ANSI/ASB Standard 092, First Edition
2021

Standard for Training and Certification of Canine Detection of Explosives

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ASB Approved July 2021

ANSI Approved December 2021

410 North 21st Street
Colorado Springs, CO 80904

Foreword

This document serves as a baseline for the general protocols for training canines for the detection of explosives. This standard promotes consistency across organizations utilizing canines for the detection of explosives and relieves the judicial system of conflicting protocols.

This document was revised, prepared, and finalized as a standard by the Dogs and Sensors Consensus Body of the AAFS Standards Board. The draft of this standard was developed by the Dogs and Sensors Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science, who determined that initial training, certification, and documentation guidelines should be established for detection canine disipline as no industry standards currently exist. This document is based on the Scientific Working Group on Dog and Orthogonal detector Guidelines (SWGDOG) approved SWGDOG SC 8 – Substance Detector Dogs – Explosives Detection Guideline[a].

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All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

Keywords: *explosives, explosive detection canine, explosive detection dog, bomb dog, initial training, improvised explosives, canine team assessments, canine certification, maintenance training, record keeping and document management, person screening canine, certifying official.*

[a] https://www.nist.gov/system/files/documents/2018/04/25/swgdog_substance_detector_dogs_-_explosives_detection.pdf

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Standard for Training and Certification of Canine Detection of Explosives

1 Scope

This standard provides the training requirements for a canine team (canine handler and canine), and details follow-on assessments for trained canine teams, in the field of explosives detection including traditional explosives detection canines (EDC), person screening canines (PSC), and explosives detection canines with person screening capabilities (EDC w/PSC). This standard is intended to be used as the basis for all phases of the training process and includes certification procedures, training and assessments, record keeping, and document management.

2 Normative References

There are no normative reference documents. Annex C, Bibliography, contains informative references.

3 Terms and Definitions

For purposes of this document, the following discipline specific definitions apply. Please refer to ASB Technical Report 025, *Crime Scene/Death Investigation – Dogs and Sensors – Terms and Definitions*, First Edition, 2017[b] for a comprehensive listing of detailed general canine detection definitions.

3.1
assessments
An evaluation during training and/or certification process; a tool to assess canine team ability.

3.2
assessment record
A record of the assessments of the canine team, i.e., evaluations during either the training or certification to access the canine team's ability and proficiency. The assessment records may be combined with training and certification records or maintained separately. A record documenting the performance of the canine team, especially an account of an act or occurrence kept in writing or some other permanent form, i.e., digital format, which is discoverable.

3.3
canine handler
A person who has successfully completed a recognized course of canine handling in a specific discipline and maintains those abilities through: field applications; maintenance training; certification; recertification; and department, agency, or organization required continuing canine education.

3.4
canine handler error
Any action or cue by the handler that causes the canine team to perform incorrectly.

[b] http://www.asbstandardsboard.org/wp-content/uploads/2019/05/025_TR_e1_2017.pdf

3.5
certification
A process that attests to the successful completion of an examination of relevant skills for the canine team.

3.6
certifying authority
The organization authorizing the certification of a canine team.

3.7
certifying official
assessor
A person who has been delegated the authority to conduct an evaluation (assessment and/or certification) and/or sign certificates on behalf of an organization or entity, that recognizes a canine team has been trained to a particular standard within the organization.

3.8
Change of Behavior
COB
A characteristic pattern of behaviors, as recognized by the canine handler that occurs when the canine detects a trained odor. This differs from other olfactory interest that otherwise are exhibited by the canine in response to the daily environment. The initial change of behavior typically leads to following the odor to its source/target. The pattern of behavior may be unique to each canine.

3.9
competent canine trainer
A person having suitable or sufficient skill, knowledge, experience to train canines and canine handlers.

3.10
confirmed operational outcome
Verification of search results following a deployment of a canine team(s).

3.11
contamination
When an odor/scent is inadvertently or purposefully introduced. Contamination can include the following: contamination of a search area with a target odor/scent or contamination of a target aid with competing odor/scent.

3.12
control training
The training of a canine to obey certain commands while working around people.

3.13
controlled search
An experiment/training/testing exercise in which any defined variable(s) is consistent within specific parameters.

3.14
corrective action plan
A training course of action to remediate performance deficiencies with a canine team.

3.15
distractor
Non-target stimuli placed or naturally occurring within a search area. These can include: humans, toys, food, animal odor, etc.

3.16
double-blind assessment
In the evaluation of a canine team neither the assessor nor the canine handler knows the location of the target odor/scent or whether target odor/scent is present (i.e., a blank / null search).

3.17
explosives detection canine
EDC
A canine trained to detect and alert to the presence of explosives and explosives related substances (e.g., propellants, oxidizers, precursors) for which it has been trained that may be located in the environment.

3.18
explosives detection with person screening capability canine
EDC w/PSC
A canine trained to detect and alert to the presence of explosives and explosives related substances (e.g., propellants, oxidizers, precursors) for which it has been trained that may be located in the environment and/or person borne.

3.19
explosive precursor chemicals
A chemical substance that can be utilized in the production of explosives by either mixing or blending with other substances, or by chemical processing. The vast majority of chemicals are used for legitimate purposes. However, some chemicals could potentially be misused for the illicit manufacture of homemade or improvised explosive. Indeed, relatively small amounts of select chemicals can be applied in certain processes that produce a significant amount of explosives.

3.20
false alert
An indication/trained final response demonstrated by the canine in the absence of the target odor/scent; a situation in which the canine exhibits the trained final response in the absence of the odor/scent on which he /she was trained to find.

3.21
final response
A behavior that a canine has been trained to exhibit in the presence of a target odor/scent source. This behavior may be either passive (sit, stare, down, point, etc.) or active (bite, bark, scratch, etc.). Also known as a trained final response.

NOTE For EDC, EDC w/PSC, and PSC refer to 4.2.1.3.

3.22
hasty search
A quick search or rapid assessment of the defined area.

3.23
initial training
The fundamental training associated with detector canine training which consists of, but not limited to: bonding/relationship building, obedience, basic odor/scent discrimination, and basic search techniques.

3.24
natural distractors
Distractor odor(s)/scent(s) that are naturally occurring in the search environment that are not placed by evaluators, observers or participants. Animal remains that were not placed by someone, holes that were dug by wild animals, feces from other animals, etc.

3.25
non-productive response
A change of behavior of the canine followed by a positive indication which cannot be confirmed by the canine handler. This may be the result of residual odor/scent that the canine can detect but which cannot be confirmed by technology or direct observation. A non-productive response may also be an error—a false alert—but these outcomes cannot be distinguished in an operational environment.

3.26
odor
Volatile chemicals emitted from a substance that are able to be perceived by olfaction. “Odor” has traditionally referred to canine detection of a substance. “Scent” has traditionally referred to canine detection of humans.

3.27
odor recognition assessment
A test of the canine's olfactory ability to alert to target odor(s) in a controlled environment.

3.28
operational assessment
A test conducted (single- or double-blind) in an operational environment in which the canine team will be deployed or utilized.

3.29
operational odor recognition assessment
A test of the canine's olfactory ability to alert to target odor(s) in a controlled manner that the odor is readily available, but still visibly concealed from the canine and handler. Commonly, the baggage/parcels assessment is utilized for an operational odor recognition assessment.

3.30
operational proficiency
Training conducted beyond the initial training of a discipline, designed to maintain a high level of competence or skill by ensuring the team's capability to perform desired tasks.

3.31
person screening canine
PSC
A canine trained to detect and alert to the presence of explosives and explosives related substances (e.g., propellants, oxidizers, precursors) for which it has been trained that may be person borne. The canine team is not EDC certified, however, the canine team may be responsible for searching its intended operational area and/or person(s) separated from their personal property.

3.32
positive alert
A trained detection alert in the presence of the target odor/scent.

3.33
single-blind assessment
An evaluation of the canine team's ability to complete an exercise where the evaluator knows the outcome and the canine team does not.

3.34
taggant
detection taggant
Nitro compounds that possess a high vapor pressure and are added to enhance the detection of plastic explosives by vapor detection means.

3.35
target person
A person bearing an explosive, or explosive precursor chemicals.

3.36
training aid
Target odor/scent sources used for training.

3.37
unconfirmed operational outcome
Lack of verification of search results following a deployment of a canine team(s).

4 Canine Team Requirements

4.1 Initial Training of the Canine Handler

4.1.1 The canine handler training shall be conducted by a competent canine trainer from an canine team's department, agency, or organization, herein referred to as organization, that utilizes a structured curriculum with specific training and learning objectives.

4.1.2 EDC handler training shall include, but not be limited to the following:

a) education on explosives safety to include storage, transportation, and handling;

b) the ability to "read the canine" (recognize the canine's change of behavior to particular stimuli);

c) the acquisition and processing of odor/scent by the canine;

d) education on the various environmental conditions affecting odor/scent dispersion;

e) canine handling techniques (e.g., voice inflection and lead handling);

f) rewarding the canine;

g) education on cognitive bias;

h) first aid for canine and handler;

i) fitness for canine and handler, and

j) relevant legal aspects to include:

- effect of odor/scent dispersion,
- relevant case law,
- preparation of legal documentation, and
- preparation for courtroom testimony.

4.1.3 EDC w/PSC and/or PSC handler training shall include all requirements in 4.1.2 and the following:

a) the acquisition and processing of odor/scent by the canine with an emphasis on air scenting; and

b) education on the various environmental conditions affecting odor/scent dispersion with an emphasis on search techniques that maximize the chances for the canine to encounter odor.

4.1.4 Canine handler training may include techniques for collecting, handling, storing, and disposing of articles and odor/scent evidence as required by the canine handler's organization.

