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14. ABSTRACT
This TOP contains a compilation of procedures for safety testing of small arms weapons including hand and shoulder weapons, machineguns, and medium caliber weapons up to 50 mm. The test procedures serve as a guide to help standardize testing and to specify tests commonly used to identify and assess safety hazards associated with the use of small arms. The procedures concentrate on those recommended for Safety Release Recommendations and Safety Confirmation Recommendations.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

*Test Operations Procedure 03-2-504A 29 May 2013
DTIC AD No.

SAFETY EVALUATION OF SMALL ARMS AND MEDIUM CALIBER WEAPONS

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*This TOP supersedes TOP 03-2-504 Safety Evaluation of Hand and Shoulder Weapons, 1 March 1977.

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1. SCOPE.

a. This Test Operations Procedure (TOP) provides procedures for testing and evaluating the safety of small arms and medium caliber weapons. It covers pistols, rifles, machineguns, sub-machineguns, shotguns, grenade launchers, and medium caliber weapons up to 50 millimeters (mm). The test procedures apply to the basic weapons only; see the relevant TOPs for testing of ammunition, fire control devices, muzzle launched ordnance, etc.

b. The test procedures serve as a guide to help standardize testing and to specify tests commonly used to identify and assess safety hazards associated with the use of small arms. Each test procedure should be reviewed to determine if it needs modification or tailoring to assure that it accommodates the specific characteristics of the test item. This TOP does not constitute a requirement to do any of the specific tests, nor does it serve to set requirements for Army materiel. Actual requirements and criteria must come from requirements documents, contractual obligations, Army Regulations (ARs), etc.

2. FACILITIES AND INSTRUMENTATION.

The lists below show specialized items that are used in the test procedures. Additional information is contained in the individual test procedures since requirements for accuracy and precision of a given measurement may vary among the procedures. Standard equipment common to most technical organizations is not listed; however, the Test Officer must assure that the specific requirements of each procedure are met by whatever equipment or instrumentation is used.

2.1 Facilities.

Item	Requirement
Firing ranges	Ranges must safely accommodate firing to the required distances; range safety fans must consider the possibility of catastrophic failure of test weapons.
Test stands	Must safely restrain the weapon, allow remote firing, and ensure reproducible results.
Control weapon	Similarity to the test weapon to permit comparison of test results and verification of proper operation of instrumentation and test setups.
Recoil measurement weapon mount	Capability to hold weapons for measuring recoil impulse.

2.2 Instrumentation.

Devices for Measuring	Error of Measurement[a]
Cyclic rate recorder	±1 percent at rates up to 6000 shots per minute (spm) and burst lengths of 100 rounds
Stargage, airgage, and laser bore mapping	±0.025 mm
Thermograph/thermocouples	±0.6 °Celsius (C) (1 °Fahrenheit (F))
Impulse noise measuring system	Peak pressure to ±1 decibel (dB), A-duration and B-duration to ±10 percent
Recoil energy instrumentation	Recoil energy to ±0.1 foot-pound (ft-lb) (0.14 Joules (J)) as calculated from measured impulse and weapon mass

[a] Values can be assumed to represent ±2 standard deviations; thus, the stated tolerances should not be exceeded in more than 1 measurement of 20.

3. REQUIRED TEST CONDITIONS.

3.1 Test Planning.

3.1.1 Background.

a. Small arms weapons are designed to give the Soldier a lethal capability to engage an enemy. This lethality must be controlled to ensure that the safety of the user is not compromised. This TOP identifies tests commonly used to identify and assess safety hazards associated with the use of small arms. In particular, tests needed to prepare Safety Release Recommendations (SRRs) and Safety Confirmation Recommendations (SCRs) are identified. Also identified are those tests usually required for a Health Hazard Assessment Report (HHAR).

b. SRRs are prepared for participation of military personnel using the test weapon in a specific test, demonstration, in-theater assessment, or training event at a specific location. The SRR must consider the conditions specific to the planned use and must address the safety of use under those conditions. It may not be necessary to do all the tests listed in Table 1. For example, a toxic gases test would not be necessary for a demonstration firing of a small number of standard rounds in open air conditions. Conversely, a toxic gases test would be necessary if the demonstration required firing while in an enclosed situation such as a bunker, inside a vehicle, or under a cover. Likewise, an Operational Test planned for the Cold Region Test Center in January would require different environmental safety testing than one planned for Fort Benning, Georgia in the month of July.

TABLE 1. SMALL ARMS SAFETY TESTS

TEST PARAGRAPH	TEST TITLE	REQUIRED FOR SRR	REQUIRED FOR SCR	REQUIRED FOR HHAR
4.1	Inspections	Yes	Yes	No
4.2.1	Safety Selector, Planned Conditions	Yes	No	No
4.2.2	Safety Selector, Comprehensive Conditions	No	Yes	No
4.3.1	Misassembly, Operator	Yes	No	No
4.3.2	Misassembly, Detailed	No	Yes	No
4.4.1	Function, Limited	Yes	No	No
4.4.2	Function, Complete	No	Yes	No
4.5	Recoil Energy	Yes	Yes	Yes
4.6.1	Cookoff, Limited	Yes	No	No
4.6.2	Cookoff, Complete	No	Yes	No
4.7	Toxic Gases	A	Yes	Yes
4.8	Noise	Yes	Yes	Yes
4.9.1	Malfunction Hazards, Planned Conditions	Yes	No	No
4.9.2	Malfunction Hazards, Complete	No	Yes	No
4.10.1	1.5-Meter (5-Feet) Drop, Limited	Yes	No	No
4.10.2	1.5-Meter (5-Feet)Drop, Complete	No	Yes	No
4.11	Blocked Barrel	A	Yes	No
4.12	Post-Test Inspections	Yes	Yes	No
4.13	Ancillary Equipment	B	B	B
4.14	Supplemental Tests	B	B	B

A = Only if planned conditions warrant.
B = As required by examination of the test item and its planned usage.

c. SCRs are prepared in support of program milestones such as type classification and fielding. The SCR must consider the Army wide use of the test item and address all the safety concerns likely or possible to be encountered by Soldiers using the weapon. Consider that extreme environments such as high and low temperatures, severe firing schedules, and rough handling are likely to occur during the life span of the test item.

d. The format for a SRR is shown in Appendix A, Figure A-1. The format for a SCR is shown in Appendix A, Figure A-2. Note that addresses and the command structure may change from those shown in the formats.

e. Health Hazards Assessment (HHA). The US Army Public Health Command (USAPHC) is responsible for the Army's HHA Program. The USAPHC prepares the HHAR for the Program Executive Office (PEO) to support milestone events such as type classification and fielding. Tests of particular interest for the HHA include noise, toxic gases, and recoil energy; but may include any test results that identify a health hazard. Test procedures should be coordinated with the USAPHC through the US Army Test and Evaluation Command (ATEC) to ensure that their data requirements are met. Some of the test procedures contained in Section 4

have been somewhat modified from those in TOP 03-2-045[1**] in order to accommodate the latest known USAPHC requirements.

