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Note:	This report is one of 16 reports released under Mandatory Declassification Review by the US Army Intelligence & Security Command. All of these reports may be accessed here: http://www/governmentattic.org/inscomBWCW.html

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INTELLIGENCE AND SECURITY COMMAND
FREEDOM OF INFORMATION/PRIVACY OFFICE
FORT GEORGE G. MEADE, MARYLAND 20755-5995

REPLY TO
ATTENTION OF:

Freedom of Information/
Privacy Office

10 JUN 2013

This is in further response to your Freedom of Information Act (FOIA) request of October 23, 2008, and supplements our electronic message of May 12, 2010.

Coordination has been completed with another element of our command and other government agencies and records returned to this office for our review and direct response to you. We have reviewed the records and determined the records are partially releaseable to you. A copy of the records are enclosed for your use.

We have completed a mandatory declassification review in accordance with Executive Order (EO) 13526. As a result of our review information has been sanitized and 4 pages have been withheld in their entirety as the information is currently and properly classified TOP SECRET, SECRET and CONFIDENTIAL according to Sections 1.2(a)(1), 1.2(a)(2), 1.2(a)(3) and 1.4(c) of EO 13526. This information is exempt from the public disclosure provisions of the FOIA pursuant to Title 5 U.S. Code 552 (b)(1). It is not possible to reasonably segregate meaningful portions of the withheld pages for release. The records are enclosed for your use. A brief explanation of the applicable sections follows:

Section 1.2(a)(1) of EO 13526, provides that information shall be classified TOP SECRET if its unauthorized disclosure reasonably could be expected to cause exceptionally grave damage to the national security.

Section 1.2(a)(2) of EO 13526, provides that information shall be classified SECRET if its unauthorized disclosure reasonably could be expected to cause serious damage to the national security.

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Section 1.4(c) of EO 13526, provides that information pertaining to intelligence activities, intelligence sources or methods, and cryptologic information shall be considered for classification protection.

In addition, information has been sanitized from the records and 4 pages have been withheld in their entirety as the release of the information would reveal sensitive intelligence methods. This information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(7)(E) of the FOIA. The significant and legitimate governmental purpose to be served by withholding is that a viable and effective intelligence investigative capability is dependent upon protection of sensitive investigative methodologies. It is not possible to reasonably segregate meaningful portions of the withheld pages for release.

The withholding of the information described above is a partial denial of your request. This denial is made on behalf of Major General Stephen G. Fogarty, the Commanding General, U.S. Army Intelligence and Security Command, who is the Initial Denial Authority for Army intelligence investigative and security records under the FOIA. You have the right to appeal this decision to the Secretary of the Army. Your appeal must be postmarked no later than 60 calendar days from the date of this letter. After the 60-day period, the case may be considered closed; however, such closure does not preclude you from filing litigation in the courts. You should state the basis of your disagreement with the response and provide justification for a reconsideration of the denial. An appeal may not serve as a request for additional or new information. An appeal may only address information denied in this response. Your appeal is to be made to this office, for forwarding, as appropriate to the Secretary of the Army, Office of the General Counsel.

Coordination has been completed and we have been informed by the Central Intelligence Agency (CIA) that information is exempt from public disclosure pursuant to Title 5 U.S. Code 552 (b)(1) and (b)(3) of the FOIA.

The withholding of the information by the CIA constitutes a denial of your request and you have the right to appeal this decision to the Agency Release Panel within 45 days from the date of this letter. If you decide to file an appeal, it should be forwarded to this office and we will coordinate with the CIA on your behalf. Please cite CIA #F-2010-01292/Army #57F-09 assigned to your request so that it may be easily identified.

Coordination has been completed and we have been informed by the Defense Intelligence Agency (DIA) that their information is exempt from public disclosure pursuant to Title 5 U.S. Code § 552 (b)(1), (b)(2) (b)(3) and (b)(4) of the Freedom of Information Act and Executive Order (EO) 13,526 § 1.4 (c) (d) and (h). The statute invoked under Title 5 U.S. Code 552 (b)(3) is 10 U.S.C. §424, which allows for the protection of organizational and personnel information for DIA.

The withholding of the information by the DIA constitutes a partial denial of your request and you have the right to appeal this decision directly to the DIA. If you decide to file an appeal, it should be forwarded to the Director, Defense Intelligence Agency, ATTN: DAN-1A-FOIA, Washington, DC 20340-5100. Please cite MDR #0155-2010 assigned to your request so that it may be easily identified.

You have received all Army intelligence investigative records pertaining to this request.

There are no assessable FOIA fees.

If you have any questions regarding this action, feel free to contact this office at 1-866-548-5651, or email the INSCOM FOIA office at: INSCOM_FOIA_ServiceCenter@mi.army.mil and refer to case #57F-09.

Sincerely,

Brad S. Dorris
Director
Freedom of Information/Privacy Office
Investigative Records Repository

Enclosure

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CIRC NICD

DST-1620S-145-77

DEFENSE INTELLIGENCE AGENCY

[SMOKE, FLAME, AND INCENDIARY MATERIALS AND DEVICES–FOREIGN (U)]

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MAY 1977

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SMOKE, FLAME, AND INCENDIARY MATERIALS AND DEVICES—FOREIGN (U)

(b)(6)

DST-1620S-145-77

DIA Task PT-1620-09-76

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NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject to criminal sanctions

This is a Department of Defense Intelligence Document prepared by the Foreign Science and Technology Center of the US Army Materiel Development and Readiness Command under the Department of Defense Scientific and Technical Intelligence Program, with contributions from the Defense Intelligence Agency, the US Army Medical Intelligence and Information Agency, the Naval Intelligence Support Center, and the Foreign Technology Division of the US Air Force Systems Command.

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PREFACE

(U) This study assesses the capabilities of foreign countries to conduct smoke, flame and incendiary warfare. On the basis of available information, trends in research and development (R&D) have been projected, and forecasts made, for the next 10 years.

(U) The study includes information relative to the smoke, flame, and incendiary capabilities of the Eurasian Communist countries and the Middle East countries less Israel. For simplification, however, the term Eurasian Communist countries (ECC) as used throughout the study includes the Middle East countries less Israel. Because the bulk of subject materiel and equipment is of Soviet origin or design, Soviet capabilities are emphasized. The study also covers known capabilities of the Free World countries, Israel, and non-aligned countries. Again, for simplification the term free world (FW) countries includes Israel and non-aligned countries. Appendixes are included to provide technical characteristics of specific free world munitions and a comparison of these munitions with their counterparts in the Eurasian Communist countries.

(U) Further technical data and related weapon characteristics may be found in TB-381-5-05 (FOMCAT Vol. 5), dated 10 March 1976, and in F10-CST-1-76, dated June 1976.

(b)(1)

(U) This document will be used to satisfy the needs of US policy planners, Department of Defense staff, military departments, commanders in the field, intelligence collectors and analysts, and R&D personnel. It will also be used to satisfy Department of Defense quick-reaction requirements, both formal and informal.

(U) This study is being disseminated devoid of bibliographical material to facilitate wider distribution. A compiled bibliography has been prepared separately and can be made available to authorized recipients upon request to the Defense Intelligence Agency, ATTN: DT-1A, Washington, DC 20301. Individuals making such requests are cautioned that the addition of the bibliography to (or its association with) the study makes mandatory a more restricted distribution of the study. When the bibliography is attached, the study must carry the additional caveats DISSEMINATION AND EXTRACTION OF INFORMATION CONTROLLED BY ORIGINATOR NOT RELEASABLE TO CONTRACTORS OR CONTRACTOR/CONSULTANTS.

(U) Constructive criticisms, comments, or suggested changes are encouraged, and should be forwarded to the Defense Intelligence Agency, Washington, DC 20301 (ATTN: DT).

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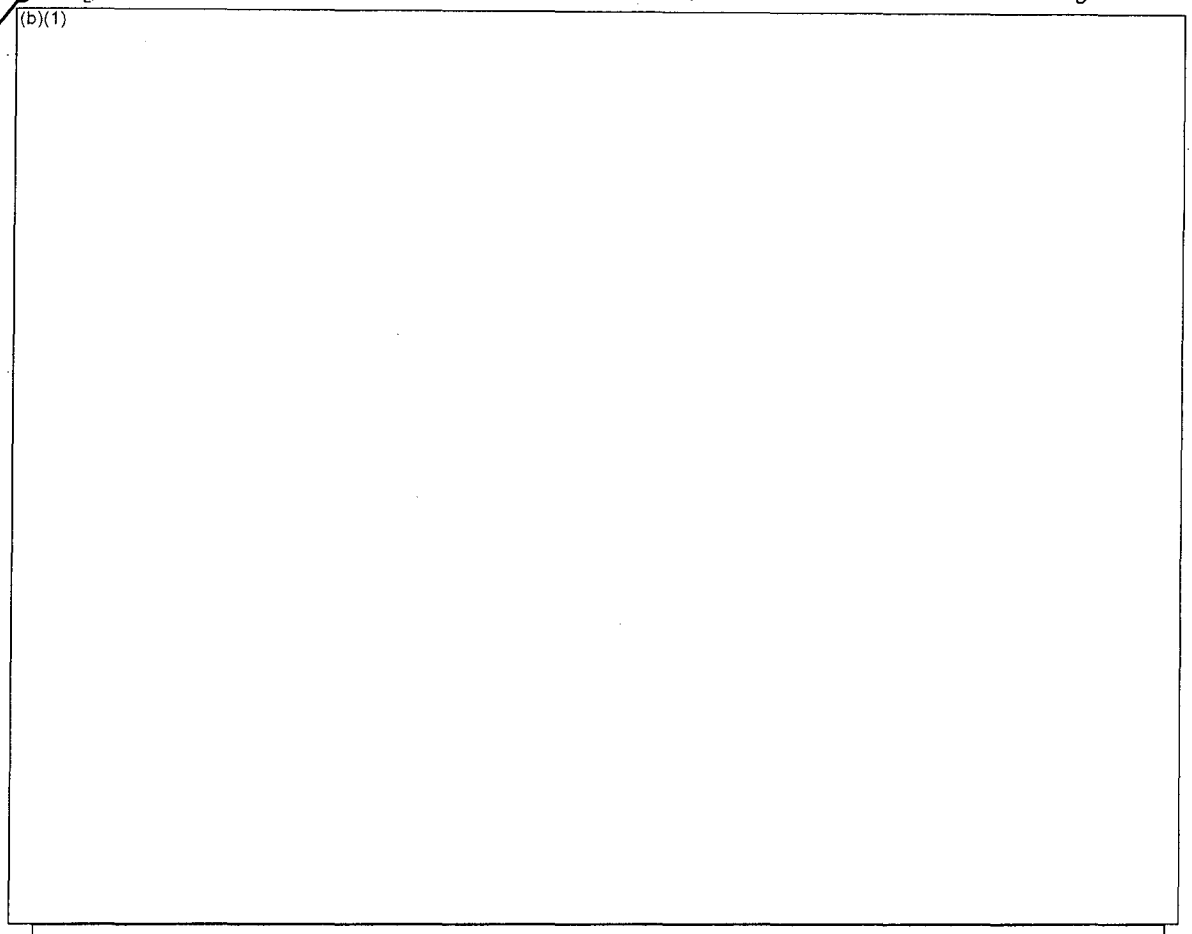

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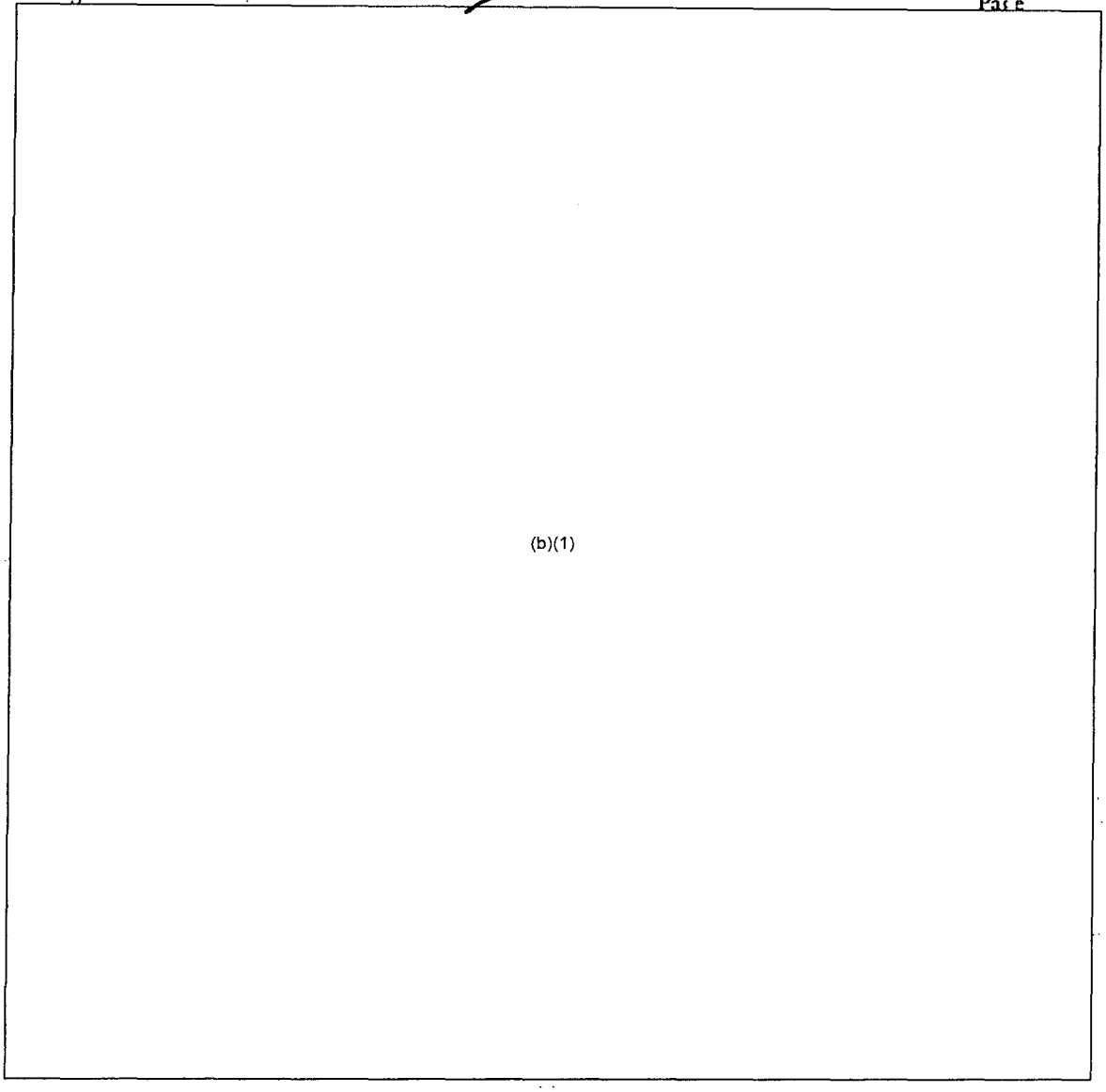
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SUMMARY

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*In this document the term ECC includes the Middle East countries less Israel (see Preface).

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Section I.

INTRODUCTION

1. (U) General

Smoke may be defined as "an artificially produced aerosol, that is, a suspension of solid or liquid particles in the atmosphere, which attenuates the passage of visible light or other forms of electro-magnetic radiation." Although generated (by burning wet straw, leaves, or burlap soaked with potassium nitrate) during a few isolated battles, smoke was not developed specifically for use in military operations until World War I.[1] [2] During World War I, smoke, used rather extensively both in offensive and in defensive operations, proved to be a decisive factor affecting the outcome of many battles. The development of smoke systems continued from World War I throughout World War II. Following World War II, the introduction of electro-optical surveillance and guidance systems caused the interest in smoke to decline because its use seemed less applicable with these modern systems of warfare.[2] During the 1960s, renewed interest in the military applications of smoke began to appear in a number of foreign countries, notably in the Eurasian Communist countries (ECC). Subsequently, the extensive use of smoke during the Yom Kippur (October) War reestablished that the proper use of smoke in offensive and defensive operations provided a decided advantage for the user. This historical evidence, in addition to the continuing emphasis placed on smoke operations by potential adversaries, indicates that smoke will play a major role in future conflicts.

2. (U) Standard Smoke Agents

a. Smoke agents have not changed significantly since World War II. Suspected or known smoke agents included in foreign military inventories are those derived from World War I and World War II technology. Variations of some of these standard smoke mixtures have been noted (these will be discussed later), but no innovative types are apparent.[3] The following agents are commonly found in smoke inventories.[1] [2]

(1) Liquid agents.

(a) Smoke acid. Smoke acids include chlorosulfonic acid, sulfur trioxide, and fuming sulfuric acid. Normally, mixtures of these acids are used to produce maximum screening properties, although satisfactory smoke screens can be obtained with individual components. Stated optimum concentrations of a smoke acid mixture designated by the Soviets as "S-4" are 54% to 60% chlorosulfonic acid, 35% to 43% sulfur trioxide, and 3% to 5% sulfuric acid. The components of this mixture, atomized at about 400 kPa, react to form sulfuric and hydrochloric acids, which combine with moisture in the air to produce smoke. The size of the particles formed varies, depending upon the relative humidity of the air. Although corrosive and irritating, the acid smoke is economical to produce and probably is used widely to produce large-area smoke screens as well as for training purposes. Smoke acids can be used under extreme climatic conditions, since they react with ice and snow in the same manner as with water.

(b) Chloride mixtures. Liquid chloride agents are composed primarily of titanium, silicon, or tin tetrachlorides. Of these, titanium tetrachloride has the best screening power. Sprayed into the air, titanium tetrachloride reacts with moisture to form titanium trichloride and hydrochloric acid. The smoke, therefore, is somewhat corrosive and irritating. When ammonia is present, it reacts with the hydrochloric acid to form ammonium chloride. The smoke produced by this latter mixture is more dense and less irritating than titanium tetrachloride used alone. The chloride agents can be used in sprays from aircraft, by smoke vehicles, and in bombs and shells.

(c) Fog oil. "Fog oil" or "smoke oil," which is derived primarily from crude oil or byproducts of petroleum distillation, is relatively economical, safe to handle, nonirritating, and noncorrosive. A common mixture contains 70% petroleum distillate and 30% fuel oil. The smoke formed by pumping this mixture into the hot exhaust (about 1200°C) from combustion chambers, is a combination of incomplete combustion products and simultaneously evaporated excess oil. It is black-gray in color and has satisfactory screening power and stability. Armored vehicles, equipped with a special device, use fuel oil instead of fog oil as the smoke agent.

(2) Pyrotechnic mixtures.

(a) Berger mixtures. The so-called Berger mixtures contain a metal (aluminum, zinc, iron), a chlorocarbon [carbon tetrachloride, hexachloroethane (HC)], and other additives, such as zinc oxide, to improve burning. A mixture used by the Soviet Union during World War I contained 41% carbon tetrachloride, 35% zinc dust, 9% sodium chlorate, 8% magnesium carbonate, and 7% potassium nitrate. During World War II, improved Berger

mixtures were prepared by substituting HC, octachloropropane, and hexachlorocyclohexane for carbon tetrachloride. A German improved mixture comprised 40% HC, 44% zinc dust, 2% zinc oxide, 2% powdered magnesium, 2% calcium, 4% silicon dioxide, and 6% absorbents or stabilizers. Despite good screening effects, Berger mixtures have the disadvantage of a high combustion temperature and a delay time of 10 to 20 seconds between ignition and smoke production.