4.1.5 In order to maximize search efficiency, canine handler training shall include search techniques.

4.2 Initial Training of the Canine

4.2.1 EDC, EDC w/PSC, and PSC training shall be conducted by a competent canine trainer from an organization that utilizes a structured curriculum with specific training and learning objectives. The initial training shall include, but not be restricted to the following.

4.2.1.1 Sufficient obedience training to ensure the canine will operate safely and effectively based on mission requirements. Obedience training should include on- and/or off-lead control and responsiveness to verbal commands.

4.2.1.2 Sufficient control training to ensure the canine will operate safely and effectively based on mission requirements. Control training should include on- and/or off-lead control and responsiveness to verbal commands.

4.2.1.3 Training to perform a pre-determined specific passive final response upon locating the trained odor.

4.2.1.4 Exposing the canine to a variety of locations, expected situations, and searches.

4.2.1.5 Initial training shall be completed using actual explosive, or explosive precursor chemicals.

4.2.1.5.1 Detection of the following mandatory explosives (see Annex A, Table A.1 for additional details):

a) 2,4,6-trinitrotoluene (TNT)-based,

b) ammonium nitrate (AN)-based:

- pure AN (prill, powder, etc.);
- blasting agents [e.g., dry blasting agents (ANFO), emulsions, slurries, water gels];

c) black powder,

d) double-base smokeless powder,

e) pentaerythritol tetranitrate (PETN)-based, and

f) cyclotrimethylenetrinitramine (RDX)-based.

4.2.1.5.2 The following substances may be included, in addition to the mandatory explosives listed in 4.2.1.5.1, in the detection training as required by mission or specific threat (see Annex A, Table A.2 for additional details):

a) ammonium nitrate (AN) blended with high explosive-based explosives;

b) black powder substitutes;

c) blasting agents (non AN-based);

d) cast boosters;

e) dynamite [nitroglycerin (NG) or ethylene glycol dinitrate (EGDN)-based] ;

f) improvised explosives (IE):

- salts (e.g., chlorate-based mixtures, nitrate-based mixtures, perchlorate-based mixtures);
- erythritol tetranitrate (ETN);
- peroxide-based explosives [e.g., Hexamethylene Triperoxidediamine (HMTD), Triacetone triperoxide (TATP)];
- urea nitrate (UN)-based explosives.

g) photoflash/fireworks/pyrotechnic powders;

h) plastic explosives (untagged and tagged[c]);

i) single-base smokeless powder; and

j) additional explosives:

— nitromethane (NM)-based;

— octogen (HMX)-based;

— tetryl-based;

— emerging threats (liquid explosives, etc.).

Due to the extreme sensitivity and/or chemical instability of certain IEs, (i.e., peroxide-based explosive compounds, ETN) training shall be done under the guidance of a chemist, bomb technician, and/or explosives canine trainer who has received IE training specific to the safe storage, transportation, and handling of the training aids.

4.2.1.6 The canine trainer and handlers shall be aware of whether or not the explosives used for training contain taggants.

4.2.1.7 The canine shall be exposed to varying concentration/amounts of available odor.

4.2.1.8 Training shall include exposing the canine to a variety of different noise, visual, and odor/scent distractors [e.g., unused storage containers uncontaminated with explosive, or explosive precursor chemicals (e.g., cotton scent bags, plastic bags, plastic containers, glass jars); metal pipes; handling gloves; barriers].

4.2.1.9 The training shall be structured to meet the typical mission requirements of the canine team's organization.

4.2.2 Additional EDC specific training shall include exposure to various heights and depths of training aid(s) placement within different training scenarios.

4.2.3 Additional PSC specific training shall including, but not limited to the following.

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[c] Taggants – Based on the and *Convention on the Marking of Plastic Explosives* of 1991 and *The Antiterrorism and Effective Death Penalty Act* of 1996 (Section 842 of Title 18, United States Code) mandated that as of April 24, 1997, all plastic explosives manufactured in the United States be marked with a chemical detection agent. Taggants are simply nitro compounds that possess a high vapor pressure and are added to enhance the detection of plastic explosives by vapor detection means. Any plasticized high explosive (i.e., Detasheet, Flex X, Primasheet, C4, Semtex) legally manufactured after 4/24/97, contains taggants. Taggants include:
— EDGN (discontinued in the mid-90's)
— Dimethyl Dinitro Butane (DMNB)
— Ortho-Mono nitrotoluene (o-MNT) (deleted from the list of detection agents in a March 2002 amendment)
Para-Mononitrotoluene (p-MNT) (used by France and Russia)

The canine shall be exposed to various training aid placements within different training scenarios to include:

a) in a bag (knapsack, back pack, book bag, etc.) typically worn on the shoulder(s) or hand carried attaché case, computer-type bag or any other similar item used to hold, carry, and transport items carried by the target person;

b) various heights on the target person in a vest, belt, waist pack, pockets, socks, apron, pouch, hat, or any other carry method that may hold and conceal the training aids;

c) in a rolling bag, rolling back pack, wheel chair, utility cart, janitor's cart, catering cart, or other similar item where the item is controlled, pulled, pushed, or propelled by the target person; and

d) items within the physical environment (trash cans, vehicles, baggage, etc.).

4.2.4 Additional EDC w/PSC specific training shall include all requirements listed in 4.2.2 and 4.2.3.

4.3 Initial Training of Canine Team

4.3.1 The canine team's training shall be structured to meet the typical mission requirements of the canine team's organization.

4.3.2 The bond between the handler and canine shall be developed through training, social interaction, and husbandry.

4.3.3 The canine team shall be trained to perform a safe, effective, and controlled search.

4.3.4 The canine team's initial training shall be continued until the required level of operational proficiency is achieved and the canine team is certified. (See Sections 5, 6, and 7).

5 Canine Team Assessments

5.1 Assessments are part of certification, maintenance training, and proficiency testing.

5.2 Each assessment is the evaluation of a search.

5.3 The canine handler shall articulate the canine's final response prior to the start of the assessment. The canine may not be able to make a final response due to the components and parameters of the assessment. Reasonable consideration by the assessor shall be given in these instances (e.g., the target is inaccessible for the canine to make a final response).

5.4 The desired outcome of the search is the correct identification of the number and placement of the target odor(s) by the canine team.

5.5 Safety considerations for canine team assessments include the following.

5.5.1 No detonators will ever be placed with the target odors or used in testing.

5.5.2 All target odors should be placed on the target person and/or inside the assessment areas in a manner so the canine cannot retrieve it.

5.5.3 Aggression towards a placed target odor/person (intrusive contact, bite, bark and/or scratch) shall trigger an immediate remediation action.

5.6 Safety considerations for target person(s) participating in canine team assessments include the following.

5.6.1 All target odors shall be placed in a manner to avoid direct skin contact.

5.6.2 Target odor(s) known to be vasodilators (NG, tetryl, etc.) shall only be placed on the target person's extremities to minimize exposure.

5.6.3 Primary explosives (e.g. peroxide based and ETN) shall not be placed on the target person for safety.

5.6.4 Only explosives that have been properly maintained, stored, and are in good condition shall be used.

5.6.5 Target person(s) shall be provided with an expectations and safety briefing prior to target odor placement.

5.7 Target odors used for assessments shall be comprised of the explosives and targeted oxidizers listed in 4.2.1.5.1 and 4.2.1.5.2 (Annex A, Table A.1 and A.2).

5.7.1 A minimum of ¼ lb (0.11 Kg) of target odor shall be used for all assessments.

5.7.2 Exceptions to the minimum include the following.

5.7.2.1 Minimum of one 8 ft (2.44 m) length of 50 gr/ft (9 g/m), or equivalent, of detonation cord. Reference Annex B Table B.1 for acceptable equivalences.

5.7.2.2 Peroxide-based and ETN explosives, limited to no more than 1 g to 2 g in order to handle and transport the explosives safely.

NOTE US Customary units are not necessary for this procedure, as only grams are used.

5.7.2.3 For non-operational odor recognition assessment a maximum of ¼ lb (0.11 Kg) of target odor shall be used.

5.7.2.4 Nitromethane should not exceed ½ ml.

NOTE US Customary units are not necessary for this procedure, as only milliliters are used.

5.8 The canine team shall be assessed in the following ways.

5.8.1 The assessments in this section are intended for *single-blind assessments*.

5.8.1.1 *Odor recognition assessments* shall test the following.

5.8.1.1.1 The ability of the canine to detect the trained odor while discriminating from non-trained odor.

5.8.1.1.2 Demonstration of the canine's ability to perform a systematic search.

5.8.1.1.3 Demonstration of the canine handler's control of the canine during the execution of a systematic search.

5.8.1.1.4 The canine handler's recognition of the canine's behavior while searching.

5.8.1.1.5 The canine's final response.

5.8.1.1.6 The canine handler's recognition of the canine's final response.

5.8.1.1.7 Odor recognition assessments shall be conducted in an operational or non-operational testing setting.

5.8.1.1.8 The operational odor recognition assessment shall consist of the following components and parameters.

5.8.1.1.8.1 Operational odor recognition assessments shall be conducted following the components and parameters described in 5.8.1.2.

5.8.1.1.8.2 Unlike the assessments described in 5.8.1.2, the target odors shall be placed in a manner that the odor is readily available, but still visibly concealed from the canine and handler. Commonly, the baggage/parcels assessment (see 5.8.1.2.19.1) is utilized for an operational odor recognition assessment.

5.8.1.1.8.3 The canine handler shall be advised of the parameters of the assessment.

5.8.1.1.8.4 The canine handler shall not know the total number or placement of target odors for the totality of the exercise(s).