3.1.2 Test Planning.

a. Assemble information on the test item's method of operation, mission requirements, and expected modes and areas of deployment. This information may be very specific for the conditions for a SRR, or very general for purposes of planning for a SCR.

b. Review any available Safety Assessment Report (SAR) and all instructional material issued with the test item by the developer and manufacturer. Also, check for and review any reports of previous tests conducted on the same model or closely related item. Determine if existing data can be accepted to satisfy any of the necessary safety tests.

c. The test weapon may be a commercial off-the-shelf (COTS) item. A COTS weapon is one that is in production and has been sold previously in some quantity to other Government agencies or to the general public and has had practically no significant changes to safety features or working parts. Check for the item's history and prior tests. Determine whether or not the item meets the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI) standards for its caliber.

d. Based on the above information, plan a comprehensive testing program to verify that the test item satisfies minimum design and construction requirements for safety. Tests appropriate for forming a test program are identified in Table 1 and are described in Section 4. For some test programs, these procedures will need to be modified or tailored to accommodate specific characteristics of the test item or the unique requirements of the developer or intended user. Additional individual test procedures may be needed, while in other cases not all procedures contained in this TOP will be applicable.

3.1.3 Test Sequence.

A predetermined sequence for the complete series of subtests cannot be established in advance due to the many variations of weapon designs and due to facility considerations such as the scheduling of ranges and laboratory support. However, in all cases, the Inspection test (paragraph 4.1) and the Safety Selector tests (paragraph 4.2) must be done first. Abusive tests, particularly the 1.5-Meter (5-Feet) Drop test (paragraph 4.10) and the Blocked Barrel test (paragraph 4.11), should be done last as they may damage test items to the extent that they cannot be used for further testing. Test sequences may have to be revised during testing to accommodate emerging results, retests, changes in scope, etc.

** Superscript numbers correspond to Appendix C, References.

3.2 Test Conduct.

a. The operation of small arms is interrelated with ammunition. Care must be taken during testing to assure that the distinction is made between inherent weapon functioning and ammunition induced problems. If the test weapon uses standard ammunition, a single lot of ammunition should be used for the entire series of tests. If a single lot cannot be obtained, every effort must be made to complete each separate test procedure with a single lot. The ammunition used must be fully identified; record the full nomenclature, Department of Defense Identification Code (DODIC), condition code (CC) and lot number. Only CC "A" and CC "B" should be used. Lower cased CCs should not be used until consultation with the customer and the ATEC/US Army Evaluation Center (AEC) Test Manager.

b. Additional review and testing will be necessary if the test weapon uses nonstandard ammunition, or standard ammunition that has not been qualified for the specific type of weapon. Safety testing procedures for ammunition are given in TOP 04-2-016[2].

c. If military personnel are required to support testing, ensure a Test Schedule and Review Committee (TSARC) request is submitted within one year from the start of testing, or as early as possible.

3.3 Assessing Safety.

a. All test data will be reviewed for safety implications in accordance with Military Standard (MIL-STD)-882E[3]. Determine the proper severity category and mishap probability in accordance with that standard. For each hazardous condition assessed, a Hazard Risk Assessment Code in terms of potential severity and probability of occurrence will be provided. Unless indicated differently through program documents, definitions of severity categories and probability levels addressed in the latest MIL-STD-882 will be followed when categorizing the hazardous condition (see MIL-STD-882E, Tables A-I and A-II). The Hazard Risk Assessment Code will be expressed as follows: hazard severity description, followed by the hazard probability description, and concluded with the category and probability level (for example, Critical-Probable 2-B). The Test Center will not categorize the risks as high, medium, or low; this is dependent upon the decision authority matrix that is being used.

b. For convenience, a consolidated hazard severity versus hazard probability matrix has been extracted from applicable portions of MIL-STD-882E Department of Defense Instruction (DODI) 5000.02[4], and is shown in Table 2. This matrix has undergone significant changes over time and may be changed again from the one shown. Test Officers should make sure that they are using the latest version.

TABLE 2. CONSOLIDATED RISK MATRIX.

RISK Acceptance Levels per DODI 5000.02, 8 Dec 08 Risk Assessment Levels & Definitions per Tables I thru III of MIL-STD 882E, 11 May 12					HAZARD SEVERITY			
					Catastrophic	Critical	Marginal	Negligible
		Specific Individual Item	Fleet or Inventory		Could result in one or more of the following: death, permanent total disability, irreversible significant environmental impact, or monetary loss equal to or exceeding $10M.	Could result in one or more of the following: permanent partial disability,injuries or occupational illness that may result in hospitalization of at least three personnel, reversible significant environmental impact, or monetary loss equal to or exceeding $1M but less than $10M.	Could result in one or more of the following: injury or occupational illness resulting in one or more lost work day(s), reversible moderate environmental impact, or monetary loss equal to or exceeding $100K but less than $1M.	Could result in one or more of the following: injury or occupational illness not resulting in a lost work day, minimal environmental impact, or monetary loss less than $100K.
					1	2	3	4
HAZARD PROBABILITY	Frequent	Likely to occur often in the life of an item.	Continuously experienced	A	1-A HIGH AAE	2-A HIGH AAE	3-A SERIOUS PEO	4-A MEDIUM PM
	Probable	Will occur several times in the life of an item.	Will occur frequently	B	1-B HIGH AAE	2-B HIGH AAE	3-B SERIOUS PEO	4-B MEDIUM PM
	Occasional	Likely to occur sometime in the life of an item.	Will occur several times	C	1-C HIGH AAE	2-C SERIOUS PEO	3-C MEDIUM PM	4-C LOW PM
	Remote	Unlikely, but possible to occur in the life of an item.	Unlikely, but can reasonably be expected to occur	D	1-D SERIOUS PEO	2-D MEDIUM PM	3-D MEDIUM PM	4-D LOW PM
	Improbable	So unlikely, it can be assumed occurrence may not be experienced in the life of an item.	Unlikely to occur, but possible	E	1-E MEDIUM PM	2-E MEDIUM PM	3-E MEDIUM PM	4-E LOW PM
	Eliminated	Incapable of occurence. This level is used when potential hazards are identified and later eliminated.	Incapable of occurence. This level is used when potential hazards are identified and later eliminated.	F	Eliminated			

4. TEST PROCEDURES.

4.1 Inspections.

4.1.1 Background.

Weapons received for test must be inspected for their physical characteristics, safety, and identification. These inspections also often serve as a baseline for subsequent inspections later in

the sequence of tests. The inspections are performed in accordance with TOP 03-2-045 with emphasis on inspecting components that may affect safety. The following paragraphs list typically required safety inspection information; a specific test item may require more, fewer, or different inspections.

4.1.2 Method.

a. Disassemble the weapon, and visually examine all major components (e.g., safety and trigger mechanisms, locking arrangement) for conformance with specifications and design drawings (if available). Record any deviations from specifications.

b. Review the test item documentation and examine the weapon for any indication of a source of ionizing radiation such as components that are self luminous or glow in the dark. If any source is identified, or is suspected, contact the US Army Public Health Command, ATTN: MCHB-TS-OHP for guidance.

c. Conduct nondestructive testing (NDT), such as magnetic particle or dye penetrant inspection, of components subjected to stress during firing (e.g., bolt, locking lugs, barrel, muzzle device) as described in TOP 03-2-807[5].

d. Record the following for the test weapon, as applicable:

(1) Test item nomenclature, serial number(s), manufacturer's name, and any corresponding locally assigned identification.

(2) Number and names (establish, if necessary) for all parts.

(3) Defective parts (ascertain with weapon disassembled), repair or replace as required.

e. Determine if the weapon can be fired without the bolt or barrel (if operator changeable) being completely or adequately locked. Test a minimum of three weapons.

