5289		PROPELLANT POWDER F/VARIOUS SOLID PRP RKT GRAINS
1376-01-123-5089		PROPELLANT POWDER,M17 F/CARTRIDGE, 90MM, M353
1376-01-125-5945		PROPELLANT POWDER,M30 PROP F/105MM
1376-01-125-5946		PROPELLANT POWDER,M30 F/105MM HEAT-T M456A2
1376-01-126-3602		PROPELLANT POWDER,BS NACO F/5 IN 38 PROP CHG
1376-01-126-5051		PROPELLANT POWDER F/NAVAL GRAINS
1376-01-126-8342		PROPELLANT POWDER,M10 FLAKE
1376-01-127-0728		PROPELLANT POWDER F/NAVAL GUNS
1376-01-127-5190		PROPELLANT POWDER SPD F/5 IN 38
1376-01-127-5191		PROPELLANT POWDER SPD F/5 IN 54
1376-01-127-5192		PROPELLANT POWDER SPD F/6 IN 47
1376-01-127-5193		PROPELLANT POWDER SPD F/16 IN 45
1376-01-127-5194		PROPELLANT POWDER,SPD,PYROCELLULOSE F/16 IN 50
1376-01-127-9539		PROPELLANT POWDER, SPDB F/3 IN 50
1376-01-127-9540		PROPELLANT POWDER,SPDB,PYROCELLULOSE F15 IN 38

NSN	DODIC	NOMENCLATURE
1376-01-127-9541		PROPELLANT POWDER,SPDF F/5 IN 54
1376-01-127-9542		PROPELLANT POWDER,SPDF F/6 IN 47
1376-01-129-4679		PROPELLANT POWDER,M6,SPDN F/3IN 50
1376-01-129-4680		PROPELLANT POWDER,M6,SPD F/ 5 IN 38
1376-01-129-4681		PROPELLANT POWDER,M6,SPDN F/16 IN 47 CAL
1376-01-129-4682		PROPELLANT POWDER,M1, SPDN F/20MM
1376-01-129-4683		PROPELLANT POWDER,M1, SPDN F/40MM
1376-01-129-8053		PROPELLANT POWDER,SPD,PYROCELLULOSE F/4 IN 50
1376-01-129-8055		PROPELLANT POWDER,SPD,PYROCELLULOSE F/8 IN 55
1376-01-129-8056		PROPELLANT POWDER,SPDB F/6 IN 47
1376-01-129-8057		PROPELLANT POWDER,SPDW F/8 IN 55
1376-01-129-8058		PROPELLANT POWDER,SPDW F16 IN 45
1376-01-129-8059		PROPELLANT POWDER F/ 5 INCH 38
1376-01-130-1974		PROPELLANT POWDER,M6 PROP SPDN F/8IN 55
1376-01-130-1975		PROPELLANT POWDER,SPDF F/8 IN 00
1376-01-132-1692		PROPELLANT POWDER,WC814, F/5.56MM BLANK M200
1376-01-132-1710		PROPELLANT POWDER,SPDW F/5 IN 38
1376-01-132-1710		PROPELLANT POWDER,SPDF F/3 IN 50
1376-01-132-7304		PROPELLANT POWDER,SPDW F/5 IN 54
1376-01-132-9160		PROPELLANT POWDER,BS-NACO F/5 IN 54
1376-01-133-7463		PROPELLANT POWDER,M10 FLAKE F/60MM INCR M204
1376-01-141-1060		PROPELLANT POWDER,M10,MP F/75MM, M309A1
1376-01-141-1230		PROPELLANT POWDER,M30,MP F/105MM M774
1376-01-141-1230		PROPELLANT POWDER,BS-NACO F/PROP CHG F/CANNON
1376-01-149-1702		PROPELLANT POWDER,M30,MP F/105MM APFSDS-T M833
1376-01-152-3078		PROPELLANT,SOLVENTLESS F/155MM RA M549A1 1CLASS
1376-01-152-3079		PROPELLANT,SOLVENTLESS F/155MM RA M549A1 2 CLASS
1376-01-164-3489		PROPELLANT, SHEET STOCK
1376-01-176-8765		PROPELLANT POWDER,M6+2 F/5 IN 54
1376-01-177-5974		SPT FORM 120MM M830/M831
1376-01-177-9229		PROPELLANT POWDER,JA-2, 15 IN STICK F/120MM XM 827
1376-01-177-9230		PROPELLANT POWDER,JA-2 F/120MM M829
1376-01-177-9231		PROP POWDER,DIGL-RP,14 IN STICK F/120MM XM 830/831
1376-01-177-9232		PROP POWDER,DIGL-RP,FORM B,4 IN STICK F/120MM
1376-01-177-9233		PROP POWDER,DIGL-RP,FORM C,F/120MM XM830/831
1376-01-177-9234		PROPELLANT POWDER,LKL F/120MM CTG XM865
1376-01-179-5974		PROP POWDER,DIGL-RP FORM D F/120MMXM830/831
1376-01-179-5974		PROPELLANT POWDER,DIGL-RP F/120MM CTG XM830/831
1376-01-180-3513		PROPELLANT POWDER,WC844 F/5.56MM TR M856
1376-01-180-3514		PROPELLANT POWDER,WC844T F/5.56MM BALL M855
1376-01-184-1696		PROPELLANT POWDER,IMR 4895 F/CTG 7.62MM M852
1376-01-187-7650		PROPELLANT POWDER,M14 F/105MM M490A1
1376-01-190-1114		PROPELLANT POWDER
1376-01-190-1115		PROPELLANT POWDER F/40MM SGT YORK SYSTEM