5.8.1.1.8.5 The assessor shall know the correct outcome of the assessment.

5.8.1.1.8.6 The canine handler shall not know the correct outcome of the assessment.

5.8.1.1.8.7 The assessor shall observe the canine team. At the conclusion of the assessment, the assessor shall compare the search results with the parameters of the search. This comparison may be done immediately after the handler determines the canine has made its final response, or at the conclusion of the entire assessment.

5.8.1.1.8.8 The assessor may take into consideration the environmental influences on the odor in determining whether or not the canine team has successfully completed the odor recognition assessment.

5.8.1.1.9 The non-operational odor recognition assessment shall consist of the following components and parameters.

NOTE Successful completion of this assessment does not indicate proficiency in operational environments.

5.8.1.1.9.1 The canine handler shall be advised of the parameters of the assessment.

5.8.1.1.9.2 The canine handler shall not know the total number or placement of target odors for the totality of the exercise(s).

5.8.1.1.9.3 The assessor shall know the correct outcome of the assessment.

5.8.1.1.9.4 The canine handler shall not know the correct outcome of the assessment.

5.8.1.1.9.5 The assessor shall observe the canine team. At the conclusion of the assessment, the assessor shall compare the search results with the parameters of the search. This comparison may be done immediately after the handler determines the canine has made its final response, or at the conclusion of the entire assessment.

5.8.1.1.9.6 A minimum of 18 sample containers shall be used.

5.8.1.1.9.6.1 The sample containers shall be placed in a location that minimizes environmental influences that may affect the odor.

5.8.1.1.9.6.2 The sample containers will be spaced a minimum of 3 ft apart.

5.8.1.1.9.6.3 Each test sample (target odor or distractor) shall be placed in a clean, unused container, with perforations (metal paint can, ointment tin, etc.). All perforated sample containers must be identical. Each perforated container will be placed in a larger external container. All external containers must be identical. External containers should not be sealed or have lids. All containers will be absent of external markings and all perforations will be small enough to eliminate the presence of visual cues.

5.8.1.1.9.6.4 A minimum of six target odors shall be placed randomly among the sample containers.

5.8.1.1.9.6.5 A minimum of six different distractor odors, uncontaminated by explosives, shall be placed randomly among the sample containers (rubber bands, crayons, batteries, tapes, film, dog food, chalk, micro fiber pads, glue, gloves, aspirin, vitamin C, soap, food, etc.).

5.8.1.1.9.6.6 The evaluator will select the overall arrangement of the sample containers (e.g., individual lines of containers or circular configurations of containers).

5.8.1.1.9.7 The canine team will be allowed to search each sample container twice.

5.8.1.1.9.8 Successful completion of the non-operational odor recognition assessment requires the canine handler team to locate all target odors with an overall false alert rate not to exceed 10%, as defined and calculated in ANSI/ASB Std 088.

5.8.1.1.9.9 Failure of the non-operational odor recognition assessment includes:

a) the canine team fails to locate all of the required target odors;

b) the canine team fails to complete the assessment within two attempts;

c) the canine team exceeds the maximum amount of false or non-productive responses;

d) biting, scratching, aggressively disturbing, and/or barking directed towards a placed target odor; and/or

e) the assessor can fail the canine handler team if it is determined that the canine is no longer actively searching.

5.8.1.2 *Operational assessments* shall test the following.

5.8.1.2.1 The ability of the canine to detect the trained odor while discriminating from non-trained odor/scent.

NOTE There is no prohibition to adding additional distracters [e.g., commonly associated material that are uncontaminated with explosive or explosive precursor chemicals (e.g., cotton scent bags, plastic bags, plastic containers, glass jars; metal pipes; handling gloves; barriers)] beyond the naturally occurring distracters in each operational assessment. Routine incorporation of intentional distracters ensures the canine is locating the intended explosive, or explosive precursor chemicals, rather than unintended commonly associated materials.

5.8.1.2.2 Demonstration of the canine's ability to perform a systematic search.

5.8.1.2.3 Demonstration of the canine handler's control of the canine during the execution of a systematic search.

5.8.1.2.4 The canine handler's recognition of the canine's behavior while searching.

5.8.1.2.5 The canine's final response.

5.8.1.2.6 The canine handler's recognition of the canine's final response.

5.8.1.2.7 For EDC assessments, the assessor shall observe the canine team. At the conclusion of the assessment, the assessor shall compare the search results with the parameters of the search. This comparison may be done immediately after the handler determines the canine has made its final response, or at the conclusion of the entire assessment.

5.8.1.2.8 For PSC assessments, the assessor shall observe the canine team. The handler shall indicate that the canine has made its response to the suspected target person and/or target object. The assessor shall confirm/refute the handler's determination. The handler will then allow the canine to go to a final response if they have not already done so and may reward the canine.

5.8.1.2.9 The canine handler shall be advised of the parameters of the assessment, yet shall not know the desired outcome.

5.8.1.2.10 The canine handler shall not know the number or placement of the target odor(s)/person(s).

5.8.1.2.11 If target odor has to be moved to a new location, the previously used area must be removed as a testing site.

5.8.1.2.12 If the target person has to be changed, the previously used target person shall be removed from the testing location.

5.8.1.2.13 For EDC and PSC assessments, when possible, prior to the first canine handler team entering the assessment area; a separate, nonparticipating canine handler team should be walked through the assessment area.

NOTE This step randomizes canine odor if multiple canines are to be assessed in the same area.

5.8.1.2.14 The assessor shall know the desired outcome of the assessment.

5.8.1.2.15 Natural distracters are normally present and vary depending on the assessment area. Placement of distracters in the assessment area is required when no natural distracters are present. Care must be taken not to place artificial distractions in a manner that causes contamination with the target odor.

5.8.1.2.16 The target odors shall be concealed within the operational assessment area, target person(s), or within the carried/carted object a minimum of 30 minutes prior to the first search.

5.8.1.2.16.1 The concealment should be sufficient to avoid visual cues indicating the location of the target odor to the canine and/or handler.

5.8.1.2.16.2 If the target odor is placed within the carried/carted object then at least one non-target person(s) shall also carry/cart similar objects (e.g., a group of persons carrying backpacks instead of the target person being the only person in the assessment area with a backpack) for PSC assessments.

5.8.1.2.17 Successful completion of the operational assessment requires the canine team to achieve at least a 90% positive alert rate combined with a false alert rate not to exceed 10% as defined and calculated in ANSI/ASB Std 088 and within the specified search time.

5.8.1.2.18 Failure of the operational assessment includes the following.

a) The canine team fails to achieve a 90% positive alert rate.

b) The canine team fails to complete the assessment within the specified search time or fails to complete the minimum specified work time.

c) The canine team exceeds a 10% false or non-productive response rate.

   NOTE Organizations can set the threshold below 10% false or non-productive response rates.

d) Biting, scratching, aggressively disturbing, intrusive contact and/or barking directed towards a placed target odor/person.

e) The assessor can fail the canine handler team if it is determined that the canine is no longer actively searching.

5.8.1.2.19 The operational assessments, as defined *EDC* or *PSC assessments*, shall be representative of the canine's expected operational environment to including, but not limited to the following.

5.8.1.2.19.1 *EDC assessment:* The baggage/parcels operational assessments are designed to evaluate the canine team's ability to locate an explosive contained within baggage/parcels. The

baggage/parcels operational assessment shall consist of the components and parameters in 5.8.1.2.19.1 and 5.8.1.2.19.1.1 through 5.8.1.2.19.1.5.

5.8.1.2.19.1.1 The assessment shall include a minimum of 10 baggage/parcels items.

5.8.1.2.19.1.1.1 A minimum of two baggage/parcels items shall contain a target odor. The number of target odors may increase as long as there are a minimum of five total baggage/parcels items per target odor used.

5.8.1.2.19.1.1.2 Target odors shall be randomly placed within the baggage/parcels items.

5.8.1.2.19.1.1.3 No two target odors shall be placed next to each other.

5.8.1.2.19.1.1.4 Distractors (clothing, toys, food, items representative of the typical operational area, etc.) shall be placed in at least one baggage/parcel item.

5.8.1.2.19.1.1.5 Examples of baggage/parcels include hard and soft-shell suitcases, attaché cases, clothing bags, brief cases, golf bags, sea bags, duffel bags, cardboard boxes, envelopes and other mail articles, etc.

5.8.1.2.19.1.2 The layout area will be consistent with the number of baggage/parcels items laid out to be searched. Ample room >3 ft (1 m) between each article is required to allow the canine team to move around each baggage/parcel item.

5.8.1.2.19.1.3 The assessment shall take no more than 2 minutes per 10 baggage/parcels items searched.

5.8.1.2.19.2 *EDC assessment*: The building/room operational assessments are designed to evaluate the canine team's ability to locate an explosive contained within a building/room. The building/room operational assessment shall consist of the components and parameters in 5.8.1.2.19.2.1 through 5.8.1.2.19.2.3.

5.8.1.2.19.2.1 The assessment shall include a minimum of three rooms.

5.8.1.2.19.2.1.1 The rooms shall be between 200 ft^2 (20 m^2) to 1200 ft^2 (100 m^2) containing items (i.e., furniture, shelves, boxes, distractors). Large rooms may be sectioned off to meet the 200 ft^2 (20 m^2) requirement.

5.8.1.2.19.2.1.2 No more than one target odor shall be placed in a single room.

5.8.1.2.19.2.1.3 The explosive aids shall be placed anywhere from ground level to 6 ft (2 m) high.

5.8.1.2.19.2.1.4 The assessment shall include blank room(s).

5.8.1.2.19.2.2 The canine handler shall not change the search environment (open any closed doors, cabinet's desk drawers, etc.) during the assessment.