(1) For closed bolt firing weapons, allow the bolt (or breech) to close slowly while repeatedly pulling the trigger. Note or mark the exact position when the hammer or striker releases. Establish that the weapon was adequately locked at this location. If there is any doubt as to the adequacy of locking, attempt to fire a primed, empty, cartridge case. If the primed cartridge case fires, determine if a dangerous failure can occur by remotely firing a live cartridge. Special spacers may have to be fabricated to hold the bolt in the desired position for live firing. Repeat this procedure a total of three trials.

(2) For open bolt firing weapons it may be necessary to fabricate blocks or spacers to permit primer impact near the point of bolt locking.

(3) If the weapon is provided with an operator changeable barrel (i.e., a quick-change barrel), determine if the weapon has an adequate interlock. Install the barrel and incrementally

engage the lock while attempting to fire an unloaded weapon. Note the position of the barrel lock where it becomes possible to fire the weapon. If the condition appears marginal, attempt to fire a primed, empty, cartridge case. If the primed cartridge case fires, remotely fire a fully loaded round to determine if the barrel is retained or if any unsafe condition exists. Repeat this procedure a total of three trials.

f. Record the following physical characteristics:

(1) Trigger pull force required to manually operate the trigger.

(2) Safety selector type and mode of operation, i.e. trigger disconnect, firing pin block, sear disconnect, etc. (The safety selector may be incorporated into the fire control selector.)

(3) Fire control selector, type and method of operation.

(4) Charging force.

(5) Document any source of ionizing radiation.

4.1.3 Data Required.

The data from the inspections should be recorded in tabular or spreadsheet format where possible; this will facilitate data comparisons in subsequent inspections throughout the overall test. Videos, X-rays, etc., should be preserved in a digital format to assist data handling and transmission. If identification numbers are assigned to the weapons, a list will be maintained of the assigned number versus the weapon serial number (or other information that uniquely identifies the weapon).

4.2 Safety Selector.

4.2.1 Background.

Small arms weapons almost always include a built in safety device that allows a Soldier to carry the weapon fully loaded but incapable of being fired until the device is disengaged. These devices are critical in preventing unintended firing of the weapon. The device may be a stand-alone switch or device, or it may be incorporated into a firing selector switch that can be set for various modes of fire such as SAFE, FIRE, BURST, etc. The mechanisms of safety selectors vary greatly among weapons; therefore, test procedures must be tailored to each specific design and application.

4.2.2 Test Method.

a. Change the selector back and forth between the SAFE and FIRE positions. Observe for visual or tactile indicators showing whether or not the weapon is in a SAFE or FIRE condition.

b. Place the selector in the SAFE position with the weapon fully charged and cocked. Attempt to deliberately override the safety by forcibly pulling the trigger.

c. Repeat the above method while slowly moving the selector from SAFE to FIRE. Determine the position where the weapon is first enabled to fire. Observe visual or tactile indicators (such as pop-up buttons or tabs in the line-of-sight) to determine if they correctly show the true safety conditions while the selector is between positions.

d. With the selector on SAFE, pull and release the trigger then move the selector to the FIRE position and any other positions such as BURST or AUTO.

e. The above procedures assume that it is easy to determine if the weapon would have fired had it been loaded. If this is not the case, the trials must be done with a primed, unloaded, cartridge case in the chamber.

f. Check for proper operation of any other safety enhancements such as decocking levers, trigger inserts, grip safeties, etc.

g. To support a SRR, do the tests at the ambient conditions of the planned event. For a SCR, repeat the tests at both extreme hot and extreme cold. Use 71 and -51 °C (160 and -60 °F) for the extreme temperatures if no other guidance is available.

4.2.3 Data Required.

Record whether or not the safety can be overridden and the selector positions at which the weapon can be fired. Document the existence and accuracy of any safety indicators.

4.3 Misassembly.

4.3.1 Background.

This test is conducted to determine if it is possible to assemble the weapon incorrectly so that it can be fired in an unsafe condition. The test procedure must be done by personnel trained and experienced in the maintenance of the type of weapons, or similar weapons, undergoing the test.

4.3.2 Test Method.

a. Limited Misassembly test to support a SRR:

(1) Parts under study are those that an individual operator is likely to disassemble/assemble. These are usually limited to the parts involved in field strip and clean, but may include other weapon parts such as quick change barrels, etc., dependent on the details of the planned event.

(2) Disassemble the weapon to the level to which the operator is authorized. Reassemble the weapon with parts assembled backwards, out of order, misaligned, or missing a

part needed for safety. Attempt to assemble the weapon with all the parts but in an unsafe condition such as the firing pin jammed in the forward position, rendering a safety feature inoperable, etc. Determine if the weapon can be loaded and fired in the misassembled condition.

(3) If a condition appears to be marginal, attempt to fire a primed, empty, cartridge case. If the case fires, it may be necessary to fire a live round to determine if there are any safety consequences.

b. Detailed Misassembly. A Detailed Misassembly test is necessary to support a SCR. The general procedure is the same as that for the limited misassembly but the weapon is disassembled in detail. Follow Technical Manuals and manufacturers' information for the disassembly. It is not necessary to disassemble those parts that are designed to be replaced as complete assemblies (modular construction, parts that are only factory serviceable or must be returned to a depot level facility for repair).

4.3.3 Data Required.

The following data are required:

a. Identify all the parts involved in the misassembly procedures.

b. Report any combination or order of parts that caused an unsafe condition and detail the consequences of the unsafe condition.

4.4 Function.

4.4.1 Background.

Function tests are done to determine basic safety considerations and consequences of firing the test weapon.

4.4.2 Test Method.

a. This test is conducted using the procedures of TOP 03-2-045, paragraph 4.3. Clean, inspect, and lubricate the test weapons. Record the headspace of each weapon before and after firing. The weapons are mounted so that they can be fired remotely by use of a lanyard, solenoid, etc.

b. Witness screens must be placed around the weapon to determine if any debris, including ejected cartridge cases, is projected toward the shooter or nearby personnel. The witness screens may be of any convenient material such as paper, chipboard or corrugated cardboard. Inspect the witness screens and record the location and size of any fragment impacts or holes. If hazardous, or potentially hazardous, conditions are evident use the procedures of TOP 04-2-016 to recover a sample of the debris. The use of high-speed video, or other instrumentation, may be required to determine if the fragments or particles are hazardous.

c. Inspect fired cartridge cases for evidence of actual or potential safety hazards such as deformed or ruptured cases, perforated or blown primers, etc. Determine the fired case ejection distance and angle relative to the line-of-sight.

d. The function of the safety selector must be checked at the start of each days firing and at the end of the test.

e. A limited function test can be used to support a SRR. Fire the type of ammunition that will be used in the planned event. Use the most severe firing cycle expected in the event, or use the common cycles specified in TOP 03-2-045 if such information is not available. Do the firings at temperatures expected at the planned event (this is usually a temperate condition, but may require more extreme temperatures such as those that would be encountered by an Operational Test in Arctic or Desert conditions). Use three test weapons, if available. Fire each weapon 500 rounds or three times the number of rounds planned for the event, whichever is greater.

f. A complete function test is required to support a SCR and most other milestone events. Perform a Reliability and Durability test in accordance with TOP 03-2-045, paragraph 4.3 and also perform the High Temperature and the Low Temperature tests in accordance with TOP 03-2-045, paragraphs 4.5.1a and 4.5.1b. Fire the most common minimum hazard cartridge.

g. Inspect the weapons and repeat the nondestructive tests that were done as part of the Initial Inspection.