(b) Yershov mixtures. These solid smoke compounds contain a smoke compound and fuel (anthracene, naphthalene, paraffin), and an oxidant (potassium chlorate, sodium chlorate). A widely used mixture consists of 25% anthracene, 30% ammonium chloride, and 45% potassium perchlorate. Producing noncorrosive and nonirritating smoke, these pyrotechnic compounds have great importance on the battlefield because they can be used in small, easily manipulated devices to establish smoke screens in any tactical situation.

(3) Phosphorus. Two forms of phosphorus, white and red, are used in smoke munitions. The most widely used is white phosphorus (WP), which is employed either in the native form or mixed with a plasticizer. WP alone burns rapidly in air, and the smoke is inclined to pillar. Mixed with a plasticizer, like butyl rubber, WP burns more slowly and pillaring is reduced. WP ignites on exposure to air while red phosphorus (RP) requires an igniter. RP has less tendency to pillar and is easier to handle and package into munitions than WP. During the burning of either form of phosphorus, phosphoric acid is produced and combines with moisture in the air to form a dense, white smoke that is both corrosive and irritating to the respiratory tract. The screening power of phosphorus smoke is excellent.

b. The preceding examples of smoke agents represent those used by the ECC. The same types of mixtures, with some modifications, are used by other countries, including the United States. ECC representatives have discussed the use of smokes for attenuating radiation in regions of the spectrum other than the visible, but there is no evidence that the military forces of these countries have such a capability. Some research, both in the ECC and in free world countries, indicates that efforts are underway to develop attenuating smokes.

3. (U) Munition/Dispersion Systems

The USSR has a wide variety of systems for smoke dissemination. The systems include bursting- and burning-type munitions, pressurized and gravity-flow spray devices, and injection-type generators. With the exception of oil-smoke generators, the USSR and other ECC apparently have expended little effort to improve their smoke-producing capabilities. Unlike the free world countries, such as the United Kingdom and Sweden, there has been no

evidence that the ECC have developed and produced smoke munitions for firing from infantry antitank weapons, such as the RPG-7 or SPG-9 rocket launchers, or from tank guns. The non-Soviet ECC are equipped primarily with Soviet munition/dispersion systems or domestic copies of these systems.

4. (U) Flame and Incendiaries

Flame and incendiary materials were in use for centuries prior to the appearance of the first incendiary rocket during the Napoleonic wars.[4] Following the invention of the backpack flamethrower in 1898, the development of flame and incendiary devices continued during and after World War I. During World War II, incendiary devices were used on a broad scale by the armed forces of most combatants. These devices are still considered to be effective combat weapons and occupy an important place in overall armament systems. Equipment and concepts for employment, however, have not changed significantly during the past 10 to 15 years.

Section II.

EURASIAN COMMUNIST COUNTRIES

A. POLICY AND DOCTRINE

1. ~~(C)~~ Policy

(b)(1)

2. ~~(C)~~ Doctrine

a. ~~(C)~~ Smoke.

(b)(1)

(b)(1)

b. (U) Flame and Incendiary.

(1) (U) Flame devices are used extensively in defensive operations.[3] Static flame operations are employed along expected troop avenues of approach in accordance with defensive obstacle plans. Flame weapons may be fired by remote control, timing devices, or pressure.

(2) (U) In withdrawal operations all types of flame weapons are utilized to carry out a scorched-earth policy. Mechanized flamethrowers are used in ambushes of advancing detachments and in general support of motorized rifle and tank units.

(3) (U) On the offense, flame weapons may be used to breach enemy forward areas for assault troops. Mechanized flamethrowers reinforce landing elements of main assault and exploitation forces. They are also effective for use in combat in built-up areas.

B. ORGANIZATION, TACTICS, AND TRAINING

3. (C-NOFORN) Organization

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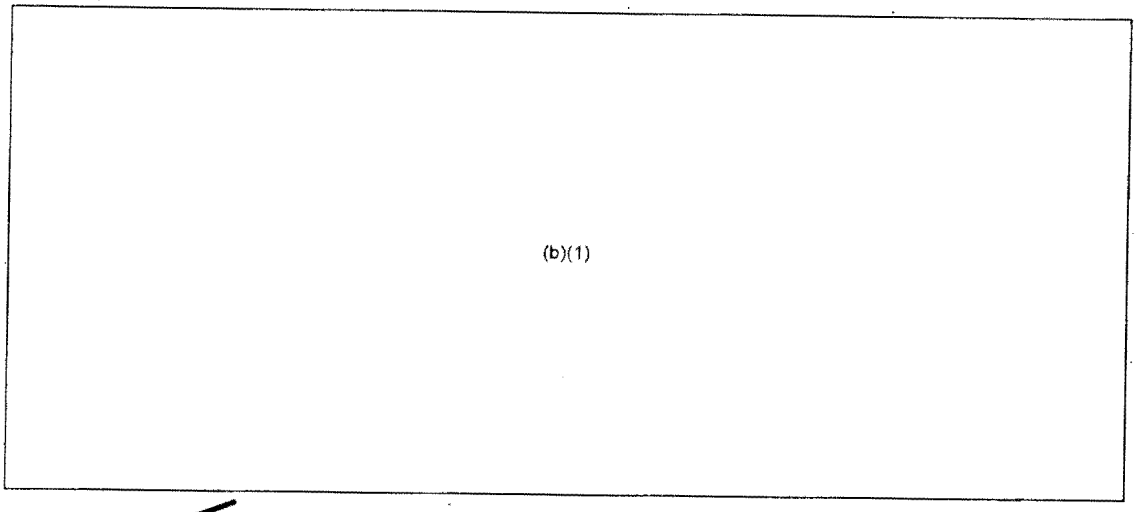

4. (C-NOFORN) Tactics

a. (C) Smoke.

(1) (U) In general, Soviet tactical principles are based on surprise and the employment of massive forces on a broad front. The Soviets maintain that when firing is done from a position covered with smoke, at targets located outside the smoke, effectiveness decreases approximately 10 times; when only the targets are concealed by smoke, effectiveness decreases 4 times. Laying down a smoke screen, especially an unexpected one, is also credited with having a significant psychological effect on enemy troops, giving them a sense of uncertainty and uneasiness. The Soviets recognize that it is particularly important for small-unit commanders, when planning for an attack, to study terrain features that can be used for concealment as well as to provide reference points for navigating in smoke.[12] Tank directional gyrocompasses can be used to maintain orientation and assist the movement of motorized rifle and artillery units to designated areas.

(2) (U) Artillery is expected to engage antitank weapons, including ATGMs. There should be direct and indirect fire and preplanned use of smoke. Antitank weapons close to the forward edge of the battle area (FEBA) in the 2-km zone can be expected to be engaged with a mix of smoke and high-explosive (HE) fire. Smoke fired from one weapon will be used to adjust fire. The remainder of the battery will fire smoke on the first volley, followed by mixed salvos and volleys of HE.[13]

(3) (U) In the past, Soviet doctrine has stated that during penetration, and in [illegible] attack across a broad front, smoke will normally be employed. It is believed that this doctrine is still valid, and that the use of smoke will be included in Soviet artillery fire planning. A variety of smoke agents and dissemination means, including field-artillery projectiles, gives the Soviets the capability to impair observation posts, to blind enemy weapons, to screen river crossings, to reduce the effectiveness of night-vision equipment, and to screen the flanks of attacking troops. During night combat, artillery smoke projectiles may be used to adjust fire when targets are not illuminated.[14]

(4) (U) During adjustment for a smoke mission, fire is conducted using an alternate point; then is shifted to the target. In this way, short rounds during adjustment will not obscure the target. The adjustment is fired, using one weapon, and continues until a 200-meter bracket is obtained for point targets, such as an observation post, or a 400-meter bracket is obtained for area screening targets, such as river-crossing sites. A battery salvo is fired when these brackets are split. The smoke from this salvo is observed and further adjustments continue to be made.

(5) (U) To blind a target when the wind is blowing toward the enemy, the mean point of impact should be 50 to 100 meters in front of a point target and 100 to 400 meters in front of an area target. If the wind is parallel or oblique to the target, the mean point of impact should be moved 50 to 100 meters toward the direction from which the wind is blowing. If there is a headwind, the center of impact should be adjusted onto the target.

(6) (U) A platoon or battery firing at a point target uses converged sheaf (the horizontal and vertical planes of the trajectories intersect at the target). A battery firing at an area target that is subjected to headwind, tailwind, or light crosswind uses parallel sheaf (the trajectories of all weapons are parallel). For screening the flanks, converged sheaf is used regardless of wind direction.

(7) ~~(C)~~ (b)(1)

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*For wind of 6 to 7 m/s increase number of rounds by 1.5 times.

Average Ammunition Expenditure to Screen Point Targets for 15 min

(b)(1)

(8) (C) (b)(1)

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(b)(1)

(10) (U) The Kostroma Chemical Defense Higher Military Command School, Kostrama (57-46N 40-55E), reportedly has devised a hand calculator for determining the number of various smoke dispensers required for a smoke mission.[21] Wind direction and velocity are taken into account. The use of such a calculator could indicate that smoke devices are being used in large quantities.

(11) (U) Because smoke can restrict optical, TV, and laser instruments as well as visual observations, smoke devices probably are widely used by various units on the front line and not handled by specialized units only.

b. (C-NOFORN) Flame and Incendiary.

(b)(1)

(2) (C-NOFORN) (b)(1)

(b)(1)

5. (S-NOFORN) Training

a. (U) Smoke.

(1) (U) The ECC are well aware of the necessity for training troops to use smoke and to operate in a smoke environment. A Soviet military author has stated: "Practical experience shows that a smoke screen can reduce losses of attacking tanks and motorized infantry by 60% to 80%. The extensive use of smoke weapons during tactical and other types of exercises enables personnel to acquire the experience required to ensure that maximum use is made of smoke weapons in the interest of achieving victory on the battlefield."[24] A number of reports describing smoke operations during field exercises indicate that the Soviets are preparing for extensive use of smoke both in offensive and in defensive operations.

(2) (C) (b)(1)

(b)(1)

(3) (U) River-crossing exercises using TDA as well as other means to lay smoke screens have also been described.[28]

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b. (S-~~NOFORN~~) Flame and Incendiaries.

(1) (~~C~~) (b)(1)

(b)(1)

(4) (U) During infantry training Polish troops are taught how to fight in a napalm attack. Troops are drilled over a napalm obstacle course that includes running through tunnels of burning napalm, jumping through napalm fire walls and burning buildings, and jumping over flaming ditches. The soldiers train while wearing masks; the training is repeated until the soldiers lose their fear of burning napalm.

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(5) (U) The Soviet Chemical Defense School of the Kostromskiy High Military Command has a flamethrower training area. Training displays have been set up on a row of stands. The area contains a preparation section where flame fuels are mixed in the MSAO-1 mechanical mixer, two areas with shelters in which light and heavy flamethrowers are loaded, and a target area for flamethrower unit practice. Training emphasis is placed on assembling, disassembling, loading, and servicing flamethrowers under field conditions.

C. STANDARD SMOKE AGENTS AND MUNITION/DISPERSION SYSTEMS

6. (U) Standard Agents

a. (b)(1)

(b)(1)

(2) (U) A KSP-4 distress signal contained 36% coal tar, 62% potassium chlorate, 0.5% magnesium, and 1.5% shellac.[34]

(3) (U) A patent covers an improved mixture for use in practice antiaircraft rounds. The mix consists of about 46% potassium chloride, 38% naphthalene, and 16% thiourea.[35]

(4) (U) A mixture intended to quench underground fires contained 35% to 50% oxidizing agent (potassium chlorate or potassium nitrate), 15% to 40% fuel (nitrogen-containing compounds such as dicyanamide, nitroguanidine, or urea), 22% to 35% carbonate, and about 3% iditol.[36]

c. (U) The attenuation characteristics of common smokes will be discussed along with research and development (R&D) efforts later.

7. ~~(C-NOFORN)~~ Munition/Dispersion Systems

a. (U) General. The ECC possess a variety of devices and munitions that give them great versatility in the employment of smoke screens. Man-portable, vehicle-mounted, and emplaced devices, as well as artillery and mortar shells, are known to exist.

b. ~~(C)~~ Grenades.

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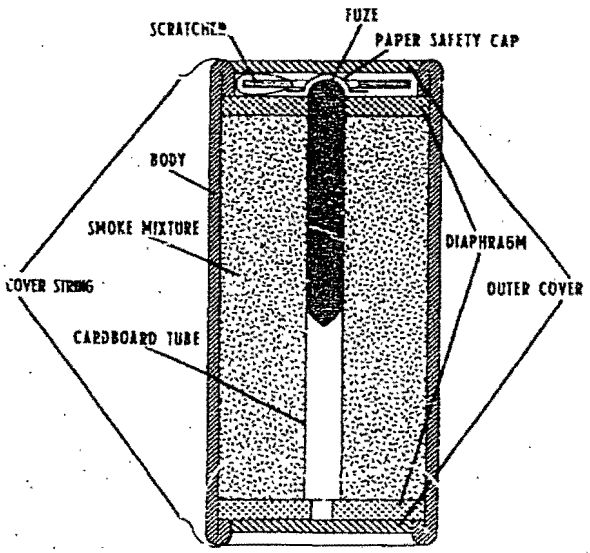

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Figure 2-1. Soviet smoke hand grenade (U).

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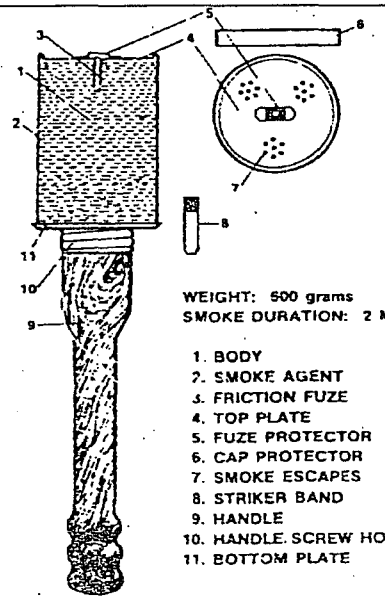

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Figure 2-2. Yugoslav smoke hand grenade (U).

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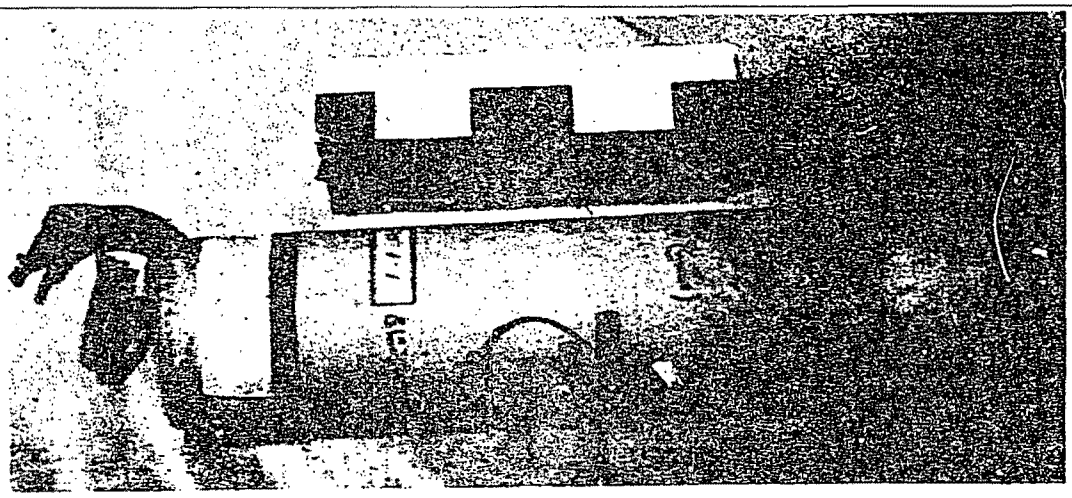

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Figure 2-3. Egyptian smoke hand grenade (U).

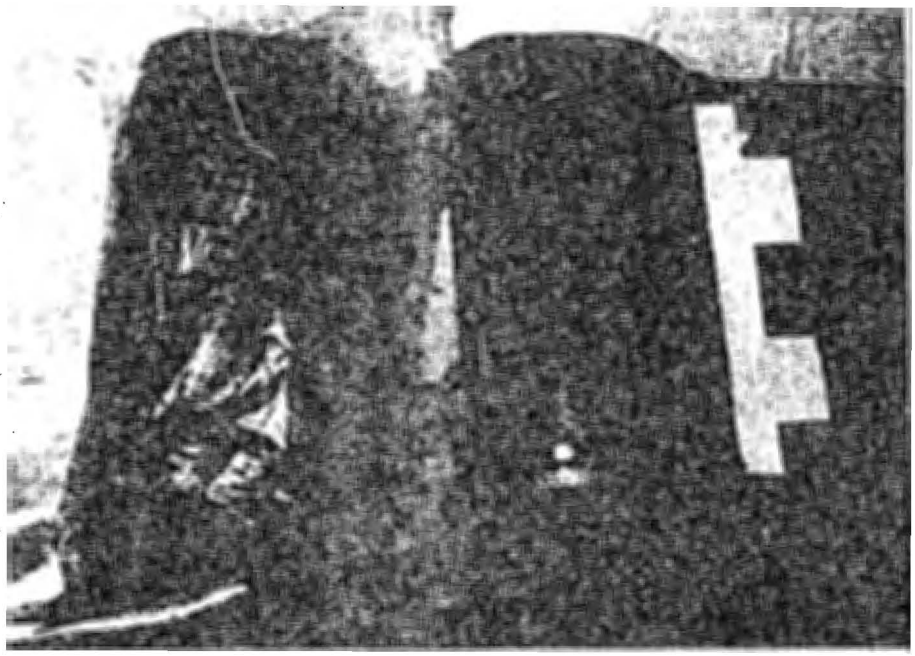

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Figure 2-4. Egyptian toxic smoke grenade (U).

(6) ~~(C)~~ (b)(1)

(b)(1)

Table 2-I. Technical Characteristics of ECC Smoke, Hand, and Rifle Grenades (U)

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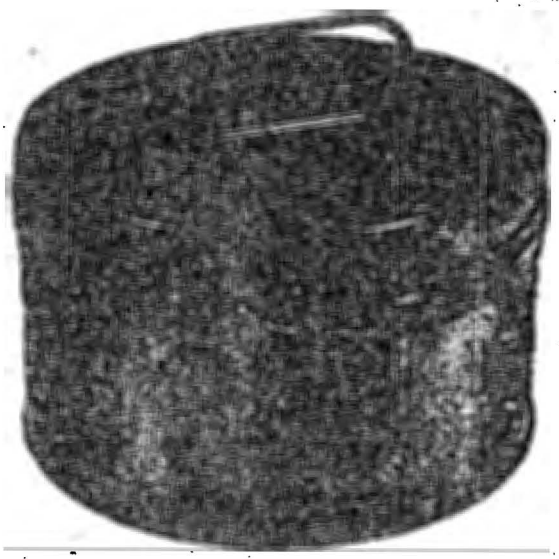
(1) (C) Smoke pots.

(b)(1)



Neg. 511593 (UNCLASSIFIED)

Figure 2-5. Soviet DM-11 smoke pot (U).