5.8.1.2.19.2.3 The canine team shall search each building/room no more than two passes [e.g., hasty search(es) and/or detailed search(es) (additional detailed searching of the area indicated by the change of behavior does not count against the number of passes)]. The assessment should take

no more than 1.5 minutes per 100 ft^2 searched (e.g., if the room is 500 ft^2 it should take no more than 7.5 minutes to complete the search).

NOTE A pass constitutes a single loop (e.g., the canine team enters the room at 6 o'clock position and starts to search clockwise, the pass is complete when the canine team returns to the 6 o'clock position).

5.8.1.2.19.3 *EDC assessment:* The motor vehicle operational assessments are designed to evaluate the canine team's ability to locate an explosive placed in the exterior or the interior of a vehicle. The vehicle operational assessment shall consist of the components and parameters in 5.8.1.2.19.3.1 through 5.8.1.2.19.3.1.4.

5.8.1.2.19.3.1 The assessment shall include a minimum of 10 vehicles.

5.8.1.2.19.3.1.1 A maximum of one target odor shall be used for every five vehicles.

5.8.1.2.19.3.1.2 Target odor(s) shall be randomly placed within the exterior and interior of the vehicles used in the assessment. Potential target odor placement may include, but is not limited to:

a) closed engine compartment;

b) closed passenger compartment with windows rolled up and doors/hatch closed;

c) drive shaft;

d) fuel tank exterior or fuel filler pipe;

e) closed trunk compartment with no additional concealment beyond the training aid packaging material;

f) open passenger compartment with window(s) rolled down and/or door(s)/hatch open [i.e., console, glove box, in a parcel/luggage, under seat(s)];

g) open trunk compartment with target odor concealed within a parcel/luggage, spare tire well, and storage compartment, etc.

h) vehicle exterior (bumper, quarter panels, wheel wells, etc.); and/or

i) undercarriage.

5.8.1.2.19.3.1.3 Only one target odor shall be placed on or in each vehicle.

5.8.1.2.19.3.1.4 No two vehicles containing target odors shall be placed next to each other.

5.8.1.2.19.3.1.5 Any type or model of passenger vehicle, including pickup trucks, tractor-trailers, vans, and buses may be utilized for testing.

5.8.1.2.19.3.2 The parking area shall be consistent with the number of vehicles to be searched or larger, with ample room between each vehicle to allow the canine handler team to move around each vehicle.

5.8.1.2.19.3.3 The canine team shall conduct the search in accordance with their organization's requirements (e.g., the organization's requirements is that only exteriors of the vehicle are searched with window(s)/door(s)/other opening(s) closed and/or a specified number of passes around the vehicle).

5.8.1.2.19.3.4 The assessment should take no more than 2 minutes per vehicle. Based on the size of the vehicle and the complexity of the search, additional time per vehicle may be allowed.

5.8.1.2.19.4 *EDC assessment:* The open area/perimeter operational assessments are designed to evaluate the canine team's ability to locate an explosive contained within an open area/perimeter. The open area/perimeter operational assessment shall consist of the components and parameters in 5.8.1.2.19.4.1 through 5.8.1.2.19.4.2.

5.8.1.2.19.4.1 The assessment shall include a minimum of one search area at a minimum of 22,500 ft^2 (2090 m^2).

NOTE A standard National Football League (NFL) football field is 57,600 ft^2 (5351 m^2).

5.8.1.2.19.4.1.1 No more than one target odor should be placed in a single search area.

Target odor(s) may be placed no more than 1 ft (0.30 m) below the ground's surface and no more than 8 ft (2.4 m) above the ground.

5.8.1.2.19.4.1.2 Open area/perimeter search shall be defined as building exteriors, open fields, wooded areas, and/or any area outside.

5.8.1.2.19.4.2 The assessment shall take no more than 1 minute per 1000 ft^2 (92 m^2) searched (e.g., if the open area is 30,000 ft^2 (2800 m^2) it should take no more than 30 minutes to complete the search).

5.8.1.2.19.5 *PSC assessment:* The choke point operational assessments are designed to evaluate the canine team's ability to locate an explosive on a person in areas where people are funneled through a certain location. This assessment involves a moving target person and requires the canine team to identify and follow the target person. The choke point operational assessment shall consist of the components and parameters in 5.8.1.2.19.5.1 through 5.8.1.2.19.5.3.

5.8.1.2.19.5.1 Potential choke point operational assessment areas shall be consistent with the operational requirements of the canine team (entry points, hallways, corridors, ramps, stairwells, moving sidewalks, gates, etc.). Choke points are also considered areas with high volume of people passing through a particular area, usually and are at least two people wide (airports, schools, mass transit locations, sport complex events, hotels, shopping malls, hospitals, government buildings, and other likewise public or private venues).

5.8.1.2.19.5.2 The assessment shall include a minimum of ten persons passing through the choke point.

5.8.1.2.19.5.2.1 Persons should behave normally.

5.8.1.2.19.5.2.2 A minimum of one target person shall carry a target odor. Potential target odor placement may include, but is not limited to:

a) in a bag (knapsack, back pack, book bag, etc.) typically worn on the shoulder(s) or hand carried attaché case, computer -type bag or any other similar item used to hold, carry, and transport items; carried by the target person;

b) various heights on the target person in a vest, belt, waist pack, pockets, socks, apron, pouch, hat, or any other carry method that may hold and conceal the training aids; and

c) in a rolling bag, rolling back pack, wheel chair, utility cart, janitor's cart, catering cart, or other similar item where the item is controlled, pulled, pushed, or propelled by the target person.

5.8.1.2.19.5.2.3 At a randomly selected time(s) the target person(s) shall pass through the choke point.

5.8.1.2.19.5.2.4 Distractors (clothing, toys, food, items representative of the typical operational area, etc.) shall be carried by at least one non-target person.

5.8.1.2.19.5.3 The assessment shall be a minimum of 20 minutes of continuous searching the selected choke point.

5.8.1.2.19.6 *PSC assessment*: The crowd operational assessments are designed to evaluate the canine team's ability to locate an explosive on a person in a crowd. The crowd operational assessment shall consist of the components and parameters in 5.8.1.2.19.6.1 through 5.8.1.2.19.6.3.

5.8.1.2.19.6.1 The assessment area shall be a minimum of 1000 ft^2 (92 m^2) location where people gather or mill around and maintain a considerable amount of foot traffic, consistent with the operational requirements of the canine team (airports, bus and train stations, schools, malls, food courts, shopping malls, sports complexes, convention centers, public speaking areas, concerts and public gatherings, etc.).

5.8.1.2.19.6.2 The crowd should consist of a minimum of 20 persons walking around (alone or in groups), and/or the crowd may be static in nature.

5.8.1.2.19.6.2.1 Persons should behave normally.

5.8.1.2.19.6.2.2 Persons will not attempt to avoid the working canine, but if walking, should continue progress as they would if they were walking through the venue.

5.8.1.2.19.6.2.3 The target person(s) shall be randomly placed in the crowd. Potential target odor placement may include, but is not limited to:

a) in a bag (knapsack, back pack, book bag, etc.) typically worn on the shoulder(s) or hand carried attaché case, computer -type bag or any other similar item used to hold, carry, and transport items; carried by the target person;

b) various heights on the target person in a vest, belt, waist pack, pockets, socks, apron, pouch, hat, or any other carry method that may hold and conceal the training aids;

c) in a rolling bag, rolling back pack, wheel chair, utility cart, janitor's cart, catering cart, or other similar item where the item is controlled, pulled, pushed, or propelled by the target person; and

d) items within the physical environment (trash cans, vehicles, baggage, etc.).

5.8.1.2.19.6.3 The assessment shall be a minimum of 15 minutes of continuous searching the selected crowd.

5.8.1.2.19.7 *PSC assessment:* The line/queue operational assessments are designed to evaluate the canine team's ability to locate an explosive on a person waiting in a line/queue. The line/queue operational assessment shall consist of the components and parameters in 5.8.1.2.19.7.1 through 5.8.1.2.19.7.3. Unlike the choke point operational assessment, the canine in the line/queue operational assessment has a limited working area that is dictated by the line/queue design and may or may not allow the canine handler team to be down wind at all times.

5.8.1.2.19.7.1 Potential line/queue operational assessment areas shall be consistent with the operational requirements of the canine team (checkpoints, gates, ticketing areas, etc.). Line/queues are also considered areas with high volume of people passing through a particular area, usually one person wide (airports, mass transit locations, sport complex events, checkpoints, and other similar public or private venues).

5.8.1.2.19.7.2 The assessment shall include a minimum of ten persons passing through the line/queue.

5.8.1.2.19.7.2.1 A minimum of one target person shall carry a target odor. Potential target odor placement may include, but is not limited to:

a) in a bag (knapsack, back pack, book bag, etc.) typically worn on the shoulder(s) or hand carried attaché case, computer -type bag or any other similar item used to hold, carry, and transport items; carried by the target person;

b) various heights on the target person in a vest, belt, waist pack, pockets, socks, apron, pouch, hat, or any other carry method that may hold and conceal the training aids;

c) in a rolling bag, rolling back pack, wheel chair, utility cart, janitor's cart, catering cart, or other similar item where the item is controlled, pulled, pushed, or propelled by the target person; and

d) items within the physical environment (trash cans, vehicles, baggage, etc.).

5.8.1.2.19.7.2.2 At a randomly selected time(s) the target person(s) shall pass through the line/queue.

5.8.1.2.19.7.2.3 Distractors (clothing, toys, food, items representative of the typical operational area, etc.) shall be carried by at least one non-target person.