NSN	DODIC	NOMENCLATURE
1376-01-192-4164		PROPELLANT P OWDER,WC844 F/5.56MM BALL M855
1376-01-195-9610		PROPELLANT,DOUBLE BASE, SPHERIODAL F/5.56MM CTG
1376-01-203-7484		PROPELLANT POWDER SINGLE BASE F/CAL 45 BALL
1376-01-203-7489		PROPELLANT DOUBLE BASE WC844 F/5.56MM M855
1376-01-204-9784	MM07	PROPELLANT POWDER F/CAD/PAD
1376-01-204-9785	MM08	PROPELLANT POWDER F/CAD/PAD
1376-01-210-4040		PROPELLANT,DOUBLE BASE WC858 F/20MM M54A1
1376-01-213-5669		PROP POWDER,M31A1,SP 29 IN SLOTTED STICK F/155MM
1376-01-218-9319		PROPELLANT POWDER,M6 F/105MM CTG M327
1376-01-221-5664		PROPELLANT GRAIN F/CADS
1376-01-221-5665		PROPELLANT GRAIN F/CADS
1376-01-221-5666		PROPELLANT GRAIN F/IMPULSE CTG CCU-52A
1376-01-221-5667		PROPELLANT GRAIN F/IMPULSE CTG CCU-52A
1376-01-221-5745		PROPELLANT POWDER
1376-01-223-0934		PROPELLANT GRAIN F/CTG. ACT. INIT. M53/91/99
1376-01-223-0935		PROPELLANT GRAIN F/CADS
1376-01-223-0936		PROPELLANT GRAIN F/CADS
1376-01-223-0937		PROPELLANT GRAIN F/CADS
1376-01-223-0938		PROPELLANT GRAIN F/IMPULSE CTG M119
1376-01-223-0939		PROPELLANT GRAIN F/IMPULSE CTG CCU-56A
1376-01-224-0356		PROPELLANT GRAIN,M2 PROP F/IMP CTG MK 40 MOD 0
1376-01-227-9360		PROPELLANT GRAIN,M2 PROP F/CTG M31A2
1376-01-247-7208		PROPELLANT POWDER,M6 MIXTURE FORM C TYPE1..
1376-01-255-6279		PROPELLANT POWDER,M38 SPHERIODAL F/81MM PROP CHG
1376-01-262-5398		PROPELLANT POWDER,M8 PROP
1376-01-274-0751		PROPELLANT POWDER F/CAL 38 BALL/IMPULSE CTG M796
1376-01-279-1324		PROPELLANT GRAIN F/INITIATOR JAU-22B
1376-01-279-1325		PROPELLANT GRAIN F/CADS
1376-01-279-2452		PROPELLANT GRAIN F/INITIATOR JAU-22B
1376-01-279-2453		PROPELLANT GRAIN F/CADS
1376-01-281-1665		PROPELLANT GRAIN F/ROCKET MOTORS & FUZES
1376-01-283-0197		PROPELLANT POWDER F/ACRFT CANOPY REMOVER M151
1376-01-285-3107		PROPELLANT POWDER F/CTG IMPULSE 150
1376-01-291-7040		PROPELLANT POWDER WC859 F/20MM
1376-01-299-8859		PROPELLANT POWDER,BENITE STRANDS 30.2 IN LENGTH
1376-01-300-9526		PROPELLANT POWDER,WC440S F/CAL .50 BLANK
1376-01-306-1237		PROPELLANT GRAIN F/CADS MK 47
1376-01-306-1238		PROPELLANT GRAIN F/CADS
1376-01-315-9742		PROPELLANT POWDER,M43 F/105MM CTG M900 SERIES
1376-01-318-6315		PROPELLANT POWDER,BENITE STRANDS 8.25 IN LENGTH
1376-01-325-3586		PROPELLANT GRAIN,HPC-3N
1376-01-325-3587		PROPELLANT GRAIN,HPC-23N
1376-01-325-3588		PROPELLANT GRAIN,HPC-1N
1376-01-325-5071		PROPELLANT GRAIN F/IMPULSE CTG CCU-56A