(b)(1)

(c) (C) (b)(1)

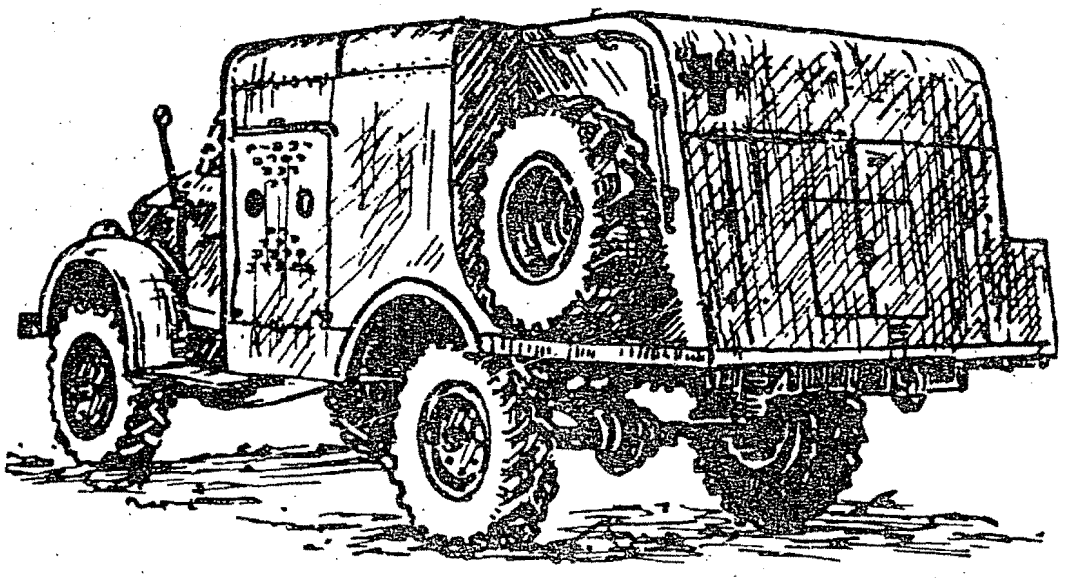
(b)(1)

(2) (C) Smoke barrels.

(b)(1)

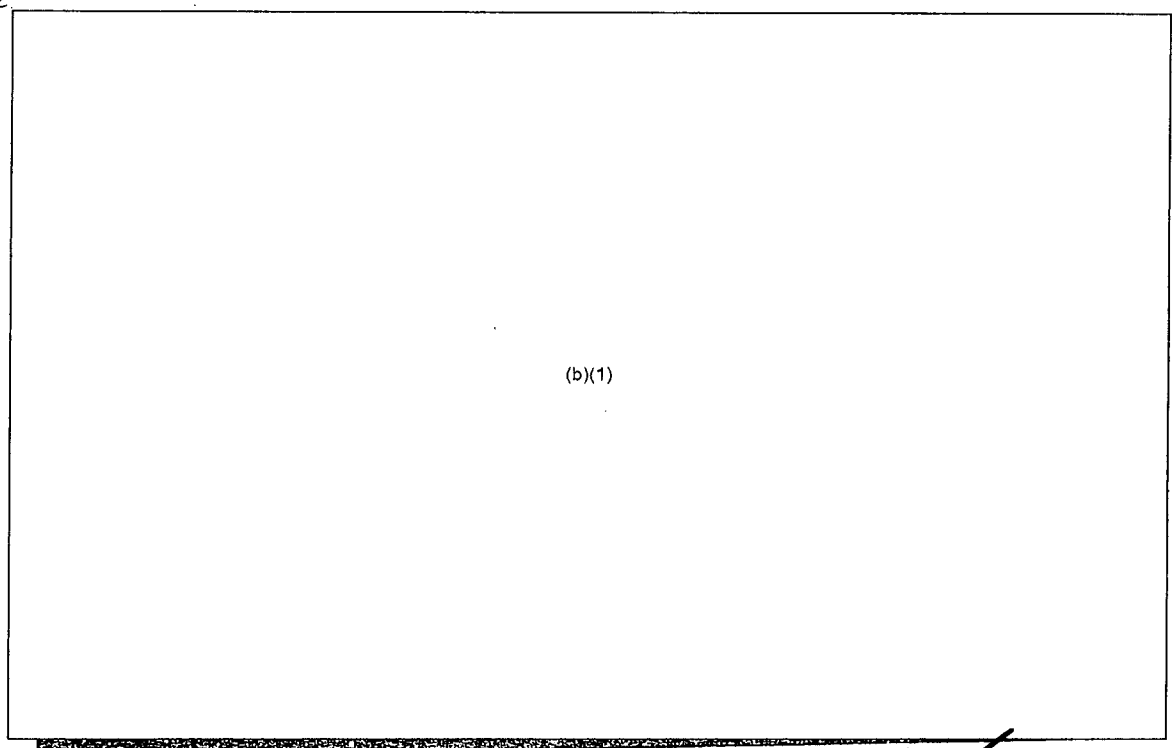
(b)(1)

(b)(1)



Neg. 522848 (UNCLASSIFIED)

Figure 2-7. East German GAZ-63 smoke-generating vehicle (U).



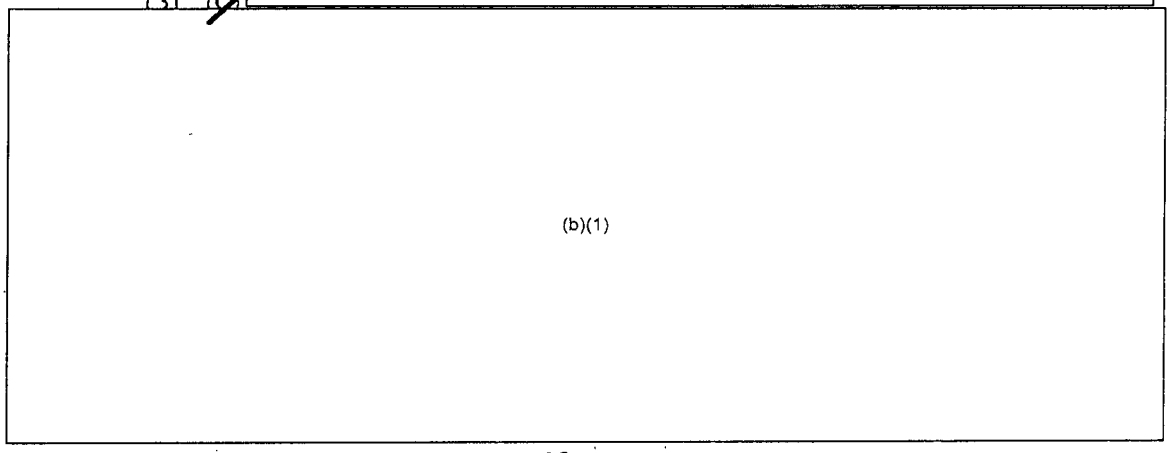
Neg. 554986

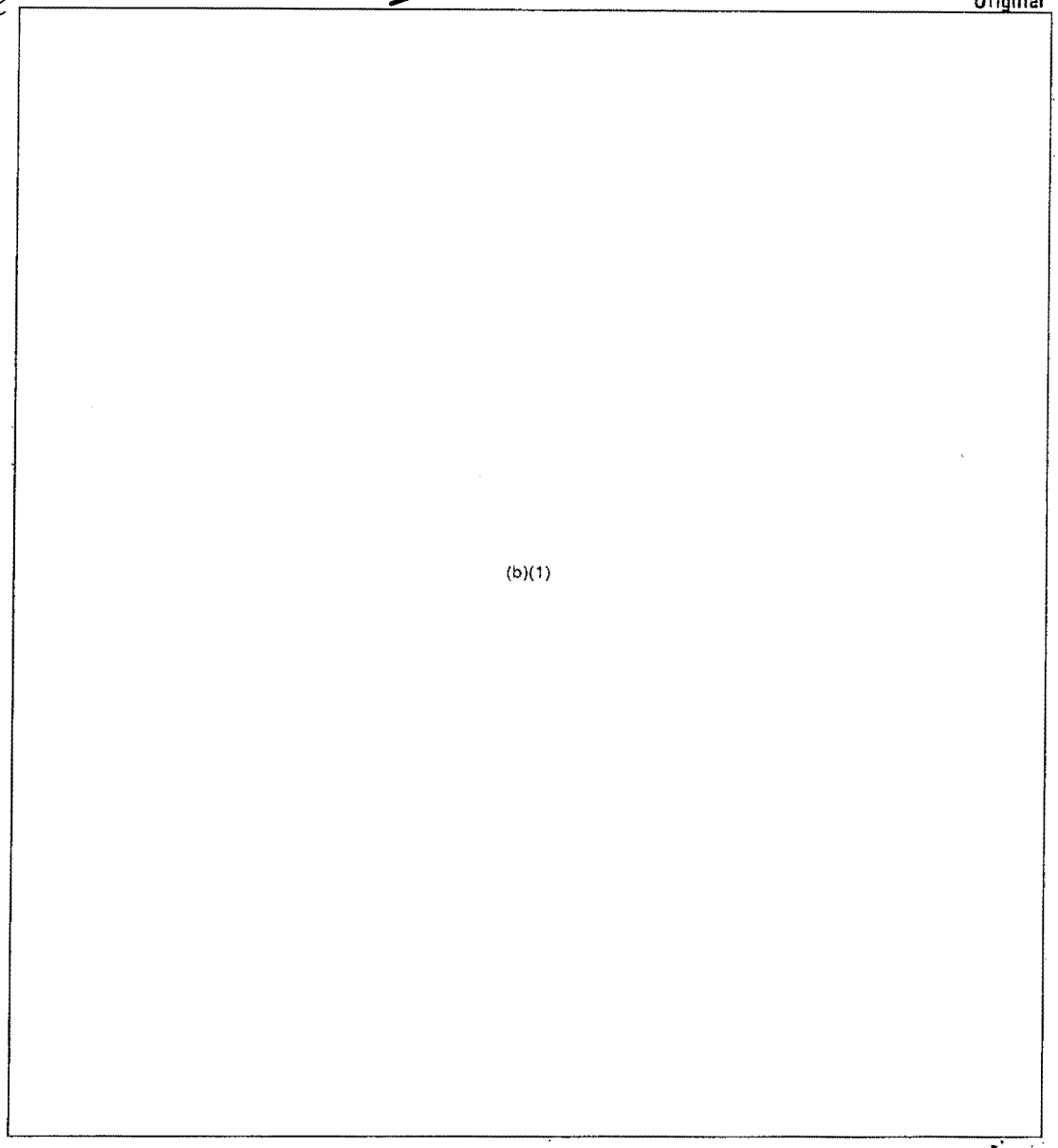
(CONFIDENTIAL)

Figure 2-8. Vehicle making smoke (U).

(3) (C)

(b)(1)





FUEL FLOW SCHEMATIC, SMOKE GENERATOR SYSTEM

Neg. 554987

(CONFIDENTIAL)

Figure 2-9. Engine installation and schematic diagram of TDA system (U).

Original

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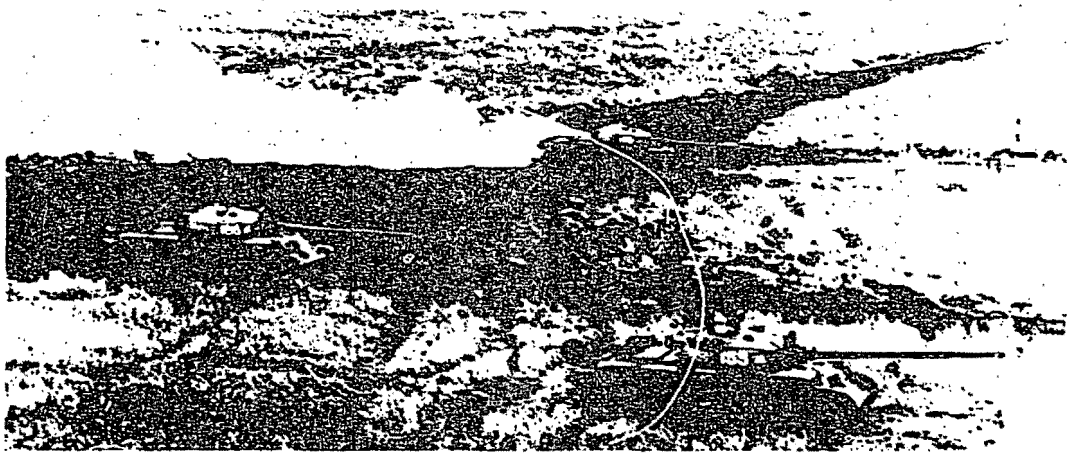


Neg. 515836

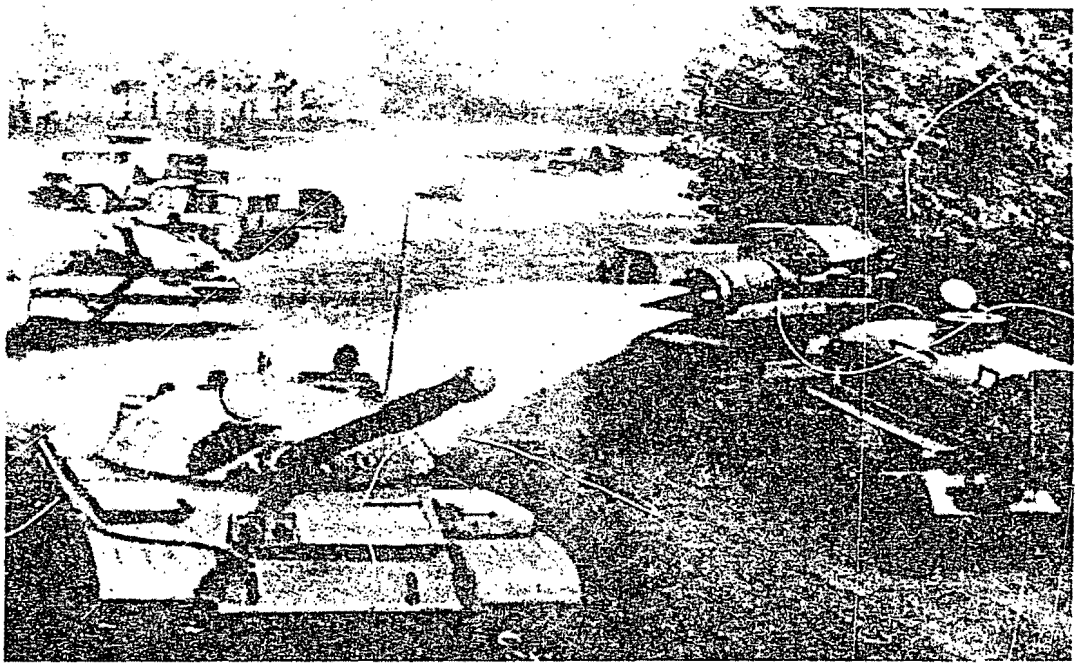
(UNCLASSIFIED)

Figure 2-10. Tanks producing smoke (U).

(4) (C)

(b)(1)

(b)(1)



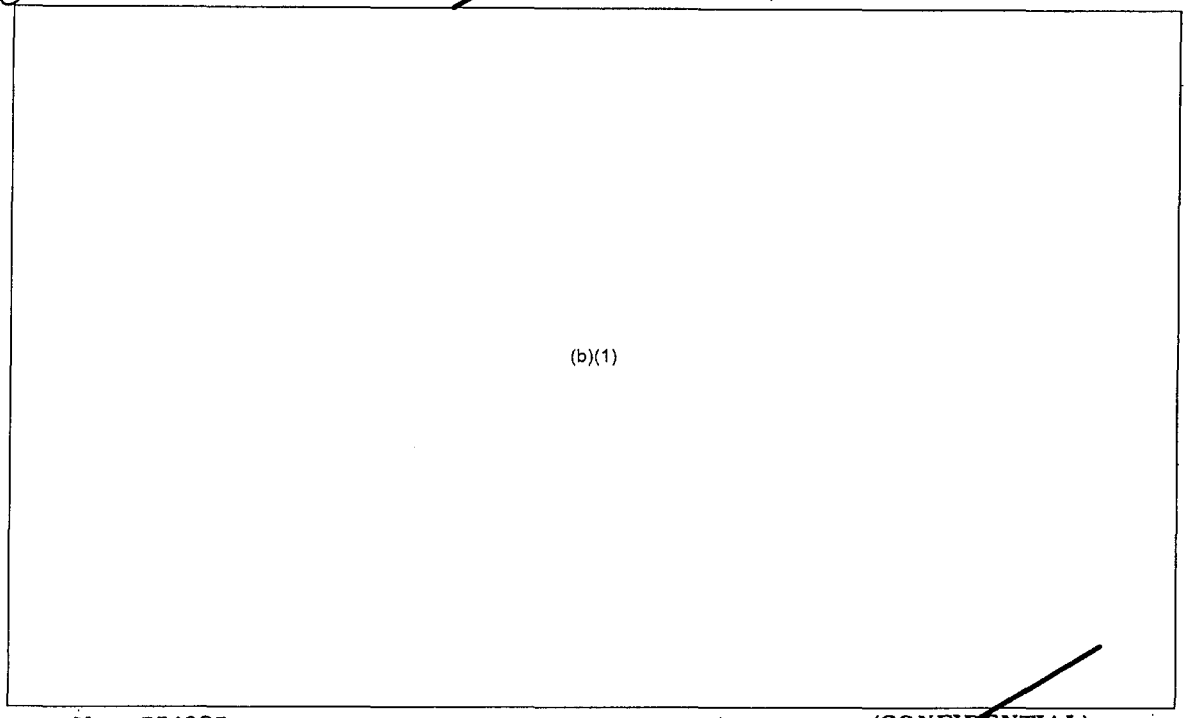
Neg. 511110 (UNCLASSIFIED)

Figure 2-11. Soviet decontamination vehicle, TMS-65 (U).

(b)(1)

Neg. 554984 (CONFIDENTIAL)

Figure 2-12. Soviet MAG-3 jet engine forger (U).

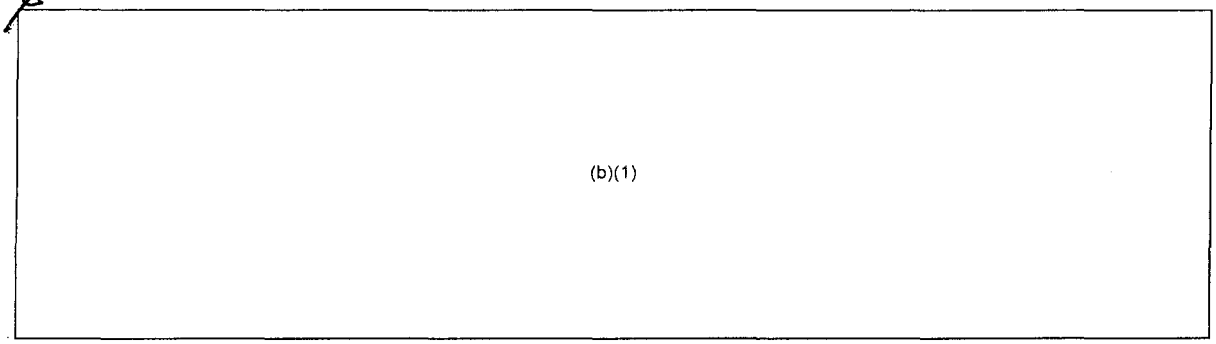


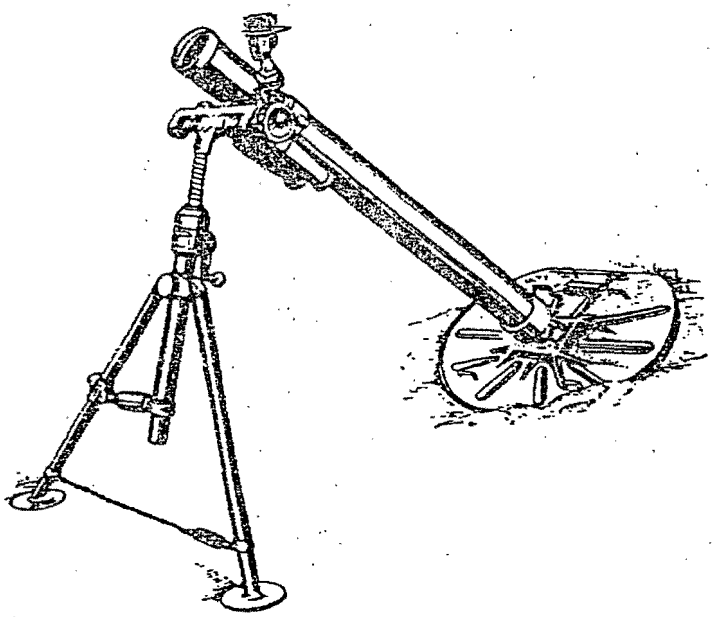
Neg. 554985 (CONFIDENTIAL)

Figure 2-13. Tractor-mounted jet engine (U).

c. (C-NOFORN) Mortar Projectiles.