5.8.1.2.19.7.3 The assessment shall be a minimum of 20 minutes of continuous searching the selected line/queue.

5.8.1.2.19.8 Additional operational assessment(s) areas are based on mission requirements and unique environments. The previously defined assessment areas shall be referenced for the preparation of the search area(s) with the time to complete the search scaled appropriate to the size/number of items/areas to be searched. Additional operation assessment areas may include, but are not limited to:

a) aircraft;

b) maritime vessels;

c) mass transit vehicles (i.e., buses, light rail cars, subway cars); and/or

d) large cargo configurations.

5.8.2 The assessments in this section are intended for *double-blind assessments*.

When a double-blind assessment is conducted, it shall be conducted with considerations for safety.

5.8.2.1 Odor recognition and operational assessments can all be conducted double-blind following the components and parameters described in 5.8.1.

5.8.2.2 Unlike the assessments described in 5.8.1, neither the canine handler, nor the assessor, nor any individual present with the canine team shall know the correct outcome of any portion of the assessment, including whether the search area(s) is a blank or includes a trained odor.

5.8.2.3 The canine team shall be required to successfully complete the assessment as defined by the assessing agency.

5.8.2.4 The assessor shall observe the canine team. At the conclusion of the assessment, the assessor shall compare the search results with the parameters of the search. This comparison may be done immediately after the handler determines the canine has made its final response, or at the conclusion of the entire assessment.

5.8.2.5 The canine team should be required to complete a double-blind assessment every six months.

5.8.2.6 An explosive detection double-blind assessment may be used for proficiency testing.

6 Canine Team Certification

6.1 Certification for the named canine team (one canine handler and one canine) shall be valid for up to one year (365 days or 366 days in a leap year). Canine handlers with more than one canine shall be required to independently certify with each canine.

6.2 The canine team shall perform regular documented maintenance training, periodic proficiency assessments, double-blind assessments, and follow other recommended Federal, state and local guidelines. Certification does not remove the requirement for continuing proficiency training.

6.3 The certifying official(s) shall not be routinely involved in the training (maintenance training, periodic proficiency assessments, double-blind assessment, etc.) of the canine team being evaluated.

6.4 The certification shall be comprised of the assessments listed in Table 1 (single- and/or double-blind assessment, or a combination of both). In order to obtain certification, the canine team shall pass all parameters outlined in Section 5, *Canine Team Assessments*. If the canine is a dual purpose (EDC/Patrol) then the canine team shall pass all parameters outlined in Section 5, in both this document and the certification requirements in Section 5 in ASB Standard 027.

Table 1—Certification Assessments

Canine Type	Required Assessments	Additional Required Assessment(s)	Additional Optional Assessments (depending on the typical mission requirements of the canine)
EDC	- Baggage/parcels - Building/room - Motor vehicles	Select One or More: - Odor recognition (operational or non-operational) - Open area/perimeter - Aircraft - Maritime vessel - Mass transit vehicles - Large cargo configurations	
EDC w/PSC	- Choke point	Select three or more: - Aircraft - Baggage/parcels - Building/room - Crowd - Large cargo configurations - Line/queue - Maritime vessel - Mass transit vehicles - Motor vehicles - Odor recognition (operational or non-operational) - Open area/perimeter	
PSC	- Choke point - Crowd		- Line/queue - Odor recognition (operational or non-operational)

6.5 Minimum weight of target odor(s) used for certification shall be ¼ lb (0.11 kg). Maximum weight of target odor(s) being tested shall be determined by the evaluator and based on mission requirements and associated threat.

6.5.1 Exceptions to the minimum include the following.

6.5.1.1 Minimum of one 8 ft (2.44 m) length of 50 gr/ft, (9g/m), or equivalent, of detonation cord. Reference Annex B Table B.1 for acceptable equivalences.

6.5.1.2 Peroxide based and ETN explosives, limited to no more than 1 g to 2 g in order to handle and transport the explosives safely.

NOTE US Customary units are not necessary for this procedure, as only grams are used.

6.5.1.3 For non-operational odor recognition assessment a maximum of ¼ lb (0.11 Kg) of target odor shall be used.

6.5.1.4 Nitromethane should not exceed 1/2 milliliter.

NOTE US Customary units are not necessary for this procedure, as only milliliters are used.

6.5.2 Certification shall be conducted with actual explosive, or explosive precursor chemicals.

6.5.2.1 The following target odors shall be included in the certification (see Annex A, Table A.1 for additional details):

a) 2,4,6-trinitrotoluene (TNT)-based,

b) ammonium nitrate (AN)-based:

- pure AN (prill, powder, etc.);
- blasting agents (e.g., dry blasting agents (ANFO), emulsions, slurries, water gels);

c) black powder,

d) double -base smokeless powder,

e) pentaerythritol tetranitrate (PETN)-based, and

f) cyclotrimethylenetrinitramine (RDX)–based.

6.5.2.2 Recommended optional target odors are listed below and may be included in the certification based on mission specific requirements (see Annex A, Table A.2 for additional details).

a) ammonium nitrate (AN) blended with high explosive-based explosives;

b) black powder substitutes;

c) blasting agents (non AN-based);

d) cast boosters;

e) dynamite (nitroglycerin (NG) or ethylene glycol dinitrate (EGDN)-based);

f) improvised explosives (IE):

- salts [e.g., chlorate-based mixtures, nitrate-based mixtures, perchlorate-based mixtures];
- erythritol tetranitrate (ETN);
- peroxide-based explosives [e.g., Hexamethylene Triperoxidediamine (HMTD), Triacetone triperoxide (TATP)];
- urea nitrate (UN)-based explosives.

g) photoflash/fireworks/pyrotechnic powders;

h) plastic explosives (untagged and tagged[b]);

i) single-base smokeless powder; and

j) additional explosives:

— nitromethane (NM)-based;

— octogen (HMX)-based;

— tetryl-based;

— emerging threats (e.g., liquid explosives).

Due to the extreme sensitivity and/or chemical instability of certain IEs (i.e., peroxide-based explosive compounds, ETN), training shall be done under the guidance of a chemist, bomb technician, and/or explosives canine trainer who has received IE training specific to the safe storage, transportation, and handling of the training aids.

6.5.3 Minimum set time shall be 30 minutes or determined by the certifying official(s) based on mission requirements and the associated threat.

6.5.4 Target odor(s) shall not be placed in plain sight. The concealment should be sufficient to avoid visual cues indicating the location of the target odor to the canine and/or handler.

6.5.5 Target odor(s) used in the certification process should not have been used in the training activities (maintenance training, periodic proficiency assessments, double-blind assessment, etc.) of the team being certified.

6.6 At least one certification component should be a double-blind assessment. Certification components that are not double-blind shall be single-blind assessments.

6.7 For successful certification, the canine team shall achieve at least an overall 90% positive alert rate and an overall false alert rate not to exceed 10%, as defined and calculated in ANSI/ASB Standard 088.

The canine team should be able to locate all target odor(s) within 3 ft (1 m) from the source without disturbing the target odor(s), regardless of the height of the source, barring extenuating environmental conditions deemed relevant by the certifying official(s).

6.8 The certifying authority may fail the canine team due to canine handler errors and breaches of safety, which may include, but are not limited to, the following.

a) Not maintaining positive control of the canine, which may lead to safety issues.

b) Allowing canine outside of the search area.

c) Not following directions of the certifying assessor.

6.9 Deliberate compromise of an evaluation will not be tolerated. Any communication concerning specifics of the evaluation will constitute a compromise and will lead to termination of the canine team's certification.

6.10 A mission-oriented environment(s) shall be used.

6.11 A canine team that fails the certification process shall complete a documented corrective action plan before making another attempt to certify.

Certifying official(s) shall identify the performance deficiency to the canine handler so that the trainer can determine the minimum amount of time for that deficiency to be remediated before another certification attempt.

6.12 During this remediation time frame, documentation should be provided by the canine trainer/handler to demonstrate that efforts have been enacted to correct the deficiency.

6.13 Organization(s) may enhance the recommended standards in order to make the requirements more stringent.

7 Canine Team Maintenance Training

7.1 The canine team's training shall continue to maintain a level of operational proficiency and obtain and maintain organizational certification requirements (see Sections 5, and 6).

7.2 The canine team shall conduct regular objective-oriented training sufficient to maintain and enhance operational proficiency that includes:

a) enhancing the proficiency level of the canine team;

b) maintaining the necessary level of fitness of the canine team;

c) correcting identified deficiencies;

d) a variety of search locations, environmental conditions, weather conditions, and search area sizes;

e) a varied duration of search times at different times of day or night;

f) a variety of blank searches;

g) a variety of odor/scent distractions and/or odor/scent distractors in the search area;

h) a variety of set times;

i) a variety of target person(s) where applicable;

j) a variety of target odor, amounts, number of targets and different sources of targets;

NOTE 1 At the discretion of the canine trainer the ¼ lb (0.1 kg) minimum (see 5.7.1) can be lowered, or increased (e.g., large vehicle bombs) during the maintenance training to meet operational objectives.

NOTE 2 In unique circumstances where access to actual explosives material for maintenance training is limited, the use of non-hazardous training aids (mimics/pseudo/non-detonable/etc.,) is acceptable, but is not a best practice.

k) a variety of degrees of concealment (heights, depths, enclosures, locations on the target person, etc.); and

l) a variety of noise distractors (traffic, sirens, children playing, verbiage over a PA system, etc.).

7.3 Routine training conducted solely by the handler to maintain the canine's proficiency is acceptable, but not a best practice, and shall be combined with supervised training on a regular basis.