NSN	DODIC	NOMENCLATURE
1376-01-325-5072		PROPELLANT GRAIN F/IMPULSE CTGS CCU-1B,11B
1376-01-325-5073		PROPELLANT GRAIN,M2 PROPELLANT
1376-01-325-5075		PROPELLANT POWDER,HPC-60 F/IMPULSE CTG CCU-106A
1376-01-325-5113		PROPELLANT GRAIN F/IMPULSE CTGS M141/146
1376-01-325-5114		PROPELLANT GRAIN F/IMPULSE CTG M37
1376-01-325-5115		PROPELLANT GRAIN,M8 PROP F/IMPULSE CTGS M43/44A
1376-01-325-5116		PROPELLANT GRAIN,M6 PROP F/IMPULSE CTG MK 18
1376-01-325-5117		PROPELLANT GRAIN F/DELAY CTG CCU-73A
1376-01-325-5118		PROPELLANT GRAIN F/IMPULSE CTG CCU-44A1
1376-01-335-5054		PROPELLANT POWDER,WC867 F/20MM CTG
1376-01-342-3843		PROPELLANT POWDER,M10 F/IMPULSE CTG M42A1
1376-01-342-3844		PROPELLANT POWDER,IMR 5010
1376-01-362-6503		PROPELLANT POWDER,PROP WC 750
1376-01-368-7116		PROPELLANT POWDER,PROP WC 845 F/5.56MM TR&BALL
1376-01-370-6678		PROPELLANT POWDER,WCR845 F/TR M856
1376-01-373-5883		PROPELLANT GRAIN F/120MM M865
1376-01-396-0257		PROPELLANT GRAIN F/120MM M831A1
1376-01-426-1542		PROPELLANT POWDER,M1 PROP F/CTG M865E2

APPENDIX D

COMMON PROPELLANT COMPOSITIONS

PROPELLANT COMPOSITIONS

(THE NUMBERS IN THESE CHARTS ARE APPROXIMATE PERCENTAGES BY WEIGHT [1])

PROPELLANT MODEL NUMBER / COMPONENT	M1	M2	M5	M6	M7	M8	M9	M10	M12	M13	M14
Nitrocellulose	85.00	77.45	81.95	87.00	54.60	52.15	57.75	98.00	97.70	57.30	90.00
Nitroglycerin		19.50	15.00		35.50	43.00	40.00			40.00	
Nitroguanidine											
Dinitrotoluene	10.00			10.00							8.00
Dibutylphthalate	5.00			3.00							2.00
Diethylphthalate						3.00					
Diphenylamine	1.00			1.00				1.00	0.80	0.20	1.00
Ethyl Centralite		0.60	0.60		0.90	0.60	0.75			1.00	
Barium Nitrate		1.40	1.40								
Potassium Nitrate		0.75	0.75			1.25	1.50				
Potassium Perchlorate					7.80						
Lead Carbonate	1.00										
Potassium Sulfate	1.00			1.00				1.00	0.75	1.50	
Tin									0.75		
Carbon Black					1.20					0.05	
Graphite		0.30	0.30					0.10			
Cryolite											

THE INFORMATION IN THIS CHART IS CONTINUED ON THE NEXT PAGE

[1] The information contained in this chart is an approximation only. Specific information regarding percentages and tolerances of components should be obtained from the appropriate specifications and standards. This listing is not intended to be a collection of all propellant compositions used by the military, but rather only examples of some typical compositions.

PROPELLANT COMPOSITIONS

(THE NUMBERS IN THESE CHARTS ARE APPROXIMATE PERCENTAGES BY WEIGHT)