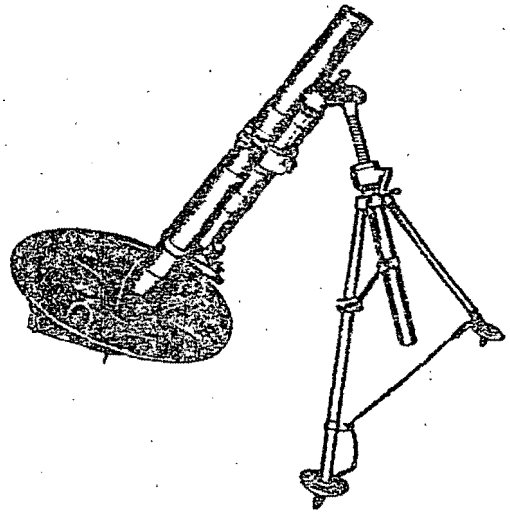
(1) (C-NOFORN) General.





Neg. 500182 (UNCLASSIFIED)

Figure 2-14. Soviet 1937 82-mm mortar smoke projectile (U).

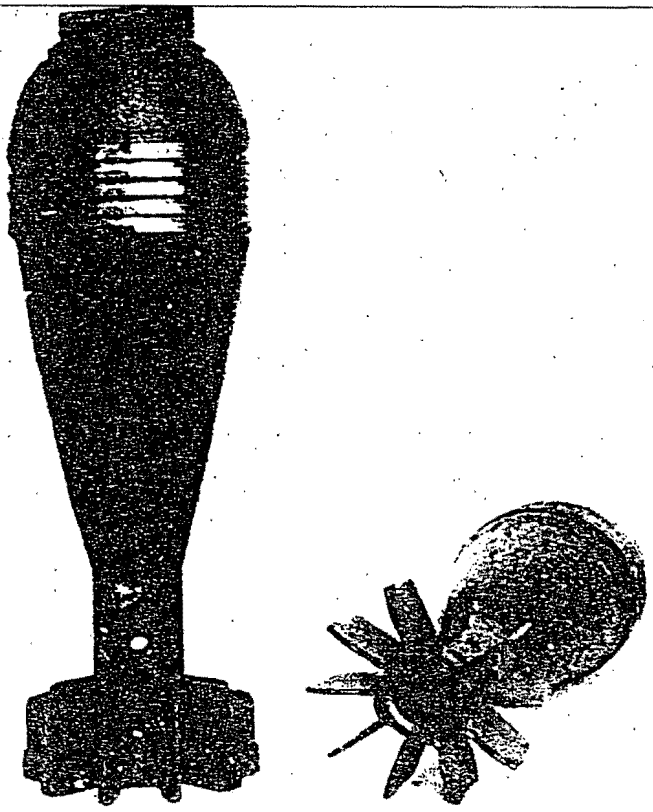


Neg. 508665 (UNCLASSIFIED)

Figure 2-15. Soviet 1943 120-mm mortar smoke projectile (U).

(U) (C-NOFORN) (b)(1)

(b)(1)



Neg. 522849 (UNCLASSIFIED)

Figure 2-16. Soviet 82-mm mortar smoke projectile, Model D-832, unfuzed (U).

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-II. Foreign Smoke (Smoke/Incendiary) Mortar Ammunition (U)

(b)(1)

(CONFIDE

NOT Rreleasable to foreign nationals

CONFIDENTIAL

Table 2-II. Foreign Smoke (Smoke/Incendiary) Mortar Ammunition (U)

DST-1620S-145-77

CONFIDENTIAL

(b)(1)

E

(CONFIDENTIAL)

Original

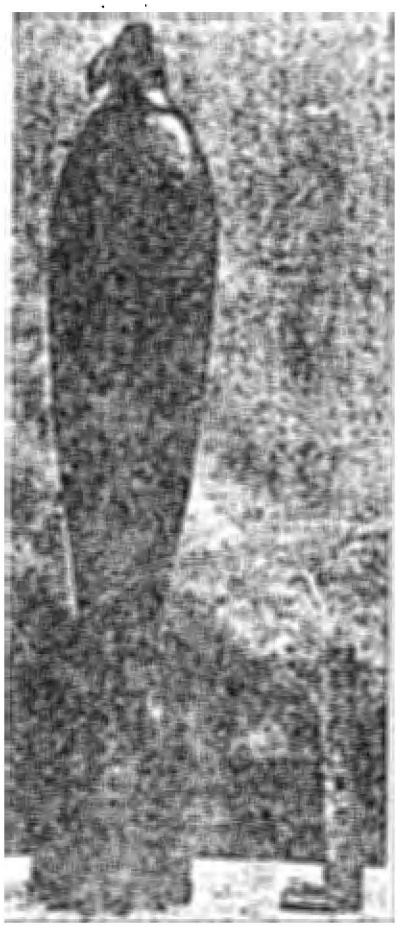
(2) (c) (b)(1)

(b)(1)

(3) (C) 120-mm smoke projectile, D-843A.

(a) (C) Description.

(b)(1)



Neg. 522850 (UNCLASSIFIED)

Figure 2-17. Soviet 120-mm mortar smoke projectile, Model D-843A (U).

2. (C) (b)(1)

(b)(1)

(b) (C) Performance.

(b)(1)

f. (C-~~NOFORN~~) Artillery Projectiles.

(b)(1)

DST-1620S-145-77 Original

(b)(1)

(2) (b)(1)

(b)(1)

Table 2-III. Technical Characteristics of ECC Artillery Smoke Ammunition (U)

(b)(1)

(CONFIDENTIAL)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-IV. Average Consumption of Smoke Ammunition per Kilometer Front for 15 Minutes (U)

(b)(1)

(CONFIDENTIAL NOFORN)

Table 2-V. Average Consumption of Smoke Ammunition to Screen an Isolated Target for 15 Minutes (U)

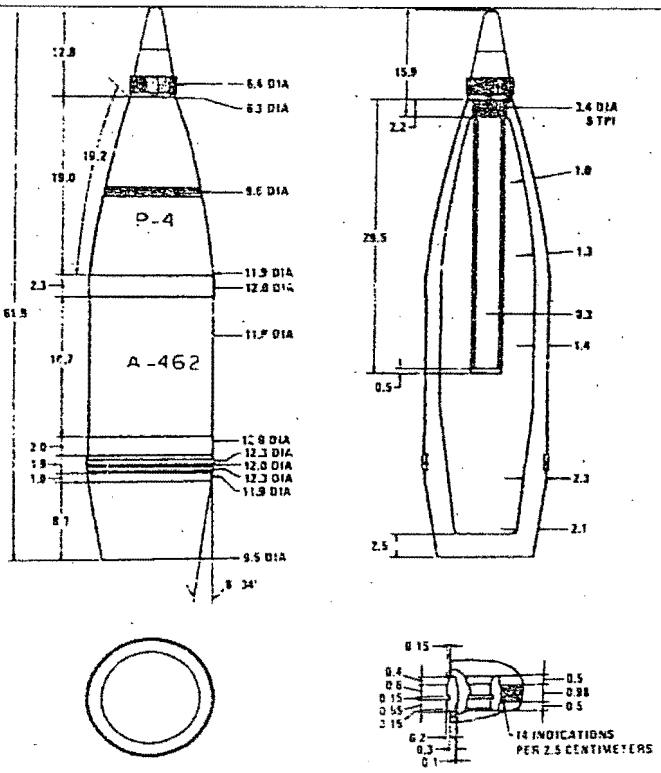
(b)(1)

(CONFIDENTIAL NOFORN)

NOT RELEASABLE TO FOREIGN NATIONALS

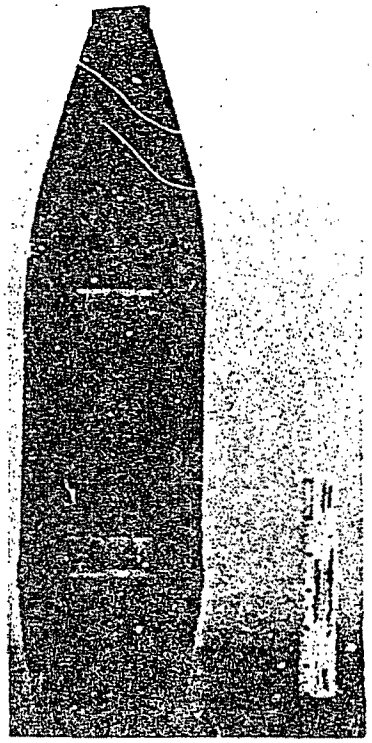
(5) (C) (b)(1)

(b)(1)



Neg. 502888 (UNCLASSIFIED)

Figure 2-18. Soviet 122-mm smoke projectile, Model D-462, without fuze (U).

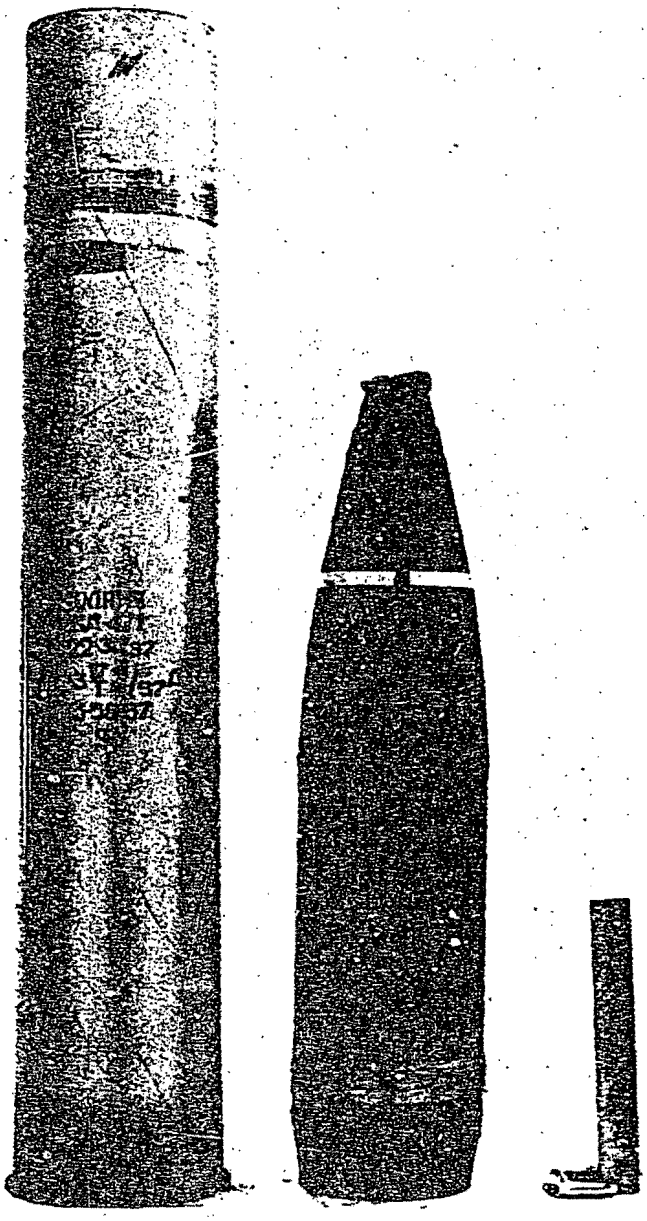


Neg. 522851 (UNCLASSIFIED)

Figure 2-19. Soviet 122-mm smoke projectile, Model D-462 (U).

(b) (C) (b)(1)

(b)(1)



Neg. 522852 (UNCLASSIFIED)

Figure 20. Soviet 122-mm smoke projectile, Model DTS-471, without fuze, with propelling charge ZLD-471 (U).

(b)(1)

(8) (U) Yugoslav 76-mm smoke projectile. The 76-mm mountain howitzer B-1 is standard in the Yugoslav Army. The smoke cartridge for the 76-mm mountain howitzer M1948 (B-1) is of the semifixed, adjustable propelling charge design.[56] The WP-filled projectile has a full-length burster initiated by the Yugoslav M51A5. Other characteristics of this cartridge are unknown.

D. STANDARD FLAME FUELS AND FLAMETHROWERS

8. (C) Flame Fuels

(b)(1)

9. (C) Flamethrowers

a. (C) (b)(1)

(b)(1)

b. (U) Manpack flamethrowers. The latest known standard manpack flamethrower, Model LPO-50, comprises a flamegun, a hose, and a backpack assembly of three fuel tanks.[3 41] Each tank of fuel can be fired individually by setting a switch on the gun and pulling the trigger. Batteries in the gun's stock are used to ignite the pyrotechnic cartridges that pressurize the tanks and those that ignite the fuel as it leaves the gun. The weapon's effective range is 18 to 72 meters. The empty weight is 15 kg; the weight when filled with 10 liters of flame fuel is 23 kg. The Chinese version of the LPO-50 is the Model 58. Vietnamese references to a Model F-50 (and possible K-5, AT-60 and AT-64) relate to Soviet and Chinese versions.

c. (C) (b)(1)

(b)(1)

d. (U) Emplaced or Fougasse Flamethrowers. The Model FO emplaced flamethrower comprises a fuel tank, an ejection nozzle, pyrotechnic pressurizing and ignition cartridges, and an electric wiring system that leads to a remote firing-control position.[3] These flamethrowers are placed in shallow pits or are otherwise concealed at anticipated points of attack. Flame fuel may be emitted horizontally from a one-direction nozzle or from one that disseminates the burning fuel in five horizontal directions. The Model FO holds 25 liters of fuel. The range with the single nozzle is 127 meters, and with the multiple direction nozzle, 91 meters. The flamethrower weighs approximately 53 kg when filled and 34 kg when empty.

e. (C) (b)(1)

(b)(1)

E. INCENDIARY AGENTS AND MUNITIONS

10. (U) Incendiary Agents

Incendiary agents are considered extremely effective in combat operations. Continued Soviet interest is reflected in the large number of articles appearing in their military journals dealing with defense training against incendiaries.[3] A variety of incendiary-agent-filled ground and aerial munitions has been developed for use against a wide spectrum of tactical and strategic targets. The standard or possible incendiary agents available (table 2-VI) apparently do not represent new or unusual concepts, but some experimental compounds, such as the pyrophoric metals and the alkyl-metal compounds, could advance incendiary capabilities.

11. ~~(C)~~ Incendiary Ground Munitions

(b)(1)

a. (U) Bullets. The 7.62-mm ZP bullet, which contains an incendiary fill of magnesium, aluminum, and barium nitrate, can be used against unarmored fuel tanks and also for the adjustment of fire.[3] Type-Z incendiary tracer bullets—composed of magnesium, aluminum, strontium nitrate, and barium oxide—can be used to ignite easily combustible materiel and fuel contained in tanks made of metal up to 3 mm thick.

b. ~~(C)~~ (b)(1)

(b)(1)

Table 2-VI. Known or Possible Incendiary Agents (U)

(b)(1)

(CONFIDENTIAL)

F. PRODUCTION, STORAGE, AND STOCKPILES

12. (C-NOFORN) Production

a. (C-NOFORN)

(b)(1)

(b)(1)

f. (C-NOFORN) (b)(1)

(b)(1)

v. (C-NOFORN) (b)(1)

(b)(1)

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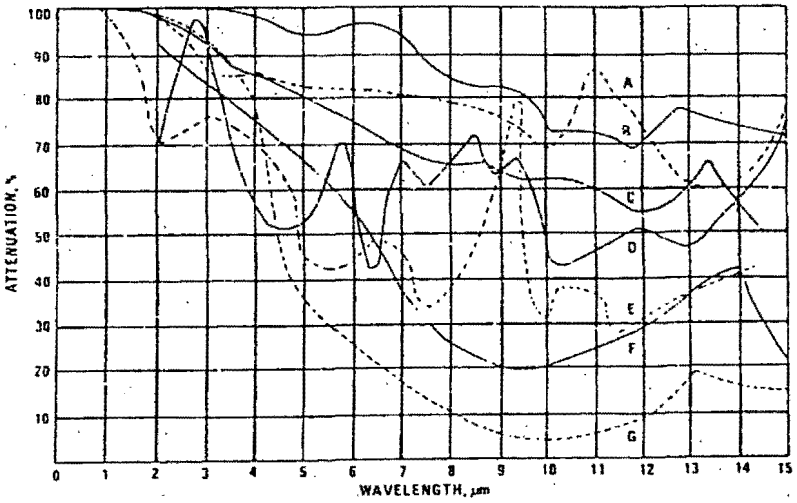
G. DEFENSE

14. (C-NOFORN) Electro-Optical Countermeasures

a. (C-NOFORN) (b)(1)

(b)(1)



INFRARED ATTENUATION PRODUCED BY SMOKE AGENTS
SMOKE CONCENTRATION 100 mg/ℓ
PATH LENGTH 31m

Neg. 519112 (UNCLASSIFIED)

Figure 2-21. Smoke attenuation of infrared radiation (U).

NOT RELEASABLE TO FOREIGN NATIONALS

b. (C) (b)(1)

(b)(1)

c. (U) Soviet military publications show that defense against ATGM is a serious consideration and possibly takes precedence over other forms of smoke use. Examples of these writings are given below:[80]

- As is known, the most effective means of combating tanks at the present time is considered to be antitank guided rockets (PTURS). Therefore, they should be destroyed with the fire of rockets, artillery, tanks, and infantry. In addition, the effectiveness of the fire of the PTURS can be lowered with the help of smoke. However, for this purpose, one should know the weak sides of guided rockets and skillfully exploit them. Thus, at the start of its flight, for a sector of up to 400 meters, the rocket is difficult to control. Therefore, in open terrain PTURSs can damage tanks only in a zone from 300-400 meters up to 2 to 3 kilometers (the maximum flight range of the rocket). For this purpose, the launcher operator must simultaneously observe both the target and the rocket.

- Tanks cross a path of 2-3 kilometers in 8-12 minutes. If, during this time, the PTURS positions are blinded or the tanks are covered by a masking smoke screen (of course, under favorable meterological conditions), the problem will be solved. This can be done with the help of smoke rounds as well as using the existing smoke equipment of tanks (thermal smoke apparatus TDA or large smoke cartridges BDSh).

- Let us assume that a tank battalion is advancing on a prepared enemy defense. With an oblique or a frontal wind towards the enemy, 2-3 tank platoons with TDA which will screen with smoke the entire front of the attackers are sufficient for the reliable screening of the firing positions of the PTURSs. These platoons are required to move ahead of the battalion at a distance of 300-400 meters.