Supervised training by a competent trainer is required in order to improve performance, identify and correct training deficiencies, and perform proficiency assessments.

7.4 A canine team shall complete a minimum of 16 hours of training per month to maintain and improve the proficiency level of the canine team. EDC w/PSC teams shall split their training time per month between EDC and PSC focused training. It is recommended that an additional amount of training hours, above the minimum 16 hours, should be incorporated for EDC w/PSC teams to maintain proficiency.

7.5 The canine team shall perform periodic proficiency assessments throughout the certification period as outlined in Section 5, *Canine Team Assessments*, including a variety of odor recognition assessments, operational assessments, single- and double-blind assessments.

7.6 Training is meant to sustain, enhance, and promote the performance of the canine team.

7.7 Canine teams shall be challenged during the regular maintenance training sessions within the operational environments for which the canine team may be deployed.

8 Training Aid Storage and Handling

8.1 Handling and storage of training aids shall be conducted in a manner that minimizes odor/scent contamination.

8.1.1 Training aids shall be stored within a Federal, state, and locally approved explosive storage magazine.

8.1.2 Transportation and vehicle storage of training aids shall follow Federal, state, and local guidelines.

8.1.3 Training aids shall be stored in separate, individual, and labeled containers in a manner safe for the handler and canine.

8.1.3.1 Each label shall contain a minimum of the following information:

a) training aid tracking codes and/or actual aid names;

b) emergency contact information.

8.1.3.2 Training aid tracking codes shall be cross-referenced to a reference log maintained within the respective organization. The log shall contain, but not be limited to, the following:

— description of aid;

— date acquired;

— quantity and/or weight.

8.1.4 Training aids shall be stored individually and separately from non-target and masking odor/scent(s).

8.1.4.1 Canine training aids should be stored separately from all other explosives to avoid contamination.

8.1.4.2 It is recommended that all dynamites containing nitroglycerin, EGDN and all plastic explosives containing taggants such as DMNB, are stored separately in sealed containers in separate explosive storage magazines. If this is not possible, then frequent replacement of training aids is recommended.

8.1.5 Training aids shall be appropriately disposed of and replenished as required and necessary due to odor/scent contamination and/or the perishable nature of the material. Disposal and or the destruction of the training aids shall follow Federal, state and local regulations.

NOTE Typically training aids are replaced on an annual basis.

8.2 Every effort shall be made to train on actual explosives and targeted oxidizers (Annex A).

NOTE Where feasible avoid use of pseudos, simulants, and surrogates.

8.3 Security of the training aids shall follow Federal, state and local guidelines.

8.4 Training aids shall be maintained in a manner to avoid loss or destruction.

8.4.1 Training aids should be at a minimum inventoried monthly by two persons.

8.4.2 Training aids should be signed in and out by two persons.

8.5 Anyone handling the explosives should have documented training on the acquisition, transportation, handling, storing and disposing of training aids.

8.6 Training aids should be procured from a reputable source and the source documented.

8.7 Safety Data Sheets (SDS) shall be available for each training aid materials utilized.

9 Canine Team Records and Document Management

9.1 The canine handler/organization shall document training, certification, canine team assessments and discipline-related deployment data as relevant.

9.2 Proficiency assessments and training records may be combined or separate documents.

9.3 Discipline-related deployment records shall be separated from training, proficiency assessment, and certification documentation.

9.4 Training and discipline-related records should be standardized within the organization.

9.5 Canine team assessment records maintained by the canine handler/organization shall include, but not be limited to, the following data.

a) Name of canine and canine handler.

b) Name(s) of individual(s) conducting, assisting, or awarding assessment.

c) Date and time of canine team assessment.

d) Canine team assessment results.

e) Operational assessment design (single-blind, or double-blind).

f) Type and size of search area (vehicle, baggage/parcels, building, open area, etc.).

g) Location, environment, and weather conditions during assessment (i.e., urban, rural, wilderness).

h) Time taken to complete assessment.

i) Location of target(s)/target person(s).

j) Target person(s) descriptors, if applicable (weight, gender, age, ethnicity, stature, etc.).

k) Set time.

l) Type(s) and amount(s) of target(s) used.

m) The concealment of the target odor(s).

n) The standard or guideline to which the canine team is assessed.

o) Deficiencies and corrective measures noted for future training.

p) Other information required by canine team's organization.

9.6 Certification records shall be maintained by the certifying authority and the canine handler, and shall include, but are not limited to, the following data.

a) Name of canine and canine handler.

b) Name(s) of individual(s) conducting, assisting, or awarding certification.

c) Certification authority [i.e., agency, professional organization, and/or individual(s)].

d) Date and time canine team certified.

e) Canine team certification results.

f) Certification assessment design (single-blind, or double-blind).

g) Type and size of search area (vehicle, baggage/parcels, building, open area, etc.).

h) Location, environment, and weather conditions during certification (i.e., urban, rural, wilderness).

i) Time taken to complete certification assessment.

j) Location of target(s)/target person(s).

k) Target person(s) descriptors, if applicable (weight, gender, age, ethnicity, stature, etc.).

l) Set time.

m) Type(s) and amount(s) of target(s) used.

n) The concealment of the target odor(s).

o) The standard or guideline to which the canine team is certified.

p) Deficiencies and corrective measures noted for future training.

q) Other information required by canine team's organization

9.7 Training records maintained by the canine handler/ organization shall include, but are not limited to, the following data.

a) Name of canine handler and canine.

b) Name(s) of individual(s) conducting or assisting with training.

c) Time and date of training.

d) Canine team search results.

e) Training design (single-blind, or double-blind).

f) Type and size of search area (vehicle, baggage/parcels, building, open area, etc.).

g) Location, environment, and weather conditions of training (i.e., urban, rural, wilderness).

h) Length of training session.

i) Location of target(s)/target person(s).

j) Target person(s) descriptors, if applicable (weight, gender, age, ethnicity, stature, etc.).

k) Number of target(s)/target person(s).

l) Set time.

m) Type(s) and amount(s) of target(s) used.

n) The concealment of the target odor(s).

o) Deficiencies and corrective measures implemented during training regimen.

p) Other information required by canine team's organization

9.8 Deployment/utilization records maintained by the canine handler/ organization shall document the specifics of the deployment including, but are not limited to, the following data.

a) Name of the canine and canine handler.

b) Name(s) of organization(s) conducting search.

c) Requestor of deployment.

d) Date and time of deployment.

e) Search results.

f) Description of the search.

g) Environmental conditions at deployment

h) Information regarding any final response(s).

i) Type and size of search area (vehicle, baggage/parcels, building, open area, etc.).

j) Location (GPS coordinates are recommended but are optional) of deployment.

k) Other information required by the canine team's organization.

9.9 All documented training, assessment(s), and certification(s) shall be used to determine the canine team's proficiency.

9.10 Confirmed operational outcomes (e.g., locating an improvised explosive device) can be used as a factor in determining canine team's capability.

9.11 Unconfirmed operational outcomes shall not be used as a factor in determining a canine team's proficiency. Unconfirmed operational outcomes, including a non-productive response, may be relevant for investigative/testimony purposes because of the following.

9.11.1 Target odor or residual odor can be present but are below the measurable level of detection for laboratory instrumentation.

9.11.2 There may be an environmental inability or external factors which prevent locating the odor source.

9.12 Supervisory review of all records is recommended.

9.13 Digitally formatted records (with appropriate back up), versus handwritten are recommended to facilitate compiling and analyzing data.

9.14 All documented training, assessments, certification, and deployments shall be documented to include final response, any false alert, and any false negatives.

9.15 Records may be discoverable in court proceedings and may become evidence of the canine team's reliability. Record retention policy shall be determined by the canine team's organization guidelines.

9.16 Training records are necessary to illustrate the type and amount of training that the team has experienced before and after certification.

9.17 Training aid records.

9.17.1 Training aids shall be clearly labeled in a manner to support accountability.

9.17.2 Appropriate records shall be maintained by the canine handler/organization in accordance with Federal, state and local requirements.

9.18 Veterinary records.

9.18.1 Veterinary records shall be maintained in a manner such as they are accessible to the canine handler/organization.

9.18.2 Vaccinations required by state or local law shall be documented in the veterinary record of the canine.

Annex A
(informative)

Classes of Explosives and Examples

This is not meant to be an all-inclusive list as the group recognizes other explosives and equivalents may exist. Additionally, any mention of a particular brand or vendor as part of this table is purely incidental, and any inclusion does not imply endorsement.

There are thousands of different explosive formulations on the market or that can be made; however many formulations have the exact same components and only vary slightly in the ratio of the components in the mix. The Safety Data Sheets (SDS) should be consulted to determine the composition of the explosive formulation selected to ensure that you are training on the categories intended. Additionally, the SDS' can be a valuable tool for selecting formulations to be incorporated into the canine's repertoire (e.g., if selecting a cast booster as a PETN source, PETN should comprise the highest percentage of ingredients in the formulation). All manufactures of explosives are required to maintain SDS' for the products they sell and SDS' can be requested directly from the manufacturer prior to purchase to ensure that the item selected is the actual item required for training. If the composition of the explosive is not known (e.g., the local bomb squad provided some plastic explosive), it should only be used as an additional optional explosive and not a source of an explosive within the mandatory category. All explosives should be sourced from a reputable company/organization/government entity. Selection of the example/formulation within the mandatory and optional categories of explosives should be based on the intelligence-driven threat in the canine team's intended operational area (e.g., evaluation of historical bomb data indicates that ANFO is prevalent in the canine team's operational area; ANFO should then be selected for incorporation into the canine's training repertoire).