4.4.3 Data Required.

The following data are required:

a. Record of any malfunctions or stoppages.

b. Observations of any unsafe conditions.

c. Complete identification of weapons and ammunition.

d. Details of any impacts found on the witness screens and any recovered debris.

e. Headspace measurements before and after test.

f. Results of fired case inspections.

g. Fired case ejection pattern.

h. Safety selector function throughout the test.

i. Results of the nondestructive tests.

4.5 Recoil Energy.

4.5.1 Background.

Firing a small arms weapon produces a rearward force that must be absorbed by the shooter or by the weapon mount. Excessive recoil can injure the shooter, degrade training, and damage weapon mounts.

4.5.2 Test Method.

a. The recoil energy of a weapon may be measured by firing from an appropriate test fixture and calculating the results. TOP 03-2-826[6] gives detailed procedures for measuring recoil using five-wire and three-wire suspended pendulums. The TOP also provides the calculation methods to determine the recoil in terms of momentum and kinetic energy. Other facilities, such as a weapon cradle mounted on linear bearings, may also be used to measure recoil. The facilities must be capable of measuring the recoil impulse and weapon mass to a precision that will allow determination of the recoil energy to a value of $\pm$0.1 ft-lb (0.14 J).

b. The procedures for conducting the test are detailed in TOP 03-2-045, paragraph 4.16. Tests supporting a SCR must be in accordance with the conditions and sample size required by TOP 03-2-045. A SRR may be supported by a limited recoil test consisting of three trials with the lightest weapon configuration and the particular type of ammunition planned for the specific event. Measure the recoil impulse and calculate the recoil energy.

c. The recoil energy, based on the measured recoil impulse and test weapon mass, will be compared to the firing limitations shown in Table 3. The limitation on rounds fired per day will be noted in the SRR and SCR.

TABLE 3. RECOIL BASED FIRING LIMTATIONS FOR TEST WEAPONS

CALCULATED RECOIL ENERGY	LIMITATION ON ROUNDS
Less than 15 ft-lb (20.3 J)	Unlimited firing
15 to 30 ft-lb (20.3 to 40.7 J)	200 rounds per day per individual
30 to 45 ft-lb (40.7 to 61.0 J)	100 rounds per day per individual
45 to 60 ft-lb (61.0 t0 81.4 J)	25 rounds per day per individual
Greater than 60 ft-lb (81.4 J)	No shoulder firing

4.5.3 Data Required.

The following data are required:

a. Specific facility used.

b. Firing procedure.

c. Weapon configuration and weight.

d. Type of ammunition fired.

e. Measured recoil impulse.

f. Calculated recoil energy.

g. Firing limitations based on Table 3.

4.6 Cookoff.

4.6.1 Background.

This test determines the maximum number of rounds that can be fired from the weapon before the chamber becomes hot enough to cause the propellant, primer, or projectile components to cookoff, i.e., ignite spontaneously, if a cartridge is resting in the chamber. Such an unintended discharge of a weapon is a hazard to both the user and nearby personnel.

4.6.2 Test Method.

a. The Cookoff test is done using the procedures detailed in TOP 03-2-045, paragraph 4.2.2. In addition to that TOP's requirements, the test weapon should be instrumented to determine the temperature of surfaces likely to come into contact with the user, particularly those surfaces that a Soldier would contact as part of a normal firing hold.

b. Cookoff testing is done at a fixed ambient temperature with a wind speed less than 8 kilometers per hour (km/hr) (5 miles per hour (mph)) and with no direct sunlight on the barrel or receiver. Weapons firing from a closed bolt can use a standard cartridge for the cookoff round. For weapons firing from an open bolt the last cartridge must be specially prepared to permit bolt closure without firing; this can be accomplished by assembling a primer without an anvil, or by recessing (crushing) the primer 2.5 mm (0.10 inch (in.)).

c. A limited Cookoff test is sufficient for support of a SRR if the specific firing schedule can be determined. In such a case, fire three trials with the specified weapon and ammunition. Each trial will fire a complement of ammunition 110 percent of that planned between complete cooling of the weapon. Firing should be conducted at the maximum rate-of-fire of the specific event.

d. A complete Cookoff test must be done to support a SCR. It is not feasible to test all possible combinations of ammunition types and rates of fire. At a minimum, do the test at the maximum rate-of-fire anticipated for it in service. For semiautomatic hand and shoulder weapons this rate-of-fire will be that attainable by a trained operator changing preloaded magazines as quickly as possible. For hand and shoulder weapons capable of full automatic operation, a schedule of one magazine every 10 seconds is often used. The schedule for machineguns is bursts of 5 to 7 rounds at 1-second intervals between bursts, changing magazines

or belts as quickly as possible. Unique firing schedules may have to be devised for weapons of unusual design or application; such schedules should be agreed upon by the concerned parties before testing begins. Testing is usually done with minimum hazard ammunition, such as target practice or ball cartridges. However, other types of ammunition must also be included in this test if there is evidence that they cause increased barrel heating or may be more likely to cookoff at a lower temperature than the minimum hazard ammunition. Confirm the point of no cookoff by firing three trials that do not produce a cookoff. The confirming firing (non-cookoff level) will consist of 15 rounds, or 5 percent, less (whichever is greater) than that producing a cookoff.

CAUTION: The Cookoff test described in TOP 03-2-045 is designed to be conducted only with non-explosive ammunition. Special test procedures must be instituted that fully control the hazards of using explosive ammunition in a Cookoff test (see TOP 04-2-016). Safety precautions for any Cookoff test must consider that this test increases the likelihood of a catastrophic weapon failure. Note that cookoff may occur after the barrel temperature has peaked and is declining. Weapon malfunctions must be approached with caution as the cartridge may fire without warning. Also, the cartridge may expel fragments when it fires since it may not be fully chambered or the bolt may not be fully locked.

4.6.3 Data Required.

The following data are required:

a. Identification of the weapon and ammunition.

b. Rate-of-fire when firing and overall rate of firing, including time to change magazines or belts.

c. Number of magazines/belts and rounds.

d. Ambient temperature.

e. Time to cookoff from the last round fired.

f. Continuous time-temperature records with barrel temperatures at cookoff and maximum temperatures attained by surfaces likely to be in contact with the user.

4.7 Toxic Gases.

4.7.1 Background.

a. Small arms weapons emit toxic gases when they are fired. These gases can degrade human performance, adversely affect short-term and long-term health, and can be lethal.

b. Common small arms may produce ammonia (NH_3), carbon dioxide (CO_2), carbon monoxide (CO), hydrogen cyanide (HCN), nitric oxide (NO), nitrogen dioxide (NO_2), and sulfur

dioxide (SO_2). Primer compounds and loss of exposed bullet lead generate lead gases and lead residue.