- Some tanks are equipped with two smoke cartridges BDSh-5 or BDSh-15. The duration of the burning of the cartridges is 9-11 minutes, and the length of the zone which cannot be seen through from one cartridge with a wind speed of 5 meters per second is up to 500 meters and its width is approximately 100 meters. They can also be used successfully for blinding PTURSs.

- With the help of BDSh, it is possible to lay an immobile smoke screen with a frontal wind towards the enemy too. In this, the distance between the "smoking" tanks should not exceed 100 meters. In order to lay a screen along the front of the attack of a tank battalion, it is necessary to detail one or two tank platoons.

- In order to reduce the effectiveness of the fire of the PTURSs, tanks should move at increased speeds, rapidly maneuver on the field of battle and exploit the protective properties of the terrain. With the fire from all weapons, and first of all artillery weapons, the launchers of the antitank guided rockets should be destroyed. At the same time smoke should occupy their place in this fight. Therefore, tankers should learn to operate confidently under conditions of smoke.

d. (C-NOFORN) (b)(1)

(b)(1)

15. (U) (S-NOFORN-WNINTEL) Therapy

a. (U) (S-NOFORN-WNINTEL) Smokes.

(1) (C-WNINTEL) (b)(1)

(b)(1)

(2) (U) In addition to inhalation injuries that may be caused by smokes, some liquid agents (e.g., sulfur trioxide, chlorosulfonic acid, and titanium tetrachloride) will also cause burns when they come in contact with the skin. Recommended treatment consists of copious washing of affected areas with water, followed by a wash with a soda solution.[88]

(3) (U) There is little information from the PRC concerning the treatment of smoke inhalation injuries. Initial therapy for irritation of the mucous membranes of the respiratory tract would probably be similar to that recommended for treatment after mustard gas (HD) inhalation. For relief of the coughing and irritation resulting from HD exposure, a Chinese military handbook recommends that the victim inhale the vapor resulting from a mixture of 20 ml of ethyl ether, 40 ml of chloroform, and 40 ml of ethanol, to which five or six drops of ammonia water are added. To treat acid burns that may occur on the skin, the affected area is to be flushed with water or soaked in a water bath.[89]

(4) (C) (b)(1)

(b)(1)

b. (U) Flame and Incendiary.

(1) (U) Available Soviet and Warsaw Pact information on recommended treatment of injuries due to flame and incendiary agents deals primarily with napalm and phosphorus. Articles pertaining to napalm indicate that burns are not the only medical concern. Other effects include a strong negative psychological reaction among troops; high temperatures, which may cause dehydration; oxygen depletion; and poisoning by carbon monoxide generated during combustion. In the case of napalm burns it is of primary importance to extinguish the agent and prevent it from reigniting. Once this is accomplished, the casualty should be led from the battlefield and treated for shock, renal insufficiency, and acute toxemia, which may result from byproducts in burned areas of the body. Casualties are given anesthetics, are washed down with disinfectants, and fluids are replaced intravenously.[93-95] One article recommends the application, after the agent is extinguished, of a 5% solution of potassium permanganate to the burned area.[89] East German treatment for napalm burns includes the additional application of a salve-impregnated bandage that is to be changed two or three times a week.[96] Further treatment of serious burns would then require the removal of necrotic tissue and, subsequently, skin-graft operations.

(2) (U) The major medical problem resulting from the use of phosphorus is burns. Burning phosphorus on the skin may be extinguished by complete immersion of the affected area in water, or by covering it with sand or dirt. The phosphorus should then be removed from the skin with a small wooden board. The burned area should be washed with a 10% solution of copper sulfate, calcium chloride, or potassium permanganate and then treated conventionally.[93]

(3) (U) The treatment of burns has been studied extensively in the PRC since the early 1950s. Much Chinese burn therapy consists of a combination of Western and traditional Chinese (herbal) medicine.

(4) (C) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(5) (C) (b)(1)

(b)(1)

(6) (U) There is no information available on specific North Korean treatments. The Koreans, however, have received extensive aid in the past from both the USSR and the PRC; it is probable, therefore, that their burn therapy is based on procedures followed in one or both of these countries. No information is available on flame and incendiary casualty treatment for the Mongolian Peoples Republic, the Khmer Republic (Cambodia), or Laos.

(7) (C) (b)(1)

(b)(1)

H. RESEARCH AND DEVELOPMENT

16. (C) Agents

a. Smoke.

(b)(1)

Original

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(b)(1)

(b)(1)

c. Incendiary.

(b)(1)

(b)(1)

17. (C) Munition/Dispersion Systems

(b)(1)

I. AEROSPACE SMOKE, FLAME, AND INCENDIARY CAPABILITIES

19. (S-NOFORN) General

a. (C-NOFORN) (b)(1)

(b)(1)

b (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

c. (S-NOFORN) Considerable intelligence gaps exist with regard to the capability

(b)(1)

(b)(1)

20. (S-NOFORN) Standard Agents and Dispersion Systems

a. (S-NOFORN) Smoke

(b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(3) (S-NOFORN) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

*Unknown (SECRET)

b. (S-NOFORN) Flame and Incendiary Capabilities.

(1) (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(2) (S) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-VIII. Soviet Aerial Incendiary Munitions (U)

(b)(1)

*Concentrated-action.
**Dispersed-action.

(CONFIDENTIAL-NOFORN)

NOT RELEASABLE TO FOREIGN NATIONALS

(7) (S)

(b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

Table 2-X. Soviet Incendiary Munition Color Coding (U)

(b)(1)

(SECRET NOFORN)

21. (S-NOFORN) Research and Development

(b)(1)

b. (S-NOFORN) (b)(1)

(b)(1)

22. (S) Trends and Forecast.

a. Trends.

(b)(1)

(b)(1)

J. NAVAL SMOKE, FLAME, AND INCENDIARY CAPABILITIES

23. (S-NOFORN) Standard Agents and Dispersion Systems

a. (U) Introduction

(1) (U) There is no information available that describes Warsaw Pact naval incendiary/flame capabilities or operations. There is information, however, to indicate a substantial Warsaw Pact capability for utilizing smoke and aerosol obscurant (AO) agents.

(2) (U) The methodical and planned use of smoke agents in battle was largely a development of World War I. The original purpose of smoke utilization was either to blind the vision of the enemy or to screen friendly forces or terrain from enemy visual observation.

(3) (U) The terminology "aerosol obscurants" has been adopted by the Joint Technical Coordinating Group to define current chemical agents and their specific function to obscure or decoy microwave and EO guided terminal homing munitions or reconnaisance sensor systems. Some of the World War I chemical smokes will, in fact, screen both visual and EO sensing devices. Chemical compounds have been or are being developed specifically to counter sensing devices. The primary purpose for the use of chemical agents, as described in this section, is to obscure or decoy terminal homing munitions or reconnaisance sensor systems.

b. (U) The Threat.

(1) (U) The outcome of future military operations will become increasingly dependent upon the ability of force commanders to perform missions within a hostile environment which includes EO and microwave (radar) devices. These devices will be utilized by the enemy for directing gun-fire, guiding missiles, and for surveillance operations. The successful completion of a force's mission will, to a great extent, be a function of how well the commander can play "hide and seek."

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(2) (C) (b)(1)

(b)(1)

c. (C) Technical Issues.

(1) (C) Aerosol obscurants.

(b)(1)

(b)(1)

(b)(1)

§

(b)(1)

d. (S-NOFORN) Screening Capabilities

§

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

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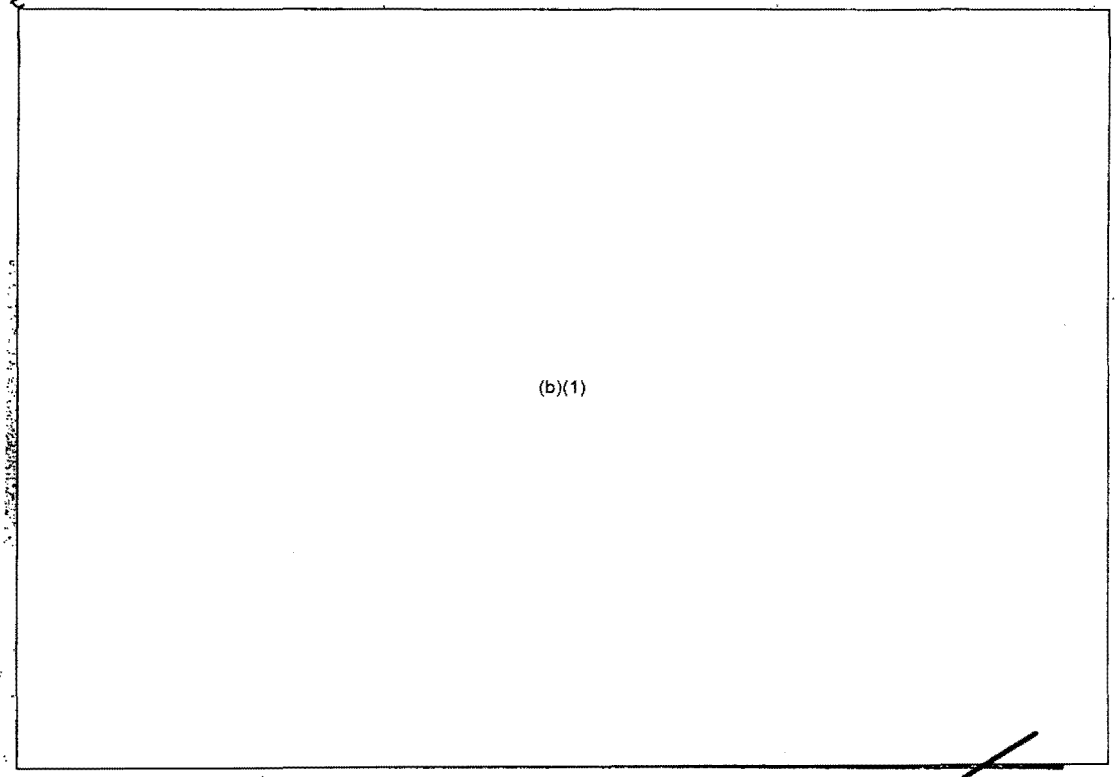
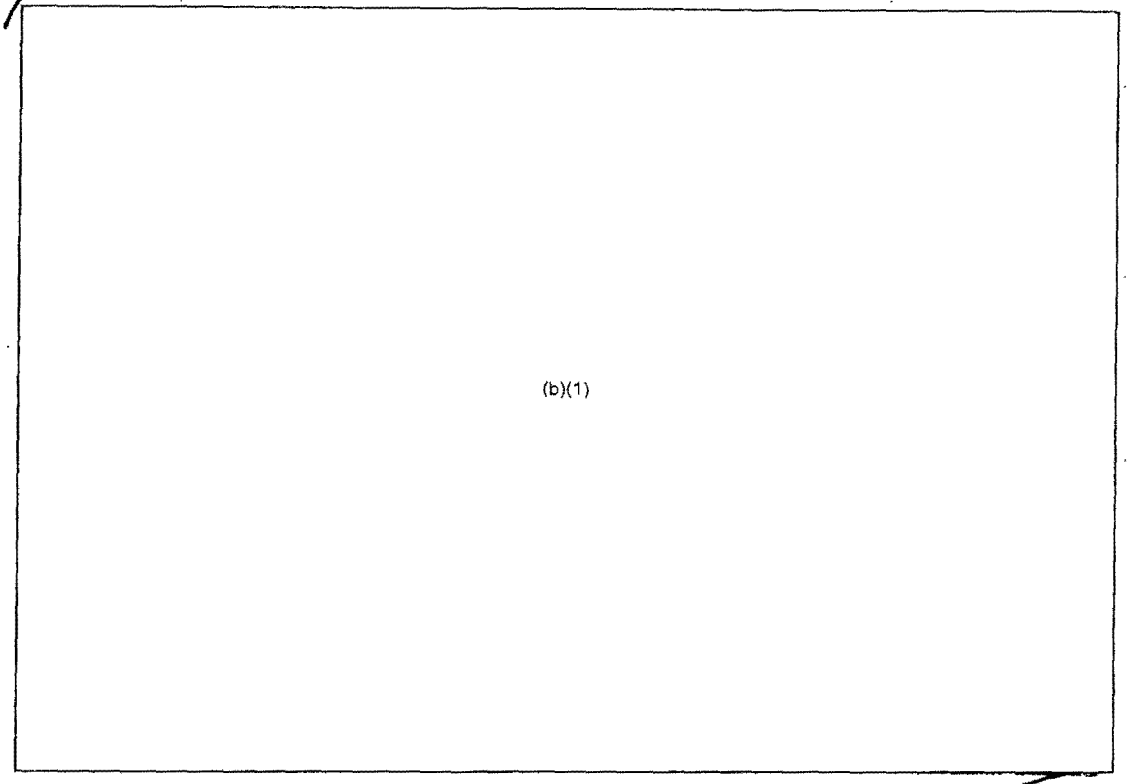


Neg. 552783 (CONFIDENTIAL)

Figure 2-22. DON Class AS MAGOMET GADZHIEV submarine tender laying smoke, 1965 (U).

NOT RELEASABLE TO FOREIGN NATIONALS

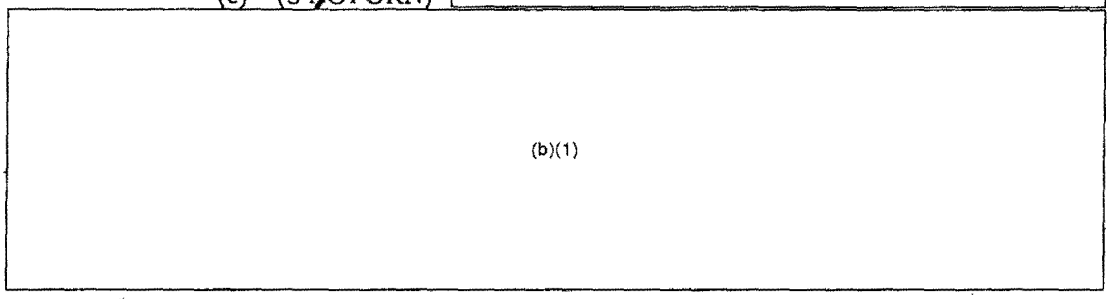


Neg. 554983

(CONFIDENTIAL)

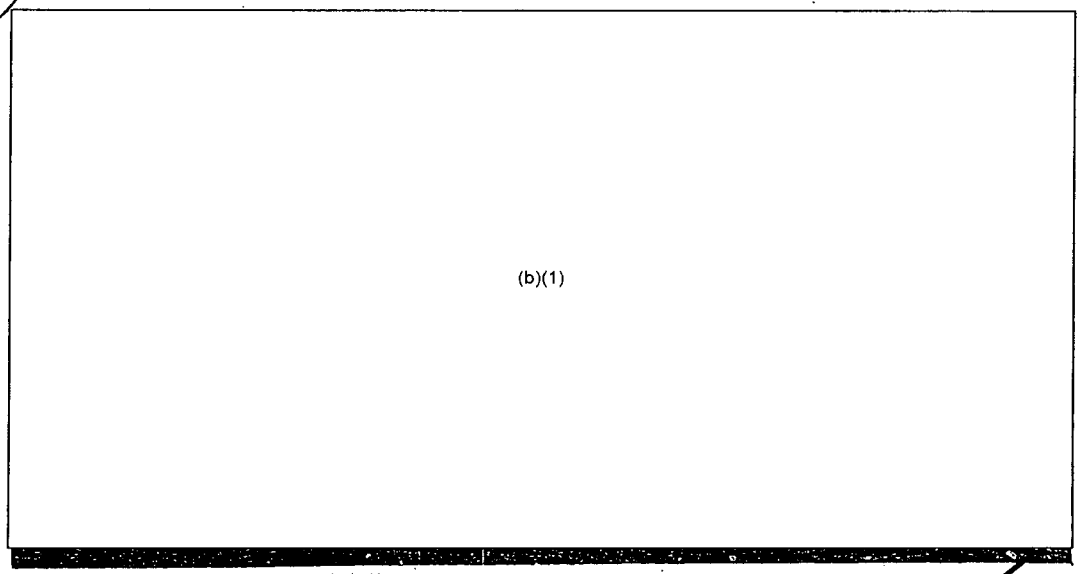
Figure 2-23. MDSh-type smoke boxes on POTI Class PCE, 1965 (c).

(c) (S-NOFORN) (b)(1)



NOT RELEASABLE TO FOREIGN NATOINALS

DST-1620S-145-77 Original



Neg. 554955 (CONFIDENTIAL)

Figure 2-24. KRESTA II Class CLGM laying smoke, 1975 (C-NOFORN).

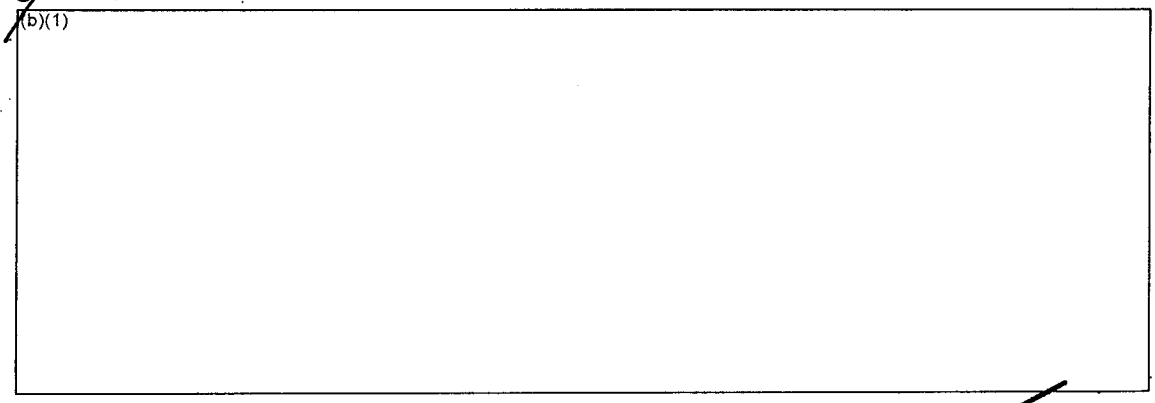


Figure 2-25. POINOCNY Class LSM deploying smoke, 1976 (C) CONFIDENTIAL.