PROPELLANT MODEL NUMBER / COMPONENT	M15	M17	M18	M26	M26E1	M30	M30A1	M30A2	M31	M31A1	IMR
Nitrocellulose	20.00	22.00	80.00	67.25	68.70	28.00	28.00	27.00	20.00	20.00	100.0
Nitroglycerin	19.00	21.50	10.00	25.00	25.00	22.50	22.50	22.50	19.00	19.00	
Nitroguanidine	54.70	54.70				47.70	47.00	46.25	54.70	54.00	
Dinitrotoluene											8.00
Dibutylphthalate			9.00						4.50	4.50	
Diethylphthalate											
Diphenylamine			1.00							1.00	0.70
Ethyl Centralite	6.00	1.50		6.00	6.00	1.50	1.50	1.50			
Barium Nitrate				0.75							
Potassium Nitrate				0.70				2.75			
Potassium Perchlorate											
Lead Carbonate											
Potassium Sulfate							1.00		1.50	1.50	1.00
Tin											
Carbon Black											
Graphite		0.10		0.30	0.30	0.10					
Cryolite	0.30	0.30				0.30			0.30		
2-Dinitrophenyldiamine									1.50		

THE INFORMATION IN THIS CHART IS CONTINUED FROM THE PREVIOUS PAGE

SUBSTITUTES AND ADDITIVES USED IN PROPELLANT COMPOSITION

PURPOSE / MATERIAL	Reduce Hygroscopicity	Stabilizer	Plasticizer	Deterrent	Reduce Flame Temperature	Reduce Flash	Reduce Bore Erosion	Increase Electrical Conductivity	Control Burning Rate	Source of Oxygen	Retards Ignition	Increases Ignitability	Moisture Proof Coating
Nitroglycerin	X		X							X		X	
Nitroguanidine					X	X	X						
Dinitrotoluene	X		X	X			X		X				X
Dibutylphthalate	X		X	X	X	X	X		X				
Diethylphthalate						X	X		X				
Diphenylamine**		X											
Ethyl Centralite*	X	X	X	X	X	X	X		X				X
Barium Nitrate						X							
Potassium Nitrate						X							
Potassium Perchlorate						X			X	X			
Potassium Sulfate						X							
Tin (Lead)***													
Carbon Black												X	
Graphite								X			X		
Cryolite						X							
2-Dinitrophenyldiamine		X	X										
Methyl Centralite			X	X		X	X		X				
Triacetin			X			X							

* Stabilizer for double base propellant
** Stabilizer for single base propellant
*** Decoppering or weapon cleaning agent

Ethyl Cellulose and Cellulose Acetate are inhibiters. They retard or slow down the burning rate.

APPENDIX E

POINTS OF CONTACT

NOTE: Suggestions to expand POC list are welcomed. Installation level points of contact might prove useful in future editions.

1. IOC: Ammunition Surveillance Division

Mail Address: Commander
HQ, IOC
ATTN: AMSIO-QAS
Rock Island, IL 61299-6000

Individual Contact: **Robert Lorenz**
Telephone: DSN 793-7572/7587, Commercial (309) 782-7572
E-mail: rlorenz@ria-emh2.army.mil

2. USADAC: Logistics Review and Technical Assistance Office

Mail Address: Director
USADAC
ATTN: SIOAC-AV
Savanna, IL 61074-9639

Individual Contact: **Elena Graves**
Telephone: DSN 585-8052, Commercial (815) 273-8052
E-mail: gravese@dac-emh1.army.mil

3. ARDEC (Picatinny): Army Propellant Surveillance Laboratory

Mail Address: Commander
ARDEC
ATTN: AMSTA-AR-AEE-WEE
Picatinny Arsenal, NJ 07806-5000

Individual Contact: **Diana-Lynn Herbst**
Telephone: DSN 880-2560/4914, Comm (201) 724-2560/4914
E-mail: dlarweth@pica.army.mil

4. NSWC Indian Head: NAVSEA Gun Propellants:

Mail Address: Commander
Indian Head Division
Naval Surface Warfare Center
ATTN: Code 6210F (David Lee)
101 Strauss Ave.
Indian Head, MD 20640-5035

Individual Contact: **David Lee**
Telephone: DSN 354-4521, Commerical (301) 743-4521
E-mail: 6210f@mail.ih.navy.mil

5. United States Marine Corps Gun Propellants

Mail Address: Commander
Naval Ordnance Center/Pacific Division
Fallbrook Detatchment
ATTN: Code 5123 (Mr. Wissa)
700 Ammunition Road
Fallbrook, CA 92028-3187

Individual Contact: **Rami Wissa**
Telephone: DSN 873-3738, Commercial (619) 731-3738
E-mail: wissar@fb.sbeach.navy.mil

6. Naval Air at China Lake

Mail Address: Commander
Naval Air Warfare Center, Weapons Division
ATTN: Code 473P50D (Dr. Pakulak)
1 Administration Circle
China Lake, CA 93555-6100

Individual Contact: **Mary Pakulak**
Telephone: DSN 437-7592, Commercial (760) 939-7592
E-mail: mary_pakulak@clplgw.chinalake.navy.mil