4.7.2 Method.

a. TOP 02-2-614[7] contains detailed instructions for the selection of instrumentation, sampling procedures, and interpretation of results.

b. Open air toxic gases testing of small arms is not normally done due to the rapid dissipation of the gasses and the significant effects of even very light wind.

c. If the small arms under test are designed to be used in armored combat vehicles (ACV), they should be tested in accordance with TOP 02-2-614, paragraph 4.2. Coordinate specific firing schedules with the organization responsible for testing the ACV.

d. Small arms Toxic Gases tests are usually conducted as comparison-type tests in an enclosed chamber. There are no ambient temperature limitations, but the relative humidity (RH) in the chamber must be less than 85 percent. A test weapon is fired in alternate trials with a known standard weapon. The results will determine if the test weapon provides an increase or decrease in toxic emissions as compared to the standard weapon.

e. Judgment must be used to determine if a Toxic Gases test is needed to support a SRR. Events that include only open air firing of the test weapon with known ammunition are not likely to expose the shooter or nearby personnel to the effects of toxic Gases. Conversely, a Toxic Gases test must always be done if there is any planned firing from an enclosed position such as a bunker, vehicle, or under a cover, etc.

f. Data from toxic gases testing is often use in the HHAR. The planned test should be coordinated through ATEC/AEC with the USAPHC to make certain that the data will meet their needs.

4.7.3 Data Required.

The following data will be recorded:

a. Zero time, peak, and stabilized concentrations, and times for each effluent gas measured.

b. Lead concentration levels.

c. Chamber dimensions.

d. Description and photographs of the weapon mounting.

e. Positions of sampling probes and the homogenizing fan.

f. Chamber temperature and RH.

g. Number of rounds fired in each trial.

h. Identification of the weapons and ammunition.

i. Time duration of each trial and time of day when it was fired.

4.8 Noise.

4.8.1 Background.

Small arms typically produce a high noise level when fired. The noise level may be hazardous to the shooter and to nearby personnel. The noise is also a factor in position disclosure and communications.

4.8.2 Test Method.

a. This test is conducted in general accordance with TOP 01-2-608[8]. Additional information for instrumentation specifications and calibration is given in MIL-STD-1474D[9]; this document also details the analysis procedures and noise limit standards for Army materiel.

b. Mount one test weapon so that the weapon muzzle is 1.6 meters (5.2 feet) above ground level. The test stand should hold the weapon so that no part of the stand is interposed between the muzzle and the microphone positions noted in paragraph 4.8.2d. If test support personnel are required on site to operate and/or control the weapon, the same rule applies. Position test personnel to the right side of the weapon, with the majority of the microphones to the left.

c. The test stand must be in a level open area with no sound reflecting surfaces within 30 meters (98 feet) of the weapon position, or the nearest microphone. Ground clutter (grass, brush, etc.) should be cut to a maximum height of 15 cm (6 in.)

d. Place instrumentation microphones at a height of 1.6 meters (5.2 feet) at the locations specified by the test plan or requirements documents. At a minimum, use eight microphones, at the positions in Table 4, all measured from the weapon muzzle.

TABLE 4. MICROPHONE POSITIONS.

5 m (16 feet) in front of the weapon, approximately -15 deg. off the line of fire.	0 degree
5 m (16 feet), 15 m (49 feet) to the left and perpendicular to the muzzle.	270 degree
5 m (16 feet), 15 m (49 feet) to the left rear of the muzzle.	225 degree
5 m (16 feet), 15 m (49 feet) to the direct rear of the muzzle.	180 degree
15 cm (6 in.) in front of the off side (left) ear, in direct line to the muzzle.	

NOTE: For testing of non-lethal or training systems add an additional 15 meter microphone position in front of the weapon, on the same lines as the established 5 meter position.

e. If the weapon system is vehicle or aircraft mounted, position additional microphones in the appropriate crew/passenger positions. Seated positions are represented by microphones 80 cm above the seat in the center of the head position.

f. Fire five single shots and record the sound pressure levels versus time at each of the microphones.

g. Repeat testing with the ammunition conditioned to the outer limits of the weapon operational limits. For combat systems, that would typically be at -51 °C (-60 °F) and 71 °C (160 °F). For training (and most non-lethal systems), the temperature range limits would typically be -32 °C (-25 °F) and 52 °C (125 °F).

h. For the purpose of supporting an HHAR by the USAPHC, repeat the test with the weapon positioned at 0.3 m (12 in.) and again at 0.8 m (31 in.) above ground level. Always check with the USAPHC for possible additional test conditions that may be required for a specific test item.

i. Test area wind conditions should not exceed 20 km/hr (12.4 mph).

4.8.3 Data Required.

Record the following:

a. Identification of the specific weapon and ammunition.

b. Meteorological data (temperature, humidity, barometric pressure, wind direction and speed).

c. Peak pressure levels.

d. A-duration (pressure wave duration).

e. B-Duration (pressure envelope duration).

f. Microphone locations.

g. Procedure/configuration (i.e., shooter present, shooter not present, etc.)

4.9 Malfunction Hazards.

4.9.1 Background.

A malfunction is an unintended function of the weapon. Malfunctions include stoppages (unintended interruption of firing), uncontrolled fire, inability to initiate fire, and the loss of capability such as loss of sights, flash suppressors, etc. A malfunction can be due to a deficiency of the weapon, or it may be due to a number of causes such as ammunition, magazines, or operator error. Malfunctions may be trivial or they may constitute serious safety hazards. This test assesses the hazards of malfunctions that occur throughout testing and also the hazards associated with deliberately induced common malfunctions.

4.9.2 Test Method.

a. Malfunctions observed during testing.

(1) All malfunctions observed during testing will be recorded. Categorize each malfunction in accordance with TOP 03-2-045, paragraph 5. Each type of malfunction will be investigated to determine if it creates any immediate or delayed hazard to the operator or nearby personnel.

(2) Immediate hazards may include exposure to expelled particles or debris or inability to control the weapon or to cease fire. An unfired cartridge that did not extract or is jammed against the chamber due to a failure to feed is an immediate hazard due to the possibility of cookoff.

(3) Delayed hazards are those associated with correcting the malfunction such as immediate action or by operator maintenance. The necessity of handling excessively hot components should be noted. Procedures and the use of items normally issued to the Soldier (such as a cleaning rod, bayonet, or multi-tool) should be observed for hazards to the operator. Investigate the possibilities of finger pinch points, forceful ejection of spring loaded components and unintended firing of the weapon.

b. Induced Malfunctions.

(1) Some common malfunctions may not occur during testing but can be expected to occur during extended use of the weapon and must be deliberately induced to evaluate safety hazards.

(2) Double feed malfunctions are simulated by placing a primed, empty, cartridge case in the chamber. Remotely feed a live round into the base of the case by manually charging and releasing the bolt. Repeat the procedure three times on three different cartridge cases. Observe for function of the primer of the impacted cases and for any unsafe condition of the live rounds.

(3) Failures to extract are examined by modifying the weapon so that it will fire but not extract the fired case (such as by removing the extractor from the bolt). Fire one round and remove the unextracted cartridge case using tools, such as a cleaning rod, available to the individual shooter. Observe for possible hazards such as release of spring loaded parts, inadvertent loading of the next round from a loaded magazine, etc.

(4) Unintended firing due to firing pin inertia in closed bolt weapons is tested by chambering a primed, empty, cartridge case and releasing the bolt from its rearmost position. Repeat the procedure five times on three different cartridge cases. Examine the cartridge cases for evidence of firing or unsafe conditions such as perforated primers.