Table A.1—Examples of the Mandatory Explosives[d]

MANDATORY CATEGORY	Examples/ Formulations or Equivalents		
2,4,6-trinitrotoluene (TNT)-based	**Pure**	— TNT (Flake) — TNT Granular	
	Other	— Amatex — Amatol — Baratol — Military TNT — Octol — Tritonal	
Ammonium nitrate (AN)-based	**Pure**	— AN prills — Kinepak (unmixed, solid component only)	
	Blasting Agents	**Dry Blasting Agents (ANFO)**	— Amex ™ Series — Austinite Series — Bi-bulk — Bio Prill — Dyno ANFO HS — Dynomix ™ series — FRAGMAX® — IEmiX-12 Series — Sulfamex ™ — WATERBLOCK ™

[d] This list is not intended as an exhaustive list. The products in this table are used as examples only and do not constitute an endorsement of these products by the AAFS Standards Board.

MANDATORY CATEGORY	Examples/ Formulations or Equivalents		
Ammonium nitrate (AN)-based	**Blasting Agents**	**Emulsions**	— 1966 Emulsion Blend — AXE series — BLAST GEL ® TX — BLASTEX ® — Coalmex — DYNO ® AP — Dyno Gold — Emulex series — Enviroseis — Fortel ™ series — HEET series — Hydromite Advance Series — Hydromite Series — POWERMITE ® — Red-D Prime — Red-D-Lite E — Senatel ™ Series — Thrifty Snowlauncher — TITAN ® Series of Explosives — Trenchpro — VX series
		Slurry Blasting Agents	— Apex Super Series — Superdyne CPT
		Water Gel	— Detagel™ — Detagel™ LD — Powergel™ Proshear — Powergel™ Striker™ — Powergel™ Striker™ LD — Powergel™ Viper™ — SEC Detagel — SEC Detagel — SEC Detagel Presplit — Tovex Series of Explosives — Watergel
Black powder	— American Visco Cannon Fuse — Goex® — Graf Black Powder		— Safety Fuse — Swiss Black Powder
Cyclotrimethylene-trinitramine (RDX)-based	**Pure**	— Cyclonite — Hexogen	

MANDATORY CATEGORY	Examples/ Formulations or Equivalents	
Cyclotrimethylene-trinitramine (RDX)-based	**Plastic**	— C-4 Plastic Explosive — Comp C-4 — M112 Demolition Block — Primasheet 2000 — Semtex 1H – Yellow — Sheet Exp - RDX based
	Other	— A-5 Pellets — Composition B — Compositions A3 — Compositions A4 — Compositions A5 — Fractune ™ Series — RDX Detonation Cord

MANDATORY CATEGORY	Examples/ Formulations or Equivalents	
Double-Base Smokeless Powder	— Accurate #11FS — Accurate 1680 — Accurate 2200 — Accurate 2230 — Accurate 2460 — Accurate 2520 — Accurate 2700 — Accurate 4100 — Accurate LT-30 — Accurate Mag-Pro — Accurate Nitro 100 — Accurate No.2 — Accurate No.5 — Accurate No.7 — Accurate No.9 — Accurate TCM — Alliant .410 ® — Alliant 20/28 ® — Alliant 2400 ® — Alliant American Select ® — Alliant AR-Comp series — Alliant BE-86 ® — Alliant Bullseye ® — Alliant E3 ® — Alliant Extra-Lite ® — Alliant Green/Red/Blue/Clay Dot ® — Alliant Herco ® — Alliant Power Pistol ® — Alliant Power Pro ® Series — Alliant Pro Reach ® — Alliant Promo ® — Alliant Reloder Series — Alliant Sport Pistol ® — Alliant Steel ® — Alliant Unique ® — Ball Powder ® M38 — Ball Powder ® M47 — Ball Powder ® M48 — Ball Powder ® OBP® — Ball Powder ® SHP series — Ball Powder ® SMP® — Ball Powder ® SPI — Ball Powder ® WAA® — Ball Powder ® WC series — Ball Powder ® WCR® — Ball Powder ® WCUNI	— Ball Powder ® WMG® — Ball Powder ® WMR® — Ball Powder ® WPR® — Ball Powder ® WPT® — Ball Powder ® WRF® — Ball Powder ® WSX® — Ball Powder® WCR845® — Hodgdon BL-C(2)® — Hodgdon CFC® Series — Hodgdon Clays® — Hodgdon H110® — Hodgdon H335® — Hodgdon H380® — Hodgdon H414® — Hodgdon HP-38® — Hodgdon HS-6® — Hodgdon Hybrid 100V® — Hodgdon International® — Hodgdon Leverevolution® — Hodgdon Lil' Gun® — Hodgdon Longshot® — Hodgdon Superformance® — Hodgdon Titegroup ® — Hodgdon Titewad® — Hodgdon Universal® — Hodgdon US869® — IMR 4166 — IMR 4451 — IMR 4955 — IMR 7977 — IMR 8133 — IMR Blue® — IMR Green® — IMR Hi-Skor 700X™ — IMR Hi-Skor 800X™ — IMR Red® — IMR Target® — IMR UnEqual® — Nobel Sport S4n — Nobel Sport SIPEn — Nobel Sport Sp2 — Nobel Sport Sp3 — Nobel Sport TECNAn — Western Powders Inc. Ramshot series — Winchester Ball® Powder Propellant series

MANDATORY CATEGORY	Examples/ Formulations or Equivalents	
Pentaerythritol tetranitrate (PETN)-based	**Pure**	— PETN Superfine, wetted (water)
	Detonation Cord	— FIRELINE CORD — LOW FLEX ™ — PRIMACORD ® — PRIMALINE ®
	Plastic	— Flex X — M118 Demolition Block — Primasheet 1000 — Semtex 10 – Black — Semtex 10 – White — Semtex 1A – Red — Semtex 1H – Yellow — Sheet Exp - PETN based
	Other	— Phlegmatized (graphite, wax, etc.) PETN

Table A.2—Examples of the Optional Explosives[e]

OPTIONAL CATEGORY	Examples/ Formulations or Equivalents	
Ammonium nitrate (AN)-based	**Other**	— Ammonal — Emuline®
Black powder substitutes	— Accurate Blackhorn 209 Black Powder Replacement — Alliant Blue-MZ Pellet — Alliant Black MZ	— Hodgdon Pyrodex series — Hodgdon Triple 7 series — IMR White Hots Pellet
Blasting agents	**(non AN-based)**	— Detotec NONA — Detotec PYX — NONA — NONA Explosive — PYX — PYX Explosive
Cast boosters	**(cast boosters contain TNT and PETN)**	— ACP Booster series — DES Pentolite Charges — Diamond Nugget — DYNO ® CORD Sensitive Boosters — Gold Nugget — NDS Booster Series — Orange Cap Series — Red Cap Series — Rock Crushers — TROJAN ® SPARTAN ®
Dynamite (nitroglycerin (NG) or ethylene glycol dinitrate (EGDN)-based)[f]	— Apcogel series — COALITE™ 8SU — DYNASHEAR™ — Dynashear™ — Dynomax ™ Pro — Dynosplit ® D — Extra Gelatin series — GEL COALITE™ Z — Gelcoalite™ Z — GELDYNE™ — Geldyne™ — GEOGEL — Geogel™	— POWERDITCH™ 1000 — Powerditch™ 1000 — POWERFRAC™ — POWERPRO™ — PowerPro™ — Red Diamons series — Red-D Gel B — Rockbuster II — Unigel — Unimax — XACTEX™ — Xactex™

[d]This list is not intended as an exhaustive list. The products in this table are used as examples only, and do not constitute an endorsement of these products by the AAFS Standards Board.

[f] Highly volatile explosives such as NG and EGDN are prone to contaminate other explosives and should be stored separately (e.g., nylon bag, sealed paint can).

OPTIONAL CATEGORY	Examples/ Formulations or Equivalents		
Improvised explosives (IE)[g]	**Salts**	**Chlorates**	— Potassium Chlorate — Sodium Chlorate
		Nitrate and Nitrate-based mixtures	— Ammonium Nitrate — Ammonium Nitrate Aluminum (ANAL) — Ammonium Nitrate Fuel Oil (ANFO)
		Perchlorates	— Ammonium Perchlorate — Potassium Perchlorate
	Other		— Erythritol tetranitrate (ETN) — Urea Nitrate (UN)
	Peroxide-based explosives		— Hexamethylene Triperoxidediamine (HMTD) — Triacetone triperoxide (TATP)
Photoflash/fireworks/pyrotechnic powders (Oxidizers)	— Ammonium Nitrate — Ammonium Perchlorate — Barium Chlorate — Barium Nitrate — Potassium Perchlorate		— Potassium Chlorate — Potassium Nitrate — Sodium Nitrate — Strontium Nitrate
Plastic explosives (untagged and tagged)	**RDX Based (if listed explosives are not selected as a source of the mandatory RDX)**		— C-4 Plastic Explosive — Comp C-4 — M112 Demolition Block — Primasheet 2000 — Semtex 1H – Yellow — Sheet Exp - RDX based
	PETN Based (if listed explosives are not selected as a source of the mandatory PETN)		— Primasheet 1000 — Flex X — M118 Demolition Block — Sheet Exp - PETN based
	Semtex (if Semtex is not selected as a source of the mandatory PETN or RDX)		— Semtex 10 – Black — Semtex 10 – White — Semtex 1A – Red — Semtex 1H - Yellow

[g] Due to the extreme sensitivity and/or chemical instability of certain IEs, (i.e. peroxide-based explosive compounds, ETN), training must be done under the guidance of a chemist, bomb technician, and/or explosives canine trainer who has received IE training specific to the safe storage, transportation, and handling of the training aids.