NOT RELEASABLE TO FOREIGN NATIONALS

(d) (SECRET NOFORN)

(b)(1)

(b)(1)

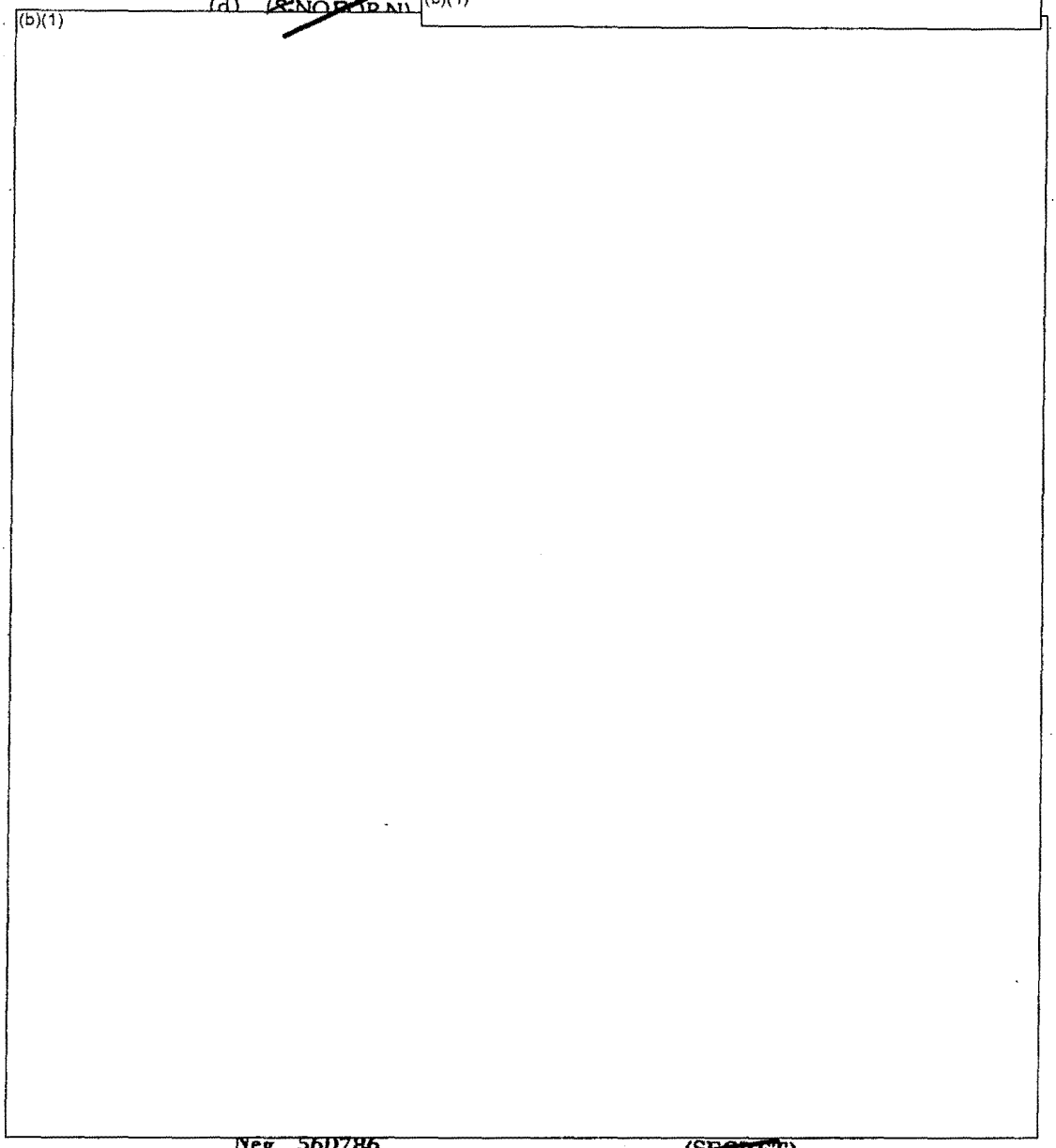


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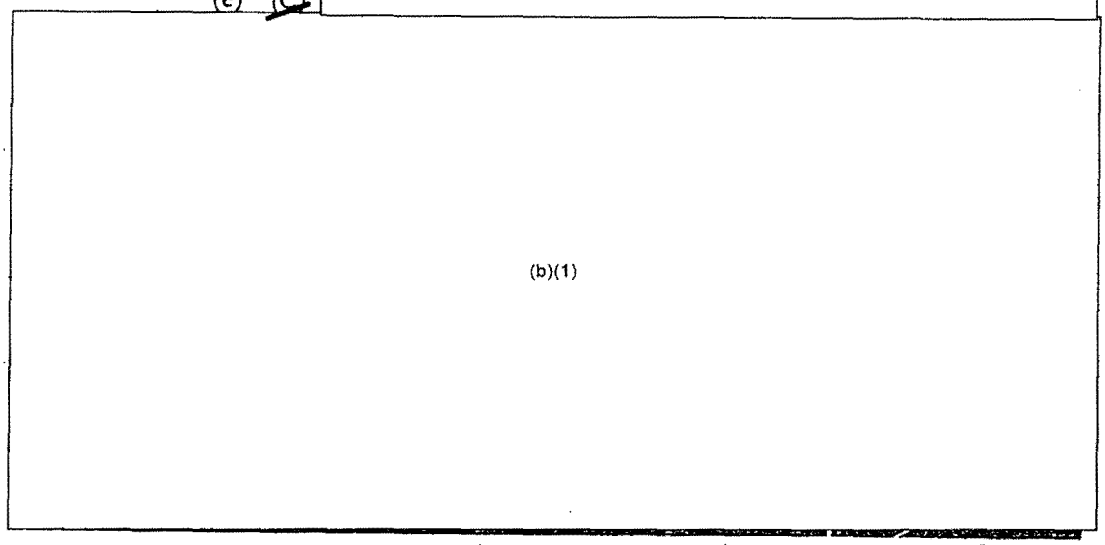
Figure 2-26. KASHIN Class DLG laying smoke, 1975 (S).

NOT RELEASABLE TO FOREIGN NATIONALS

(c) (C) (b)(1)



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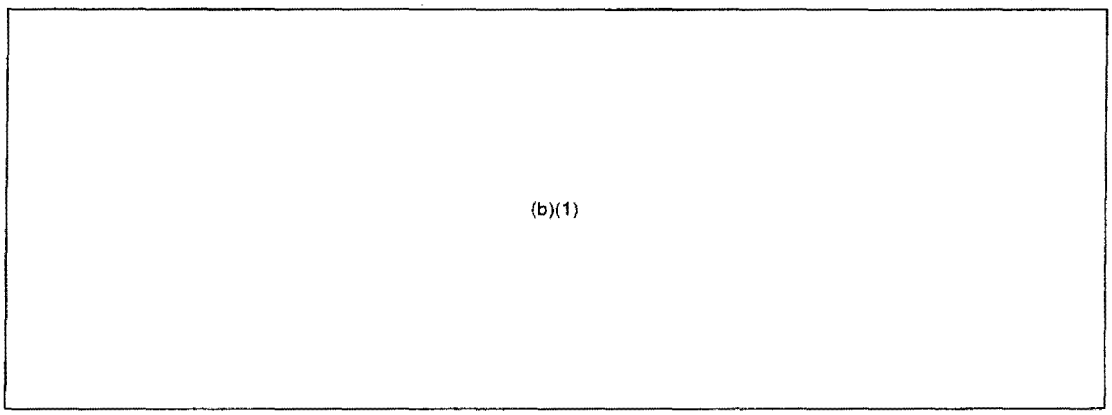
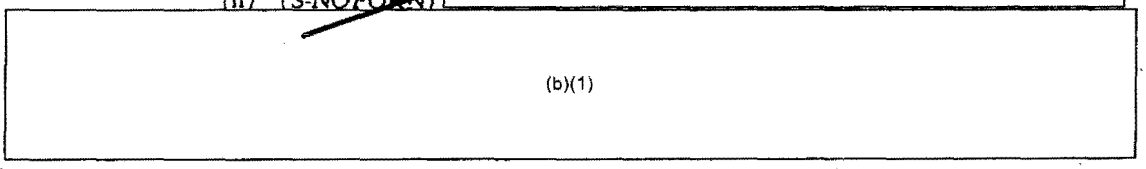
(CONFIDENTIAL)

Figure 2-27. KOTLIN Class DD deploying black smoke, 1975 (C).



(h) (S-NOFORN) (b)(1)



NOT RELEASABLE TO FOREIGN NATIONALS

(2) (C) Naval Screening Capability—European Communist Countries.

(b)(1)

e. (S-NOFORN) Limitations of Screening Operations.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(2) (U) High humidity in the atmosphere assists in the formation of some screening-agent clouds. Ideal wind speeds for screening operations are from 3 to 5 m/s. It has been reported that under ideal conditions (humidity, temperature inversion, and wind speed) some types of screening clouds may persist for 30 min. There would be periods, however, when meteorological conditions would not be favorable and the successful employment of obscurant clouds precluded.

(3) (S-NOFORN) (b)(1)

(b)(1)

f. (S-NOFORN) Summary and Conclusions.

(b)(1)

24. (C) Smoke/Aerosol Obscurant Agents Research and Development

(b)(1)

b. (U) Attention is being given to a wide assortment of plastics for this purpose, including epoxy, phenolic, polyethylene, silicone, and urethane resins. To obtain a screen from such resins, the substances are atomized by a jet of hot gases and a screen is formed by condensation in the relative cool air. The diameter of the particles varies from 1 to 100 μm, depending on the composition of the original chemical substance.[5]

K. TRENDS AND FORECASTS

25. ~~(C)~~ Trends

(b)(1)

26. ~~(C)~~ Forecasts

(b)(1)

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Section III.

FREE WORLD

A. POLICY AND DOCTRINE

1. (C-NOFORN) Policy

(b)(1)

2. (C-NOFORN) Doctrine

(b)(1)

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(b)(1)

B. ORGANIZATION, TACTICS, AND TRAINING

3. (C-NOFORN) Organization

(b)(1)

4. (C-NOFORN) Tactics

(b)(1)

(b)(1)

5. (C-NOFORN) Training

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

C. STANDARD SMOKE AGENTS AND MUNITION/DISPERSION SYSTEMS

6. (C) Agents

(b)(1)

7. (C-NOFORN) Munition/Dispersion Systems

a. (C) General.

(b)(1)

b. (C) Grenades.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(2) (U) Swedish grenade, Model FFV915. The FFV915 smoke rifle grenade,[8] which is fired from the 7.62-mm automatic rifle, is projected by a special cartridge of the rosette-crimped type. Normally fired at low angles, the grenade will produce smoke before it hits the ground at ranges greater than 250 meters. The smoke screen produced within 10 seconds after initiation is about 20 meters wide by 4 meters high under normal weather conditions. The titanium dioxide-HC agent is ignited by a black powder disc. Smoke is immediately emitted through outlet channels adjacent to the fins at the rear of the grenade, which assures smoke emission even in soft ground or snow.

(3) (U) UK L8A1 smoke grenade system. The UK L8A1 smoke system consists of the L8A1 smoke grenade and the MK 9 monobloc multibarrel smoke discharger.[9] The L8A1 grenade contains 95% RP and 5% butyl rubber within a rubber body casing; it is capable of generating a quick-forming smoke screen. The grenades have a 0.75-second delay before bursting at heights of 8 to 10 meters above the ground and at ranges of 25 to 30 meters. Twelve grenades can be fired in salvo from two MK 9 discharges to produce a smoke cloud with an initial front of about 70 meters over an arc of 110°. The smoke cloud lasts from one to three min. The MK 9 dischargers have six barrels and fire a single grenade per barrel; two can be mounted on an armored combat vehicle. The grenades are electrically fired from the barrels, with the operator having the capability to fire either a 6-grenade salvo (right or left) or a 12-grenade salvo.

(4) (C) (b)(1)

(b)(1)

(5) (U) Smoke rifle grenade, 47-mm. The STRIM 47-mm smoke rifle grenade functions upon impact to produce a dense, lasting smoke. This grenade is designed for reliable operation on any type soil and can be launched from any rifle equipped with a 22-mm-caliber device and a special blank cartridge for launch.[10] The French Army has adopted and mass produced this model in smoke, colored smoke, and incendiary rounds. Reliable functioning of all three rounds can be expected at -32° to +52°C.

(6) (U) Belgian PRB 412 smoke rifle grenade. The Belgian PRB 412 smoke rifle grenade design requires a special cartridge. The steel body, filled with HC, is attached to a boom and tail assembly that has four fins for stabilization.[10] The tail boom allows the grenade to be used with any rifle that has a 22-mm (external diameter) launcher or flash suppressor. The tail assembly is designed to carry the special cartridge that, when fired, sets off the igniter. The igniter initiates a delay element that burns for about 3 seconds to start the ignition booster. The booster in turn ignites the main charge to initiate smoke emission. White smoke is released through two channels in the base plug.

(7) (C) (b)(1)

(b)(1)

c. (C-NOFORN) Pots and Barrels.

(b)(1)

Table 3-I. West German Smoke Pots (U)

(b)(1)

(CONFIDENTIAL)

(b)(1)

Table 3-II. West German Signaling Devices (U)

(b)(1)

(CONFIDENTIAL)

(4) (C-NOFORN) (b)(1)

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(3) (C) (b)(1)

(b)(1)

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Figure 3-1. Japanese smoke generator (U).

c. (U) (C) Mortar Projectiles.

(1) (C) General.

(a) (C) (b)(1)

(b)(1)

(b) (1) (b)(1)

(b)(1)

(b)(1)

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Figure 3-2. Finnish 120-mm mortar smoke projectile (Tampella) (U).

(c) (C) (b)(1)

(b)(1)

(b)(1)

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Figure 3-5. French 60-mm mortar smoke projectile, Model G1 (U).

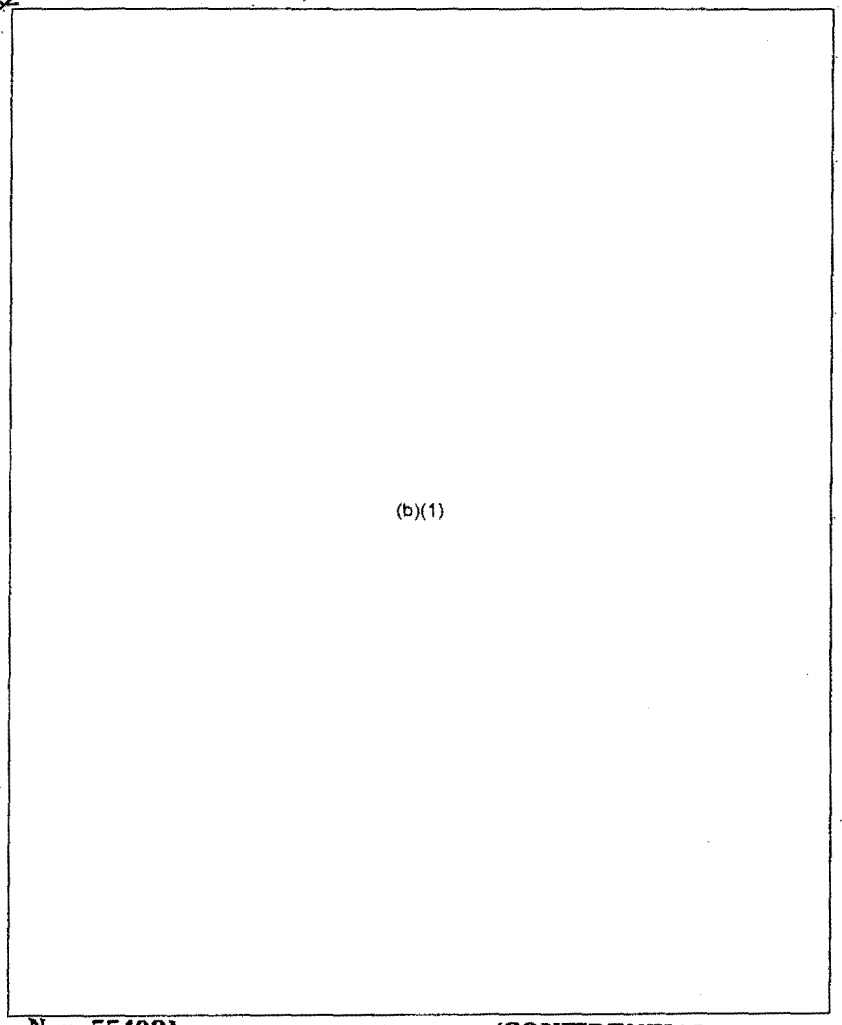

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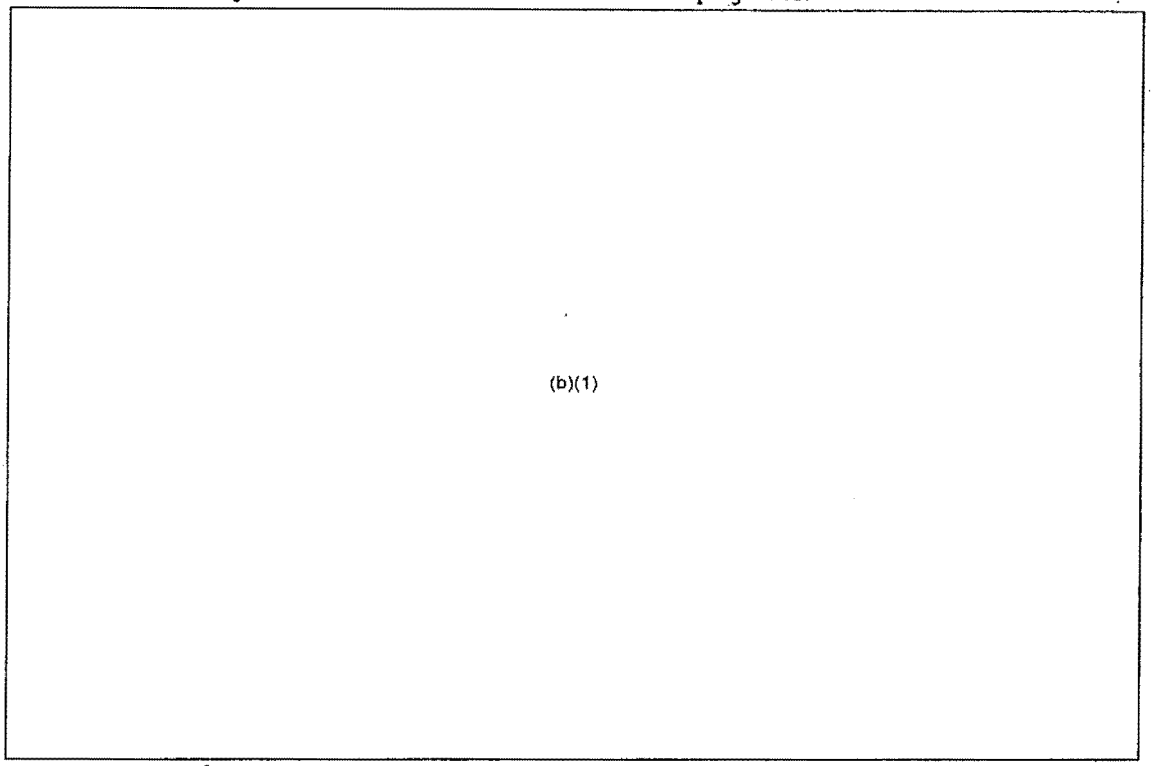
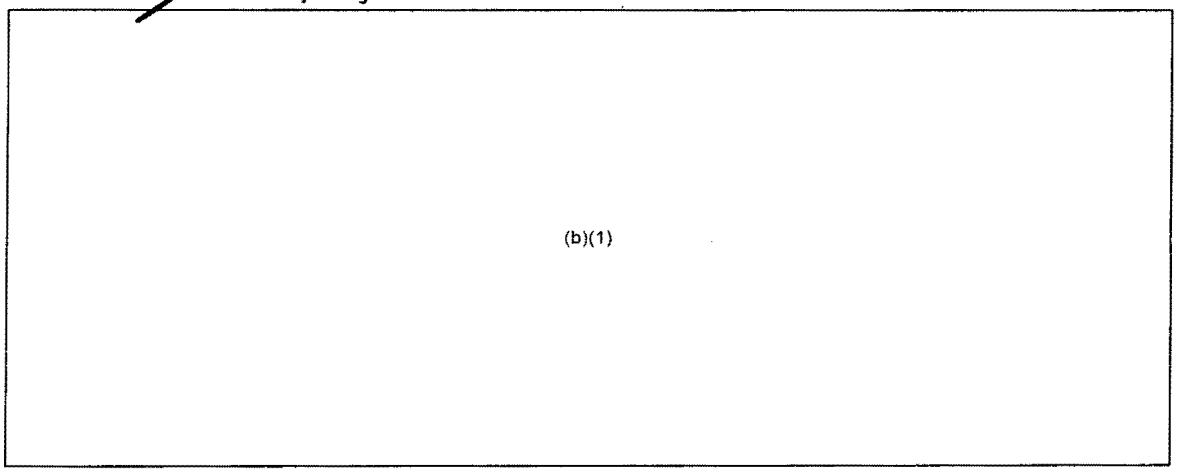
Figure 3-4. French 81-mm mortar smoke projectile, Model ML-61 (U).