4.9.3 Data Required.

The following data are required:

a. Complete list and categories of all observed malfunctions in accordance with TOP 03-2-045, paragraph 5.5.

b. Procedures and tools used to correct malfunctions.

c. Results of examinations of cartridge cases and cartridges.

d. Details of all observed or potential safety hazards.

4.10 1.5-Meter (5-Feet) Drop.

4.10.1 Background.

The drop test identifies hazards associated with accidentally dropping a loaded weapon. This test is likely to damage the weapon; therefore, it should be done near the end of the overall test.

4.10.2 Test Method.

a. Chamber a primed, empty, cartridge case in the test weapon. Ensure that the weapon is fully charged so that only a trigger pull is necessary to fire the cartridge case. Set the safety selector to the SAFE position. Drop the weapon from a height of 1.5 meters once at each of the orientations listed in Table 5.

TABLE 5. DROP ORIENTATIONS

1	Major axis horizontal (normal firing orientation)
2	Major axis horizontal, weapon upside down
3	Major axis horizontal, weapon right side down
4	Major axis horizontal, weapon left side down
5	Major axis vertical, butt down
6	Major axis vertical, muzzle down

b. Drop the weapon onto a clean, dry, and level concrete surface. It may be dropped by a mechanical means or by manually releasing it in the desired orientation. Personnel must be

protected from the risk of expelled debris from functioning primers. Verify proper orientation at impact by video recording (preferred) or by careful visual observation.

c. Inspect the weapon after each drop and determine the position of the safety selector and check to see if the primer has fired. Check the operability of the safety selector and the ability to clear the cartridge case from the weapon. Record any incidents such as an ejected cartridge case, inability to clear the weapon, or loss of parts.

d. Repeat the above procedure with the safety selector in the FIRE position.

e. Test at least one weapon to support a SRR. Three weapons are required for a SCR.

f. The drop test is usually done at local ambient temperature to support a SRR; however, the test may be conducted with the weapon conditioned to an extreme temperature if the planned event is to take place at extreme temperature conditions, such as an Arctic Operational Test.

g. Testing to support a SCR is also normally done at local ambient temperature. However, the test should be repeated with the weapon conditioned to extreme temperatures if it is suspected that this may have an effect on test results. Use 71 and -51 °C (160 and -60 °F) for the extreme temperatures.

4.10.3 Data Required.

Record the following:

a. The position of the safety selector after each drop.

b. The condition of the primer in the cartridge case after each drop.

c. Document any events or observations that during the test indicate an actual or potential safety hazard.

4.11 Blocked Barrel.

4.11.1 Background.

This test is done to determine the danger to personnel and the damage to a weapon resulting from firing the weapon with an obstructed bore. The three types of obstructions noted below are considered to be the most likely to be encountered by Soldiers in combat or training; other possibilities may apply to specific weapons or unusual operational conditions.

4.11.2 Test Method.

a. This test is conducted in accordance with TOP 03-2-045, paragraph 4.13.

b. Three types of barrel obstruction are considered to be most likely: muzzle obstruction (as by inadvertently thrusting the muzzle into mud or slush); water filled bore; and bullet in bore.

c. A SRR does not usually require a Blocked Barrel test unless there are extreme conditions in the planned event. For example, conduct a water filled bore test if weapons are likely to be submerged during planned operations.

d. Each test requires a single round of ammunition. To support a SRR, fire the type of cartridge most commonly used for the planned event. For a SCR use the most energetic cartridge for which the weapon is, or will be, qualified.

e. The test weapon must be fired remotely due to the possibility of catastrophic weapon failure. Witness screens must be placed around the weapon to determine if any debris is projected toward the shooter's position or toward nearby personnel. The witness screens may be of any convenient material; chipboard and corrugated cardboard are acceptable. The screens are arranged to box in the area behind the muzzle at a distance of 1 meter (3.3 feet) from any point of the weapon. The screens should be 2 meters (6.6 feet) high, centered on the plane of the weapon.

f. All three barrel obstructions must be tested to support a SCR.

g. The weapon must be thoroughly inspected after each shot. The weapon must be inspected by NDT before its use in any subsequent firings.

4.11.3 Data Required.

Record the following:

a. Photographs of the test setup.

b. Records and photographs of damage sustained by the weapons.

c. Measurements and photographs of impacts on the witness screens.

d. Results of weapon inspections, including NDT.

e. Maintenance requirements to return the weapons to serviceability, if possible.

4.12 Post-Test Inspections.

4.12.1 Background.

Weapon safety hazards may develop slowly over the life of the weapon. These hazards may be due to parts wear, deterioration from exposure to extreme temperatures, long term effects of lubricants and cleaners, and other effects of extended use. A detailed inspection at the end of the testing program is needed to determine if weapon safety has been compromised.

4.12.2 Test Method.

a. Physically inspect the weapons for evidence of wear or deterioration. Repeat the inspections of paragraph 4.1.2.d. Compare the results of the inspections to those originally obtained.

b. Repeat the Safety Selector tests shown in paragraph 4.2.2. Observe for proper functioning of the safety selector. Record any changes, such as loosening of the selector, difficulty in operation, etc.

c. Repeat the nondestructive tests done in the original inspection. Observe for any indications of incipient failure such as fatigue cracks.

4.12.3 Data Required.

The following data are required:

a. Record the inspection data in the same formats as the original inspections. Identify any changes or discrepancies.

b. Photographs of damaged or worn parts.

c. List of any safety related parts replaced during testing.

4.13 Ancillary Equipment.

4.13.1 Background.

Small arms weapons employ a variety of accessories that are attached directly to the weapon (grenade launchers, muzzle devices, laser pointers, slings, bayonets, brass deflectors, etc.). Such devices have the potential to affect the safety of the basic weapon. Due to the large variety of accessories, it is not possible to identify a specific test method. However, general guidance is provided below.

4.13.2 Test Method.

a. Review documents such as the weapon's operator's manual and appropriate field manuals (such as Field Manual (FM) 3-22.9[10]) to determine what accessories may be used with the test weapon.

b. Attach the accessory to the weapon and observe for any safety implications such as the following:

(1) Interference with manipulation the safety selector.

(2) Blocking of vision of the selector position or of safety indicators (such as pop-up buttons or tabs in the line-of-sight).

(3) Pinch points during installation or operation of the accessory.

(4) Mutual interference between/among attachments.

c. Attach the accessory to the weapon and fire a minimum of 10 rounds and observe for hazards such as:

(1) Shooter exposure to moving parts or hot surfaces due to needed changes in hold.

(2) Change in fired case ejection pattern that would affect the shooter.

(3) Interference with unloading or with clearing malfunctions.

d. Any accessory that contains a laser that may be attached to a small arms weapon shall have a nonionizing radiation protection study performed by the Nonionizing Radiation Program of the USAPHC, IAW AR 40-10[11]. Results of that study should be implemented prior to testing. Military lasers must meet the requirements of the Food and Drug Administration, Title 21 Code of Federal Regulation 1040[12], subchapter J. If the device cannot meet these requirements, then the laser device shall be exempt and shall meet the requirements of MIL-STD-1425A[13] and American National Standards Institute (ANSI) Z136[14].

4.13.3 Data Required.

The following data are required:

a. Observations of actual or potential hazards.

b. Photographs depicting hazards.

4.14 Supplemental Tests.

4.14.1 Background.

There are many possible small arms safety tests that are rarely needed but should be considered in the planning process. The subjects and methods below give general guidance for some specific tests.