OPTIONAL CATEGORY	Examples/ Formulations or Equivalents	
Single base smokeless powder	— Accurate 2015 — Accurate 2495 — Accurate 4350 — Accurate LT-32 — Hodgdon Benchmark® — Hodgdon H1000® — Hodgdon H322® — Hodgdon H4198® — Hodgdon H4227® — Hodgdon H4350® — Hodgdon H4831® — Hodgdon H4831SC® — Hodgdon H4895® — Hodgdon H50BMG® — Hodgdon Retumbo® — Hodgdon Trail Boss® — Hodgdon Varget® — IMR 3031™ — IMR 4007SSC™ — IMR 4064®	— IMR 4198™ — IMR 4227™ — IMR 4320™ — IMR 4350™ — IMR 4831™ — IMR 4895™ — IMR 7828SSC™ — IMR 7828™ — IMR 8208 XBR — IMR PB™ — IMR SR4756™ — IMR SR4759™ — IMR SR7625® — Nobel Sport 206 series — Nobel Sport A series — Nobel Sport C series — Nobel Sport D20 — Nobel Sport GM3 series — Nobel Sport Lowsonic — Nobel Sport Prima series
Additional Explosives	— Nitromethane (NM) — Octogen (HMX)-based — Tetryl-based — Emerging threats (e.g. liquid explosives, etc.)	

Annex B
(informative)

Detonation Cord Equivalences and Examples

This is not meant to be an all-inclusive list as the group recognizes other explosives and examples may exist. Eight 8 ft (2.44 m) of 50 gr/ft (9g/m), detonation cord was selected for the basis of the below equivalence calculations. The rationale for selecting eight ft (2.44 m) of 50 gr/ft (9g/m), detonation cord was; eight ft is the most commonly used length among the certification communities (gr/ft was not specified); and 50 gr/ft (9g/m)was the median of detonation cord that is available for purchase. If the organization utilizes a different gr/ft detonation cord than the ones listed in Table B-1, equation (1) can be used to determine the appropriate length of detonation cord to be used in an assessment. The equation (1) can also be used for training scenarios in which realistic threats are used to determine the approximate weight of training aid material used.

Table B.1—Detonation Cord Equivalences

Grains/Foot (gr/ft)	Minimum Length of Detonation Cord Required (ft)
15	26.7
18	22.2
25	16
50	8
80	5
200	2
400	1

Equations:

$$Foot\ of\ Detonation\ Cord\ Required = \frac{400\ gr}{XX\frac{gr}{ft}\ detonation\ cord\ to\ be\ used}$$

$$Pounds\ of\ net\ explosive = LL\ ft\ detonation\ cord\ used \times\ XX\frac{gr}{ft}\ detonation\ cord\ to\ be\ used \times\ 0.0001429\frac{lbs}{gr}$$

where:

XX = manufacturer specified gr/ft (e.g., 50 gr/ft.)

LL = length of detonation cord used [e.g., 8 ft (2.44 m)].

Annex C
(informative)

Bibliography

This is not meant to be an all-inclusive list as the group recognizes other publications on this subject may exist. At the time this standard was drafted, these were the publications utilized for reference. Additionally, any mention of a particular software tool or vendor as part of this bibliography is purely incidental, and any inclusion does not imply endorsement.

[1] ANSI/ASB Standard 088, *General Guidelines for Training, Certification, and Documentation of Canine Detection Disciplines*, First Edition, 2020[8].

[2] Ashton, E. H.; Eayrs, J. T.; Moulton, D. G. "Olfactory Acuity in the Dog." *Nature,* 1957, vol. 179 (4569), p.p.1069-1070.

[3] Beltz, Katylynn, "The Development of Calibrants through Characterization of Volatile Organic Compounds from Peroxide Based Explosives and a Non-target Chemical Calibration Compound." (2013). *FIU Electronic Theses and Dissertations.* 817[9].

[4] Committee on Marking Rendering Inert and Licensing of Explosive Materials *Containing the Threat from Illegal Bombings: An Integrated National Strategy for Marking, Tagging, Rendering Inert, and Licensing Explosives and Their Precursors;* National Academy Press: Washington, D.C., 1998; Vol. 6 x 9.

[5] Craven, B. A.; Neuberger, T.; Paterson, E. G.; Webb, A. G.; Josephson, E. M.; Morrison, E. E.; Settles, G. S. "Reconstruction and Morphometric Analysis of the Nasal Airway of the Dog (*Canis familiaris*) and Implications Regarding Olfactory Airflow." *Anatomical Record* 2007**,** vol. 290, p.p.1325-1340.

[6] Ewing, R. G., Waltman, M. J., Atkinson, D. A., Grate, J. W., Hotchkiss, P. J. "The Vapor Pressure of Explosives." *Trends in Analytical Chemitry*, 2013, vol. 42, p.p. 35-48.

[7] Furton, K. G.; Myers, L. J. "The scientific foundation and efficacy of the use of canines as chemical detectors for explosives." *Talanta,* 2001, vol. 54, p.p. 487-500.

[8] Gazit, I.; Terkel, J. "Domination of olfaction over vision in explosives detection by dogs." *Applied Animal Behavior Science* 2003**,** vol. 82, p.p. 65-73.

[9] Harper, R. J.; Almirall, J. R.; Furton, K. G. :Identification of dominant odor chemicals emanating from explosives for use in developing optimal training aid combinations and mimics for canine detection.: *Talanta,* 2005**,** vol. 67 (2), p.p. 313-327.

[10] Harper, R. J.; Furton, K. G. Biological Detection of Explosives. In *Counterterrorist Detection Techniques of Explosives*, Yinon, J., Ed.; Elsevier B.V.: 2007; pp 395-431.

[8] Available from: http://www.asbstandardsboard.org/wp-content/uploads/2020/02/088_Std_e1.pdf
[9] Available from: https://digitalcommons.fiu.edu/etd/817

[11] Harper, R.J. *Improving The Scientific Reliability of Biological Detection of Explosives By Canis Familiaris: Active Odour Signatures and Their Implications*. Florida International University, 2005.

[12] Johnston, J. M.; Williams, M.; Waggoner, L. P.; Edge, C. C.; Dugan, R. E.; Hallowell, S. F. "Canine detection odor signatures for mine-related explosives." *Proc.SPIE-Int.Soc.Opt.Eng*. 3392[Pt. 1, Detection and Remediation Technologies for Mines and Minelike Targets III], 490-501. 1998.

[13] Lazarowski, L., Dorman, D.C. *Explosives detection by military working dogs:Olfactory generalization from components to mixtures*. Department of Molecular and Biomedical Sciences, North Carolina State University, College of Veterinary Medicine, Raleigh, NC, USA[10]

[14] Lindsay, S. R. *Handbook of Applied Dog Behavior and Training, Procedures and Protocols;* First ed.; Blackwell Publishing Ltd: Ames, IA, 2005; Vol. 3.

[15] Lorenzo, N.; Wan, T.; Harper, R. J.; Hsu, Y.-L.; Chow, M.; Rose, S.; Furton, "K. G. Laboratory and field experiments used to identify *Canis lupus* var.*familiaris* active odor signature chemicals from drugs, explosives, and humans." *Analytical Bioanalytical Chemistry,* 2003, vol. 376, p.p.1212-1224.

[16] Lotspeich, E.; Kitts, K.; Goodpaster, J. "Headspace concentrations of explosive vapors in containers designed for canine testing and training: Theory, experiment, and canine trials." *Forensic Science International,* 2012, vol. 220*,* p.p.130-134.

[17] Macias, M. S.; Harper, R. J.; Furton, K. G. "A comparison of real versus simulated contraband VOCs for reliable detector dog training utilizing SPME-GC-MS." *American Biotechnology Laboratory* 2008, vol. 26 (6), p.p.26-27.

[18] Mistafa, R. *K9 Explosive Detection: A Manual for Trainers;* Detselig Enterprises Ltd.: Calgary, Alberta, 1998.

[19] Oxley, J. C.; Smith, J. L.; Moran, J.; Nelson, K.; Utley, W. E. "Training dogs to detect Triacetone Triperoxide (TATP). "Proc.SPIE-Int.Soc.Opt.Eng. 5403[Pt. 1, Sensors, and Command, Control Communications, and Intelligence (C31) Technologies for Homeland Security and Homeland Defense III], 349-353. 2004.

[20] Schoon, A.; Gotz, S.; Heuven, M.; Vogel, M.; Karst, U. "Training and Testing Explosive Detection Dogs in Detecting Triacetone Triperoxide." *Forensic Science Communications,* 2006, vol. 8 (Number 4).

[21] Williams, M.; Johnston, J. M. "Training and maintaining the performance of dogs (*Canis familiaris*) on an increasing number of odor discriminations in a controlled setting." *Applied Animal Behaviour Science* 2002, vol. 78, p.p. 55-65.

[10] Available from: https://www.academia.edu/5579625/Explosives_detection_by_military_working_dogs_Olfactory_generalization_from_components_to_mixtures

[22] Williams, M.; Johnston, J. M.; Cicoria, M.; Paletz, E.; Waggoner, L. P.; Edge, C.; Hallowell, S. F. "Canine detection odor signatures for explosives." Proc.SPIEInt. Soc.Opt.Eng. 3575[Enforcement and Security Technologies], 291-301. 1998.

SWGDOG documents can be downloaded from:

https://www.nist.gov/system/files/documents/2018/04/25/swgdog_substance_detector_dogs_-_explosives_detection.pdf

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