(2) (C) Swedish FFV-266 120-mm smoke projectile.



f. (C) Artillery Projectiles.



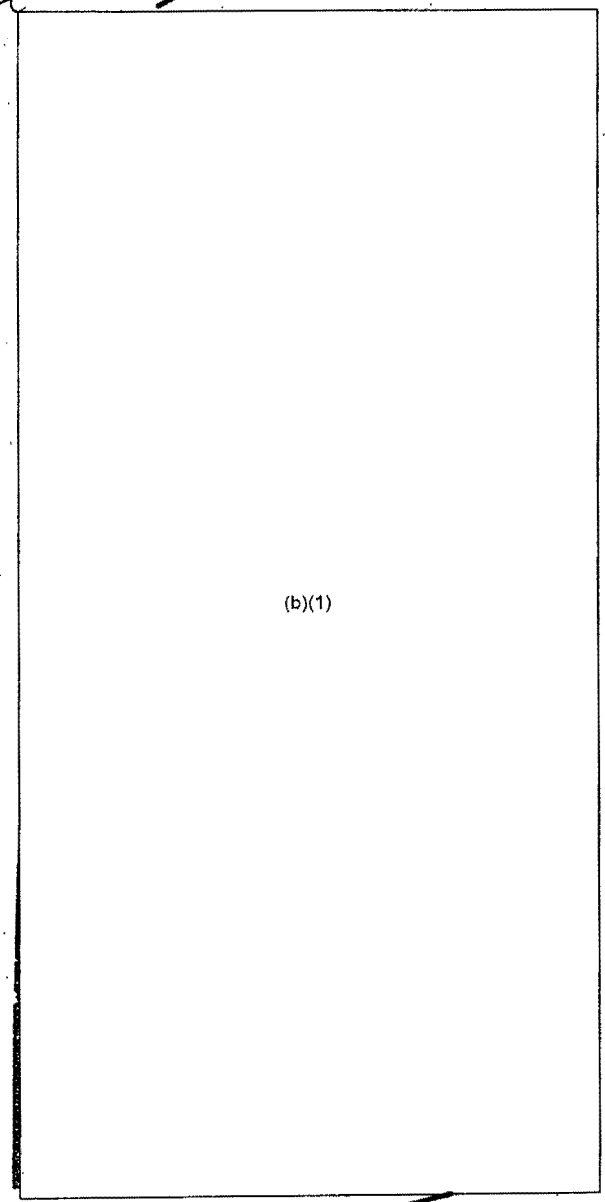


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Figure 3-5. Swedish 120-mm mortar smoke projectile, Model FFV-226 (U).

(2) (C) (b)(1)

(a) (C) (b)(1)

(b)(1)

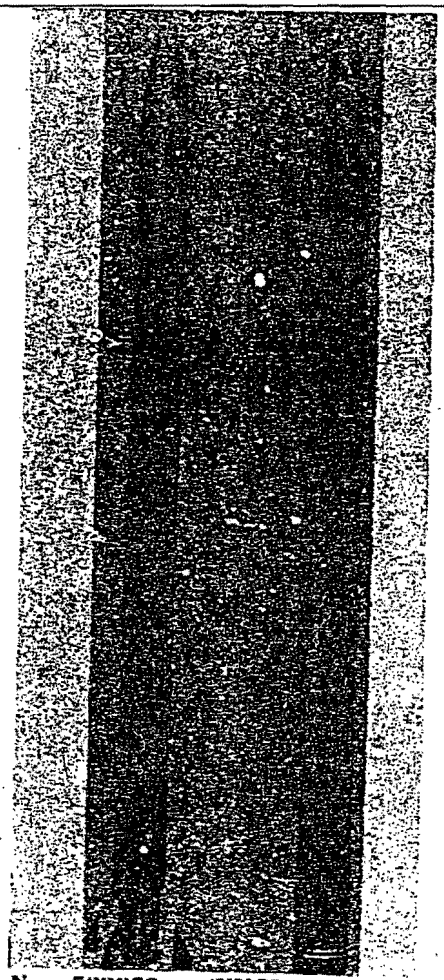

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Figure 3-6. West German 110-mm smoke-incendiary rocket (U).

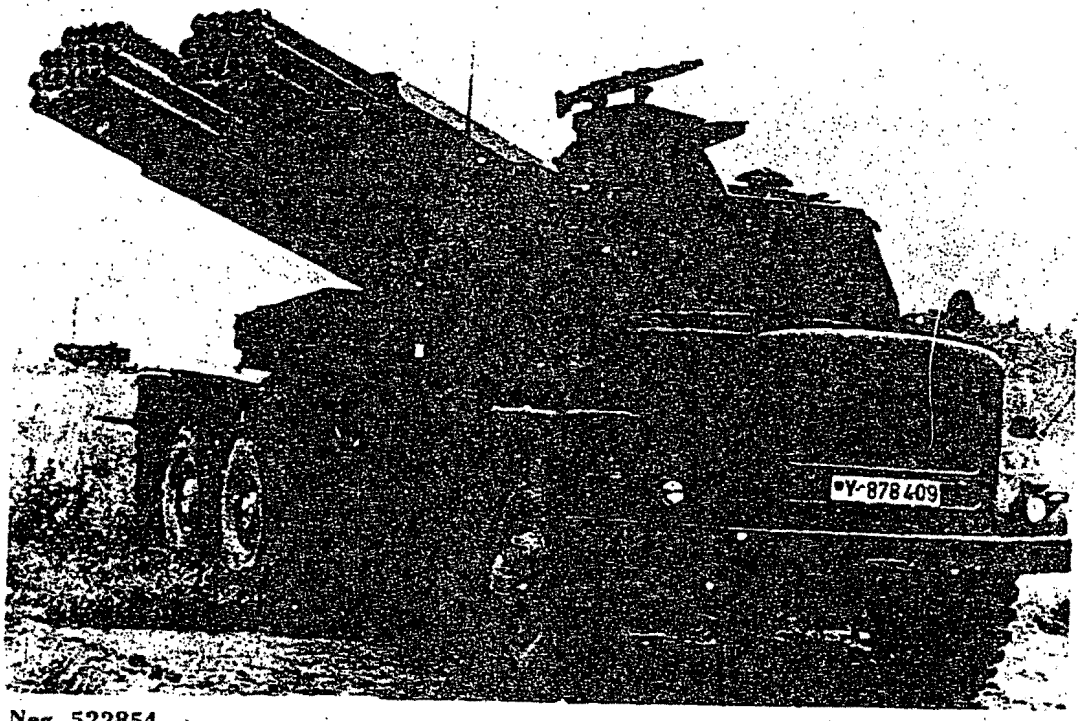

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Figure 3-7. West German 110-mm LAR system (U).

(b) (C) (b)(1)

(b)(1)

(3) (U) Swedish 105-mm smoke projectile.

(a) (U) The 105-mm smoke round, Model FFV 083, has been developed to fill Sweden's requirements for a reliable artillery smoke projectile. Each projectile releases two smoke canisters.[8] After the canisters are ejected from the body of the projectile, fin-like extensions unfold to perform a braking action during descent and to assure the proper landing of the canister. These fin-like extensions prevent rebounding and shattering when landing on hard ground and sinking into mud or soft ground, as well as assuring that the smoke-dispensing holes are not buried.

(b) (U) Each round contains 2.4 kg of smoke agent with a burning time of approximately 3 min. Titanium dioxide and HC are used as smoke-producing agents. Effective performance results at temperatures ranging from -40° to +60°C. The canisters provide a dense smoke that covers an area 125 to 150 meters by 80 meters.

(4) (U) **Swedish 155-mm smoke projectile.** The 155-mm smoke round, Model C, FFV 007, was developed along lines similar to those of the existing 105-mm smoke round, FFV 083.[8] The 155-mm smoke round now has been provided to the Swedish Army for test purposes. Like its predecessor, it releases two smoke canisters that have fin-like extensions that unfold to control descent and assure proper landing. Again the emission holes are pointed skyward and emit a dense smoke for 6 min. The smoke composition for each round consists of 6.8 kg of HC and titanium dioxide. The canisters emit a dense smoke adequate to cover an area 150 to 200 meters long and 100 meters wide. The projectile is equipped with a mechanical time fuze that normally has a setting of 5 to 80 seconds. As with the 105-mm smoke round, the most effective performance temperature ranges from -40° to +60°C.

g. ~~(C)~~ **Tank Guns, Recoilless Rifles, Rocket Launcher Warheads, and Projectiles.**

(1) ~~(C)~~ **General.**

(b)(1)

(2) (U) UK 105-mm smoke round, XM38E1. The UK 105-mm smoke round X38E1 (fig 3-8), used by Sweden in firing from the 105-mm "S" tank, employs a base-ejection projectile housing three canisters. The canisters contain a pressed smoke agent consisting of HC, zinc oxide, and calcium silicide. The smoke canisters are ignited by a black-powder expulsive charge initiated by a time fuze preset for the desired range.

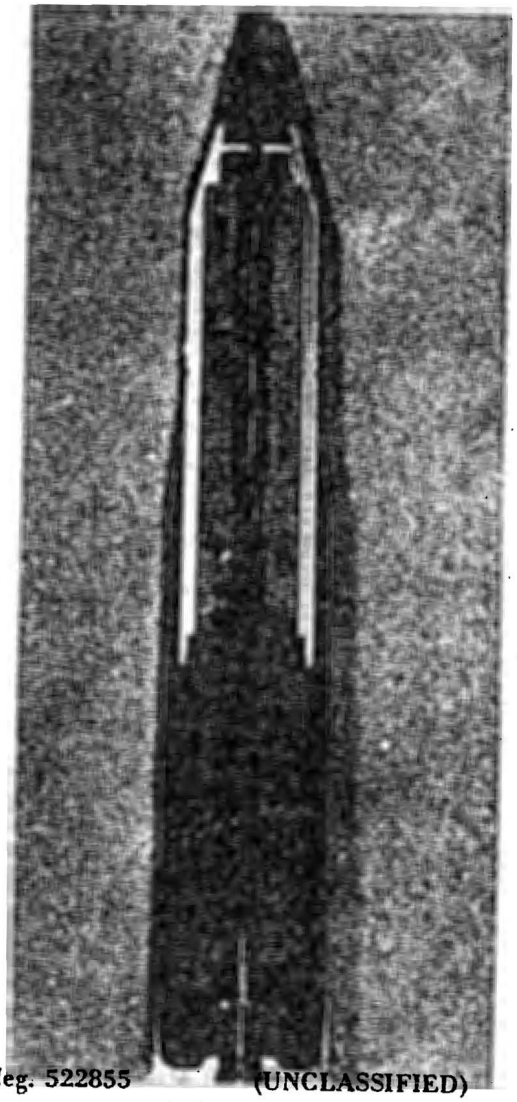

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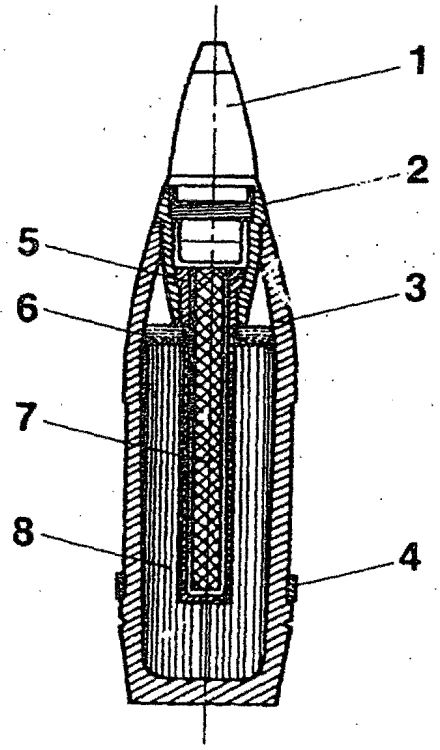
Figure 3-8. UK 105-mm smoke cartridge, Model X38E1, with time fuze No. 390 MK3 (U).

(3) (U) French 105-mm smoke projectile.

(a) (U) The French 105-mm smoke projectile (fig 3-9) can be fired from the AMX-30 105-mm tank gun. It is ballistically matched to the French 105-mm HE projectile OE 105-F-1. It has a steel body of conventional design filled with WP, a central HE burster, and a PD fuze, Model 56. In addition to incendiary and fragmentation effects, the French smoke projectile will generate smoke for 40 seconds to screen a 75-meter-wide area.



1. FUZE
2. ADAPTER
3. BODY
4. ROTATING BAND
5. SEAL
6. WATER LAYER
7. BURSTER TUBE
8. WHITE PHOSPHORUS

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(UNCLASSIFIED)

Figure 3-9. French 105-mm WP smoke projectile, Model ?, with PD fuze, Model 56 (U).

(b) (U) Technical characteristics for the 105-mm smoke projectile are as follows:

- Projectile length . . . . . 444 mm
- Projectile weight . . . . . 12.77 kg
- Filler type . . . . . WP
- Filler weight . . . . . 1.77 kg
- Muzzle velocity . . . . . 700 m/s
- Smoke duration . . . . . 40 s

(4) (U) **Swedish 84-mm smoke round, FFV 65.**

(a) (U) The Swedish 84-mm FFV 65 Ag20 is the standard smoke round for the Swedish Carl Gustav M2 recoilless rifle (fig 3-10).[15] It is intended for tactical use on the battlefield to blind direct fire weapons, enemy areas, armored fighting vehicles, and ATGMs. The projectile is filled with a composition of titanium chloride and a pulverous absorbent. Upon impact, an effective nonthermal smoke screen is instantly generated; thus, infantrymen are able to lay a smoke screen rapidly during battle. The FFV 65 smoke projectile has a range of 1300 meters and provides a smoke screen 15 meters in width. It is fitted with a PD fuze having a graze feature. Sweden currently has developed another smoke projectile, the FFV 469, similar in design to that of the FFV 65, for firing from their new antitank weapon system FFV 550. The smoke agent used in this projectile includes titanium tetrachloride, which eliminates the thermal release that might start battlefield fires.

(b) (U) Technical characteristics of the FFV 65 are as follows:

- Projectile weight . . . . . 2.2 kg
- Filler type . . . . . titanium chloride with a pulverous absorbent
- Muzzle velocity . . . . . 325 m/s
- Range . . . . . 1300 m
- Smoke screen width . . . . . 15 m

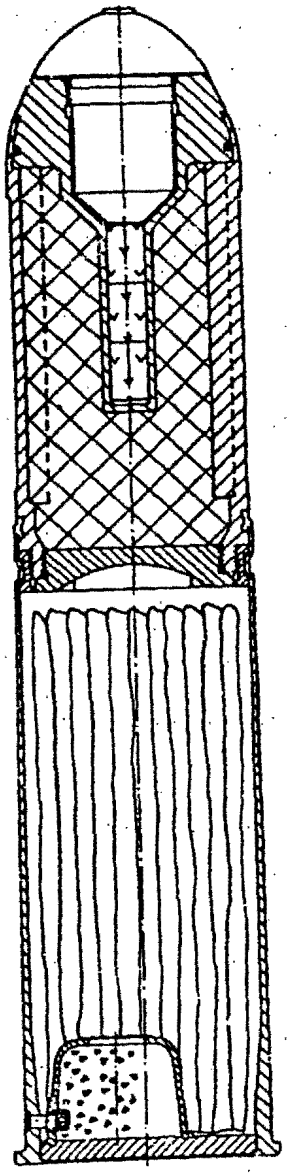

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Figure 3-10. Swedish 84-mm smoke cartridge, Model FFV-65, with PD fuze, Model ? (U).

h. (U) Smoke Grenade/Launcher Systems—Armored Vehicles.

(1) (U) General.

(a) (U) Three decades or more have passed since certain foreign free world countries concluded that on-board smoke systems enhance the combat tank's survivability and maneuver flexibility. In 1943, the Germans used a smoke projector system on some of their "Panzer" 75-mm gun tanks. In 1946, the British mounted smoke-grenade launchers on their Centurion Mark 2 tank (20-pounder gun) and in 1949, on the FV-201, the predecessor of their Conqueror heavy tank (120-mm gun). The 1951 model of the French AMX-13 light tank (75-mm gun) was equipped with similar devices. France, the United Kingdom, and West Germany have consistently used smoke-grenade/launcher systems on tanks and other armored vehicles. The HS-30 APC developed by the Swiss for, and with the cooperation of, West Germany, and adopted by the latter in 1958-59, was similarly equipped. In the early sixties other free world countries followed suit, and today all foreign free world tanks and most lightweight armored fighting vehicles, as well as some support vehicles, mount smoke-grenade/launcher systems.

(b) (U) Other on-board means of generating smoke have been developed and tested—e.g., using the vehicle engine exhaust system—but the foreign free world armies apparently agree that the grenade/launcher system is more compatible with their tactics, and that it is more effective when advancing to make contact with the enemy and when operating in a mobile defense situation. Also, grenade/launcher systems are readily adaptable to all types of armored vehicles. A cluster of two or more launcher tubes is mounted on each side of the turret of all foreign free world tanks (on the Swedish turretless "S" tank the launcher tubes are located on the commander's rotatable cupola) in service today and on experimental tanks and prototypes currently under development. The latter include the West German Leopard II tank prototypes and the British experimental Chobham tank (improved MK 5 Chieftain). Many of the lightweight armored vehicles carry these devices on the forward or rearward part of the hull, but some turreted types carry turret-mounted launcher tubes.

(c) (U) The smoke projectiles (grenades) and projectors (launchers) developed by several foreign free world countries provide a rapid means of shielding the vehicle and personnel during an evasive maneuver in an otherwise untenable situation (e.g., a single tank encounters a prepared enemy defensive position or receives surprise fire from hostile antitank weapons). The smoke screen also provides some protection to personnel when they are mounting or dismounting their vehicle, and assists in the evacuation of wounded crew members from a disabled tank. It can be used to advantage by maintenance and recovery crews when a disabled tank is retrieved or when a hasty repair could restore a tank's mobility during an engagement.

(d) (U) The smoke-grenade/launcher system is simple in concept, construction, and operation. The launcher consists of the tube assembly, mounted on the exterior of the vehicle, and the firing mechanism or control unit, which is mounted inside where it is operated by the gunner or commander. The grenade or smoke shell consists of the fuse, body, and fin assembly. Specific systems developed by foreign free world countries are described and illustrated in the remainder of this paragraph.

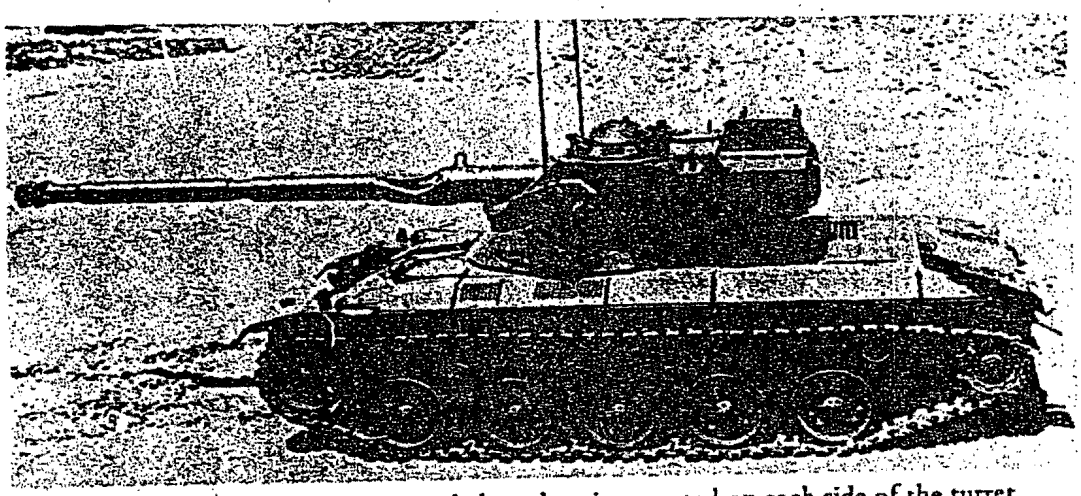
(2) ~~(C)~~ U Austria.