4.14.2 Test Method.

a. Proof Firing.

(1) Almost all small arms are proof fired by the manufacturer and do not have to be proof fired when received for test. If proof firing is needed it can be done by obtaining the

proper high pressure test cartridge for the caliber of weapon being tested. Remotely fire one high pressure test cartridge and five standard rounds, then inspect the weapon for adverse affects. All highly stressed components (such as bolts, locking lugs, barrels, etc.) should be subject to magnetic particle or dye penetrant inspections after the rounds are fired.

(2) A high pressure test cartridge may have to be locally loaded if none is otherwise available. If the required proof pressure is known, load a sample of cartridges to that pressure. Test a sample of 20 rounds to verify their pressure using the procedures of TOP 04-2-016.

(3) If the required pressure is not known, record the chamber pressures at 71 °C (160 °F) of 20 of the cartridges that will be used in the overall test. Load the high pressure test cartridge to a pressure equal to the mean plus three standard deviations of that of the 20 round samples.

b. Debris Field.

(1) This test is done to determine the spatial distribution of ammunition debris projected from the weapon. Sabot debris is the most common, but other items such as shot shell wads and sub-munition carriers must also be considered. The debris distribution has safety implications, such as when firing over the heads of friendly troops, and is also needed for the determination of range safety fans and training scenarios. The test is done in accordance with TOP 04-2-016, paragraph 4.3.5. The test is usually conducted by firing through vertical witness screens to determine the distribution of the debris, but it may be necessary to use tracking radar if debris is projected to a range that makes witness screens impractical.

(2) A sample of the debris must be recovered to verify the composition and weight if it is determined that they are distributed in a potentially hazardous direction. Recovery may be done by using a witness screen material capable of stopping and retaining the debris. Typical recovery materials are layers of fiberboard, corrugated cardboard, etc. Recovery may also be done by firing into or through a container such as a large tube or chamber.

c. Software Safety. Software embedded in small arms weapons is usually associated with fuzed ammunition; the software may initiate the fuze at a certain time, number of revolutions, or due to the proximity of a target. Software may also involve other safety features such as misfire interrupters, training safety configurations, laser operations, etc.

(1) There is no single procedure for testing software. International Test Operations Procedures (ITOPs) 01-1-056[15] and 01-1-057[16] provide guidance. However, those procedures are most appropriate for complex systems with formally documented detailed requirements. They do not totally address the adverse conditions to which small arms are exposed.

(2) In the absence of other guidance, address software safety from the viewpoint of the operator and maintainer. Review all available operator's manuals and maintenance manuals. Consider the following test procedures; taking suitable precautions against unexpected effects.

(a) Follow the procedures as written and verify that the software works as intended.

(b) Examine the operator's controls for likelihood of mistaken identity or inadvertent activation.

(c) Deliberately follow procedures in the wrong sequence as might be done inadvertently. If practical, try all possible combinations and sequences.

(d) Determine possible errors by operators or maintainers such as misaligning connectors, use of the wrong power supply, damage from inadvertent short circuits, etc.

(e) Consultation with Human Factors specialists is recommended.

d. Attitudes. Operational conditions often require that small arms weapons be fired in orientations other than normal. Safety considerations include changes in cyclic rate, unusual malfunctions, case ejection pattern relative to the shooter, etc. The test is conducted in accordance with TOP 03-2-045, paragraph 4.11. A test weapon is fired in the orientations shown in Table 6.

TABLE 6. TEST SEQUENCES FOR ATTITUDE TESTS

WEAPON ELEVATION	WEAPON ORIENTATION
0 degrees	Normal
0 degrees	Upside down
0 degrees	Right side up
0 degrees	Left side up
80 to 85 degrees in depression	Normal
80 to 85 degrees in elevation	Normal

5. DATA REQUIRED.

Specific data requirements are included in each individual test procedure in Section 4.

6. PRESENTATION OF DATA.

a. Due to the multiplicity of subtests, this TOP does not include specific data forms or formats. In all cases, the test data must be presented in formats that are factual, comprehensive, and easy to understand. General guidance on presentation of data in reports is given in ATEC Publication Number 1-8[17]; use this guidance for both printed and electronic presentations.

b. Data should be presented using standard terminology and definitions. Standard definitions for weapon malfunctions may be found in TOP 03-2-045.

c. Test results are analyzed by suitable statistical procedures for comparing samples, for obtaining point or interval estimates of a parameter, and for determining from test results

whether specific requirements have been satisfied. ITOP 03-1-005[18] provides guidance on analyzing and presenting test results.

d. Sample formats of a SRR and SCR are provided in Appendix A.

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APPENDIX A. FORMAT FOR RECCOMENDATIONS.

APGR-AT-XX-X

MEMORANDUM FOR Commander, U.S. Army Evaluation Center (TEAE-MGT)
2202 Aberdeen Boulevard - Second Floor, Aberdeen Proving Ground, MD 21005-5001

SUBJECT: Recommendation for Safety Release for [System Nomenclature] in Support of [Specific Event, e.g., PQT, LUT, IOT, Training, Demonstration, Field Use/Experimentation]

1. **References**. Include any safety related information used in the preparation of the document. Such information includes the Safety Assessment Report (SAR), reports of previous tests conducted with the same or closely related test item, and any information provided by the manufacturer or PM.

2. **Purpose**. Identify the specific test event this recommendation is supporting.

3. **System Description**. Give a complete description of the test item including full nomenclature, manufacturer, model number and any unique identifiers.

4. **Discussion**. Discuss sources of data and guidance followed to conduct the safety analysis (e.g., TOPs, ITOPs, MIL-STDs, general industry safety guidance/specifications, health standards etc). Summarize the scope of testing conducted as the basis for the Safety Release. For each hazardous condition assessed, provide a Hazard Risk Assessment Code in terms of potential severity and probability of occurrence.

5. **Conclusions/Recommendations**. Based on all available data, list hazards and any technical, operational limitations or precautions needed to prevent injury and property damage during testing. Include a statement similar to one of the following:

(1) No safety hazards beyond those normally associated with firing small arms were detected as a result of the safety evaluation tests. The subject weapon is considered safe for purposes of the (identify the specific event) provided the following restrictions are observed.

(a) Restriction.

(b) Restriction, etc.

Figure A-1. Sample of a Safety Release Recommendation format.

APPENDIX A. FORMAT FOR RECCOMENDATIONS.

(2) The subject weapon cannot be considered safe for use in the (identify the specific event) due to the following hazards:

(a) Hazard.

(b) Hazard, etc.

6. Points of contact are [Name of Test Officer and System Safety Officer], office symbols, E-mail addresses, and DSN and commercial phone numbers.

SIGNATURE BLOCK
Test Center Commander or
Delegated Authority

CF:
Test Center Safety Office

Figure A-1. Cont'd.

APPENDIX A. FORMAT FOR RECCOMENDATIONS.

APGR-AT-XX-X

MEMORANDUM FOR Commander, U.S. Army Evaluation Center (TEAE-MGT)
2202 Aberdeen Boulevard - Second Floor, Aberdeen Proving Ground, MD 21005-5001

SUBJECT: Recommendation for the Safety Confirmation for [System Nomenclature] in Support of [Acquisition Event, e.g., MS Decision, Type Classification, Materiel Release, Urgent Materiel Release, System Modification, Field Use, etc.]

1. **References**. Include any safety related information used in the preparation of the document. Such information includes the Safety Assessment Report (SAR), reports of previous tests conducted with the same or closely related test item, and any information provided by the manufacturer or PM.

2. **Purpose**. Identify the specific milestone, directive, or request that the Safety Confirmation Recommendation is supporting.

3. **System Description**. Give a complete description of the test item including full nomenclature, manufacturer, model number and any unique identifiers.

4. **Limiting Factors**. Discuss any test limitations, such as lack of test data or limited sample sizes, including their effects. If no factors require explanation, the paragraph would state None.

5. **Assessment**. This paragraph will provide the Test Center's recommendation regarding their assessment of each identified hazard. The assessment will provide a description of the unplanned event or series of events, which, due to the hazardous condition, might result in death, injury, illness, damage to or loss of equipment or property, or damage to the environment. For each hazardous condition assessed, a Hazard Risk Assessment Code in terms of potential severity and probability of occurrence will be provided. Unless indicated differently through program documents, definitions of severity categories and probability levels addressed in the latest MIL-STD-882 will be followed when categorizing the hazardous condition (see MIL-STD-882E, Tables A-I and A-II). The Hazard Risk Assessment Code will be expressed as follows: severity description, followed by the probability description, and concluded with the category and probability level (for example, Critical-Probable II-B). The Test Center will not categorize the risks as high, medium, or low. This is dependent upon the decision authority matrix that is being used. The ATEC/AEC Test Manager in coordination with the ATEC Safety Office will assign the risk category. The assessment will address as a minimum safety hazards/issues identified during test and also those identified in documentation used to prepare the test (e.g., Safety Assessment Report, Health Hazard Assessment, Safety Releases, Technical Manuals, and previous Safety Confirmations, etc).

Figure A-2. Sample of a Safety Confirmation Recommendation format.

APPENDIX A. FORMAT FOR RECCOMENDATIONS.

6. **Conclusions/Recommendations.** Based on the test data, indicate if the system is safe for the intended purpose or whether it is safe with exceptions. Identify hazards and list any technical or operational limitations or precautions needed to prevent injury and property damage during operation. Highlight the known safety problems that will require further investigation and testing. Include all warnings and cautions required for Technical Manuals/Airworthiness Releases. Include a statement similar to one of the following;

(1) No safety hazards beyond those normally associated with firing small arms were detected as a result of the safety evaluation tests. The subject weapon is considered safe provided the following restrictions are observed:

(a) Restriction.

(b) Restriction, etc.

(2) The subject weapon cannot be considered safe due to the following hazards:

(a) Hazard.

(b) Hazard, etc.

7. Points of contact are [Name of Test Officer and System Safety Officer], office symbols, DSN and commercial phone numbers, e-mail addresses.

SIGNATURE BLOCK
Test Center Commander or
Delegated Authority

CF:
Test Center Safety Office

Figure A-2. Cont'd.

APPENDIX B. ABBREVIATIONS.

ACV	armored combat vehicle
AEC	US Army Evaluation Center
ANSI	American National Standards Institute
AR	Army Regulation
ATEC	US Army Test and Evaluation Command
C	Celsius
CC	condition code
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
COTS	commercial off-the-shelf
dB	decibel
DODI	Department of Defense Instruction
DODIC	Department of Defense Identification Code
F	Fahrenheit
FM	Field Manual
ft-lb	foot-pound
HCN	hydrogen cyanide
HHA	Health Hazard Assessment
HHAR	Health Hazard Assessment Report
HERO	Hazards of Electromagnetic Radiation to Ordnance
in.	inch
J	Joule
km/hr	kilometers per hour
MIL-STD	Military Standard
mm	millimeters
mph	miles per hour
NDT	nondestructive test
NH_3	ammonia
NO	nitric oxide
NO_2	nitrogen dioxide

APPENDIX B. ABBREVIATIONS.

PEO	Program Executive Office
RH	relative humidity
SAAMI	Sporting Arms and Ammunition Manufacturers' Institute
SAR	Safety Assessment Report
SCR	Safety Confirmation Recommendation
SO_2	sulfur dioxide
spm	shots per minute
SRR	Safety Release Recommendation
TOP	Test Operations Procedure
TSARC	Test Schedule and Review Committee
USAPHC	US Army Public Health Command

APPENDIX C. REFERENCES.

1. TOP 03-2-045, Small Arms - Hand and Shoulder Weapons and Machineguns, 17 September 2007.

2. TOP 04-2-016, Ammunition, Small Arms, 9 February 2009.

3. MIL-STD-882E, Department of Defense Standard Practice for System Safety, 11 May 2012.

4. DODI 5000.02, Subject: Operation of the Defense Acquisition System, 8 December 2008.

5. TOP 03-2-807, Nondestructive Testing of Materials, 5 December 1985.

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APPENDIX C. REFERENCES.

17. ATEC Publication Number 1-8 (with Change 2), Technical Document Style Manual, April 2007.

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APPENDIX D. APPROVAL AUTHORITY.

CSTE-TM 29 May 2013

MEMORANDUM FOR

Commanders, All Test Centers
Technical Directors, All Test Centers
Directors, US Army Evaluation Center
US Army Operational Test Command

SUBJECT: Test Operations Procedure (TOP) 03-2-504A Safety Evaluation of Small Arms and Medium Caliber Weapons, Approved for Publication

1. TOP 03-2-504A Safety Evaluation of Small Arms and Medium Caliber Weapons has been reviewed by the US Army Test and Evaluation Command (ATEC) Test Centers, the US Army Operational Test Command, and the US Army Evaluation Center. All comments received during the formal coordination period have been adjudicated by the preparing agency. The scope of the document is as follows:

This TOP provides procedures for testing and evaluating the safety of small arms and medium caliber weapons. It covers pistols, rifles, machineguns, sub-machineguns, shotguns, grenade launchers, and medium caliber weapons up to 50 millimeters (mm). The test procedures apply to the basic weapons only; see the relevant TOPs for testing of ammunition, fire control devices, muzzle launched ordnance, etc. The test procedures in this document concentrate on those recommended for Safety Release Recommendations and Safety Confirmation Recommendations.

2. This document is approved for publication and has been posted to the Reference Library of the ATEC Vision Digital Library System (VDLS). The VDLS website can be accessed at https://vdls.atc.army.mil/.

3. Comments, suggestions, or questions on this document should be addressed to US Army Test and Evaluation Command (CSTE-TM), 2202 Aberdeen Boulevard-Third Floor, Aberdeen Proving Ground, MD 21005-5001; or e-mailed to usarmy.apg.atec.mbx.atec-standards@mail.mil.

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Forward comments, recommended changes, or any pertinent data which may be of use in improving this publication to the following address: Range Infrastructure Division (CSTE-TM), US Army Test and Evaluation Command, 2202 Aberdeen Boulevard, Aberdeen Proving Ground, Maryland 21005-5001. Technical information may be obtained from the preparing activity: Commander, US Army Aberdeen Test Center, ATTN: TEDT-AT-FPS, Aberdeen Proving Ground, Maryland 21005-5059. Additional copies can be requested through the following website: http://itops.dtc.army.mil/RequestForDocuments.aspx, or through the Defense Technical Information Center, 8725 John J. Kingman Rd., STE 0944, Fort Belvoir, VA 22060-6218. This document is identified by the accession number (AD No.) printed on the first page.