(a) ~~(C)~~ U General.

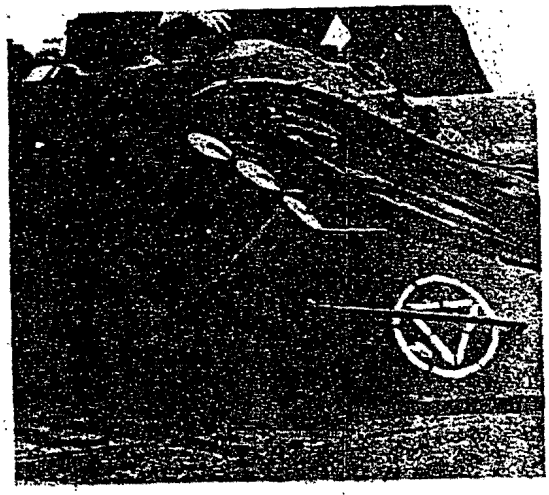
1. (U) The Austrians acquired experience with on-vehicle smoke-discharging equipment while training with French AMX-13 light tanks, which carry two smoke-grenade launcher tubes on each side of the turret. The four units can only be fired simultaneously, which the Austrians considered unsatisfactory. They developed and tested their own equipment, using clusters of two and three launcher tubes in different firing-angle arrangements. They found that, under favorable wind conditions, firing one cluster of three grenades was enough to screen effectively the change of position made by the test vehicle. In one test the three grenades hit in a fan-shaped pattern 40 to 50 meters distant from the turret and reportedly developed an effective smoke screen within 10 seconds. Under typical conditions, however, the Austrians anticipate that it will take approximately 30 seconds to build up an effective screen.[16]

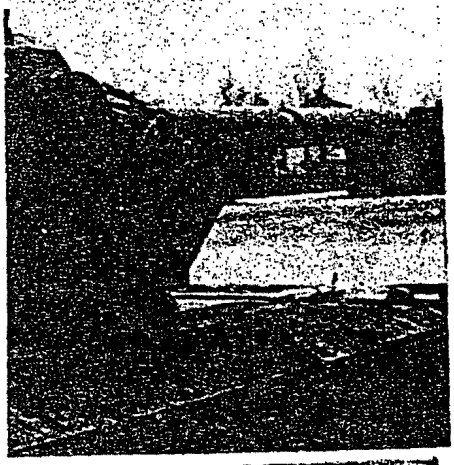
2. ~~(C)~~ (b)(1)

(b)(1)



A cluster of three smoke grenade launchers is mounted on each side of the turret.





Different mountings—two grenades (left) and three grenades (right).

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Figure 3-11. Smoke-grenade launchers on the Austrian Army's 105-mm assault gun, Panzerjäger "K" ("Kurassier") (U).

(b) ~~(C)~~ Assault gun, 105-mm, Panzerjager "K" ("Kurassier").

(b)(1)

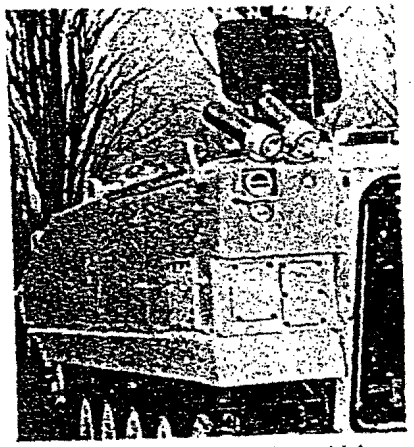
3. (U) In night tests the Austrians found that a thin smoke layer is enough to reduce substantially the range both of white-light and IR searchlights. They recommended loading only one or two smoke grenades per turret side for night combat. They concluded also that a smoke screen of satisfactory duration could be effectively laid against possible future light-intensifying sights.

(3) ~~(C)~~ U France.

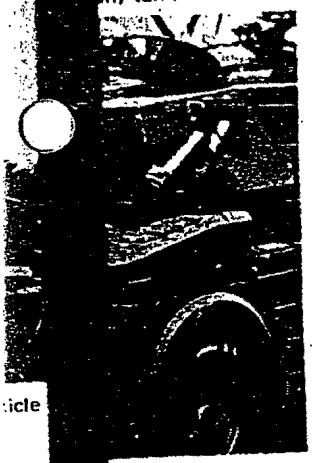
(a) (U) General. The French have been using smoke grenade launchers on their armored vehicles for more than a quarter of a century, and all French armored fighting vehicles and some armored support vehicles currently in service are equipped with them. At present, a cluster of two launch tubes is used on all of the vehicles except the AMX-30/D armored recovery vehicle, which normally mounts a single cluster of four tubes. Most of the turreted vehicles carry a two-tube cluster on each side of the turret; one exception, the turreted AMX-10P armored infantry fighting vehicle, mounts a two-tube cluster on each rear corner of the hull roof. Examples of turret- and hull-mounted launchers are shown in figure 3-12.

un) tank

Panhard M-3 APC



AMX-10P infantry fighting vehicle



rmored car

AMX-30/D armored recovery vehicle

EBR-90 armored reconnaissance vehicle

(UNCLASSIFIED)

Figure 3-12. Smoke grenade launchers on French armored vehicles (U).

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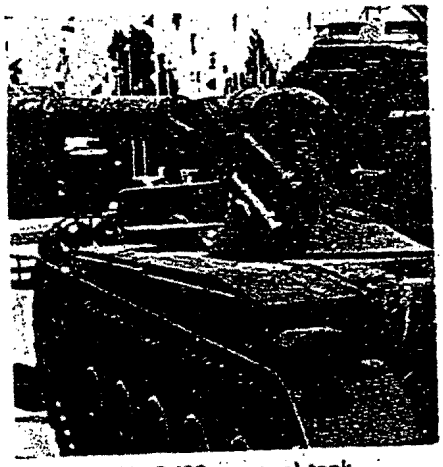
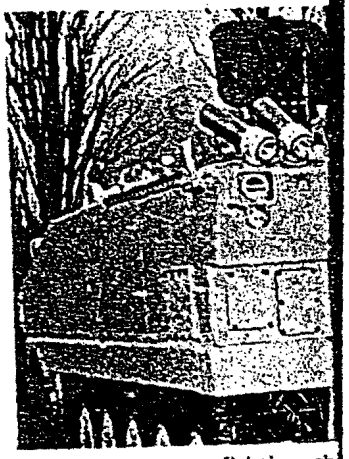
Original



AMX-13 (90-mm gun) tank

Panhard M-3 APC



AMX-10P infantry fighting veh

Panhard AML-90 armored car

AMX-30/D armored recovery vehicle

EBR-90 armored reconnaissance vehicle

Neg. 522835

Figure 3-12. Smoke grenade launchers on French armored vehicles (U).

(UNCLASS

(b) (U) French AMX-13 light tank.

1. (U) The smoke-grenade/launcher system developed for the AMX-13 tank consists of a firing/control unit mounted inside the turret within easy reach of the tank commander: the launch tubes mounted externally on each side of the turret; and the smoke grenades, which are externally loaded.[19]

a. (U) The launch tube is 318 mm long and has inside and outside diameters of 79.4 and 92.1 mm, respectively. An electrical contact point for firing the grenade is located 47.6 mm from the tube base. The tube assembly includes a base-closing cap with an expanding spring, and a top closing cap attached to the side of the tube by a chain. An electrical shielded cable connects the grenade to the firing unit (fig 3-13 and 3-14).

b. (U) The smoke grenade is 286 mm long and weighs about 4.3 kg. Approximately 37% of the weight is smoke agent.

c. (U) The firing-unit/control box is fitted to the left side of the turret interior. It consists of a thin steel housing with a sealed front cover fitted inside with a wiring diagram. The electrical circuit is activated by pushing a button on the right side of the box. A safety device prevents accidental firing. The controls for the right and left launchers are located on top of the unit.

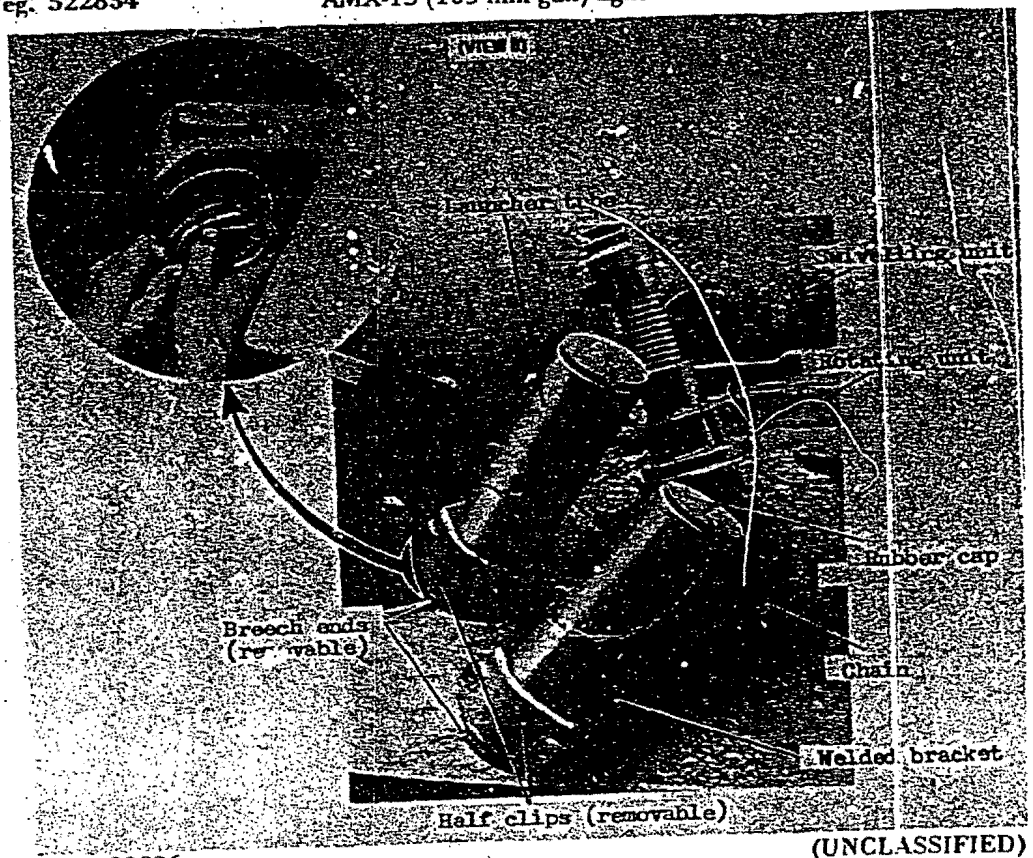
2. (U) Tests of the AMX-13 tank's grenade/launcher system were conducted with the following results:[20]

a. (U) With the launch tube elevated to 60°, the grenades were fired to ranges between 14 and 21 meters. Flight time ranged from 1.92 to 2.83 seconds, muzzle velocities from 7.6 to 9.7 m/s.

b. (U) With the launch tube elevated to 45°, the average range of the grenades was approximately 20 meters. Flight times ranged from 1.67 to 2.67 seconds, and muzzle velocities were between 8.2 and 11.3 m/s. Time from launch to intense burning of smoke ranged from 1.14 to 3.75 seconds.

c. (U) The grenades developed effective smoke screens that lasted longer than 2 min in ground winds up to 22.4 km/h.

Neg. 522834 AMX-13 (105-mm gun) light tank (UNCLASSIFIED)



Neg. 522026 (UNCLASSIFIED)

Figure 3-13. French smoke-grenade launcher tubes on the AMX-13 tank (U).

Original

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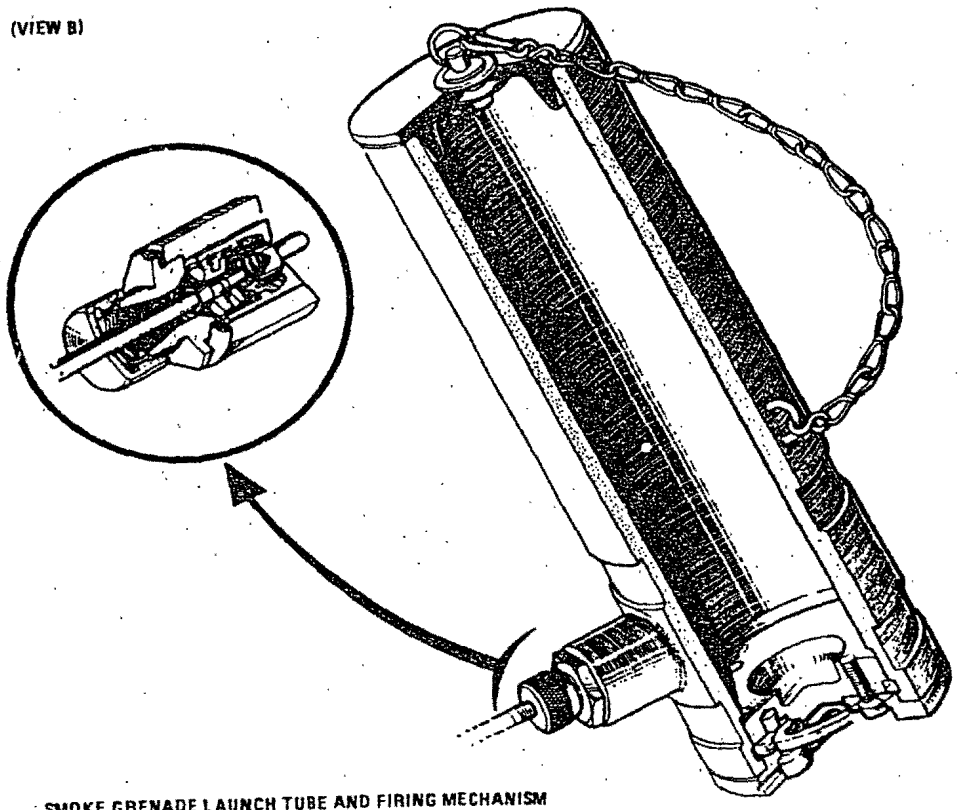
Neg. 522028

(UNCLASSIFIED)

(VIEW B)



SMOKE GRENADE LAUNCH TUBE AND FIRING MECHANISM

Neg. 522027

(UNCLASSIFIED)

Figure 3-14. Components of the French smoke-grenade/launcher system developed for the AMX-13 light tank (U).

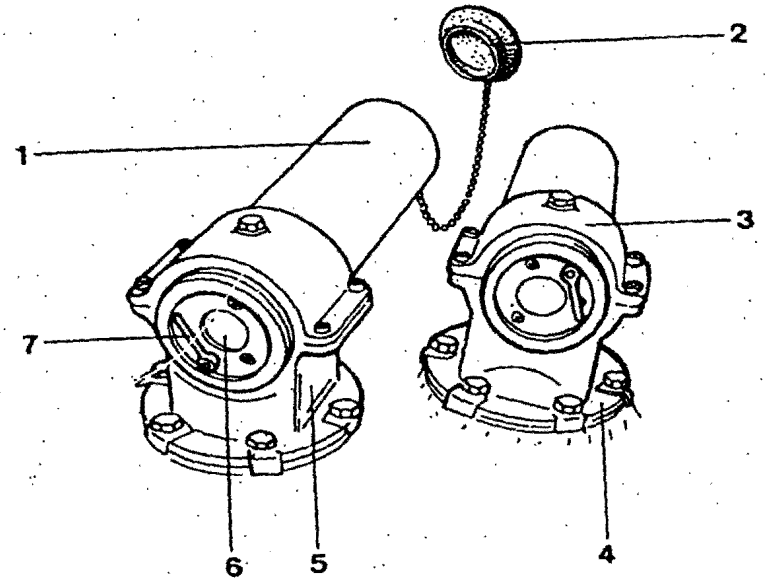
(c) (C) French AMX-30 (105-mm gun) tank.

(b)(1)

Neg. 512743

(UNCLASSIFIED)

Figure 3-15. French smoke-grenade/launcher system on the AMX-30 (105-mm gun) tank (U).

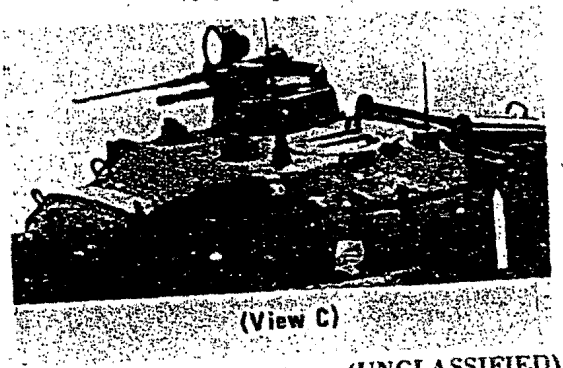


(View B)

Neg. 522838

(UNCLASSIFIED)

1. Tube
2. Rubber plug
3. Support cover
4. Turret
5. Bolted support
6. Movable breech
7. Bolting lever



(View C)

Neg. 522837

(UNCLASSIFIED)

Figure 3-15. French smoke-grenade/launcher system on the AMX-30 (105-mm gun) tank (U). (Continued)

(4) (U) West Germany.

(a) (U) **General.** The West Germans consider the smoke grenade launching system a close combat weapon, primarily for use as a defensive device against close-range attacking forces. They have mounted it as special equipment on all armored fighting vehicles and on some armored support vehicles.[23] Although various types of mounting arrangements are installed on the vehicles, the latter appear to use the same grenade and launcher equipment. Thus equipped, the vehicles can provide a smoke screen behind which troop elements as well as vehicles can be repositioned; damaged vehicles can be towed away or minor repairs can be made; target opportunities to the enemy can be reduced; and wounded personnel can be evacuated.[24]

(b) (U) **Leopard I tank series and other armored vehicles.**

1. (U) The 76-mm smoke grenade launcher system currently used on the West German Army's 105-mm gun main battle tank, Leopard I, uses two clusters of four launch tubes, one cluster on each side of the turret in a fan-shaped arrangement.[35] (The M-48 tanks and Leopard II prototypes are similarly equipped, and the austere version of the Leopard II being tested by the West German Army mounts eight launch tubes on each side of the turret. Mounting arrangements for these and other West German vehicles are shown in figure 3-16, 3-17, and 3-18).

2. (U) Like other foreign systems, the Leopard I system is electrically fired by means of controls on the firing unit inside the turret.[23] An important advantage of the German system over the French-developed system is the ability of the former to fire the grenades singly at short intervals. In addition, each cluster of four grenades can be fired as a unit. The grenade can also be thrown by hand should the combat situation so require.

3. (U) In tests, the Buck-developed grenade (HC) has produced within 3 seconds after launch an effective smoke screen of 3 min duration 40 to 60 meters distant from the tank (launch vehicle).[24] The dimensions of the smoke screen depend, of course, on the number of grenades fired.

Original

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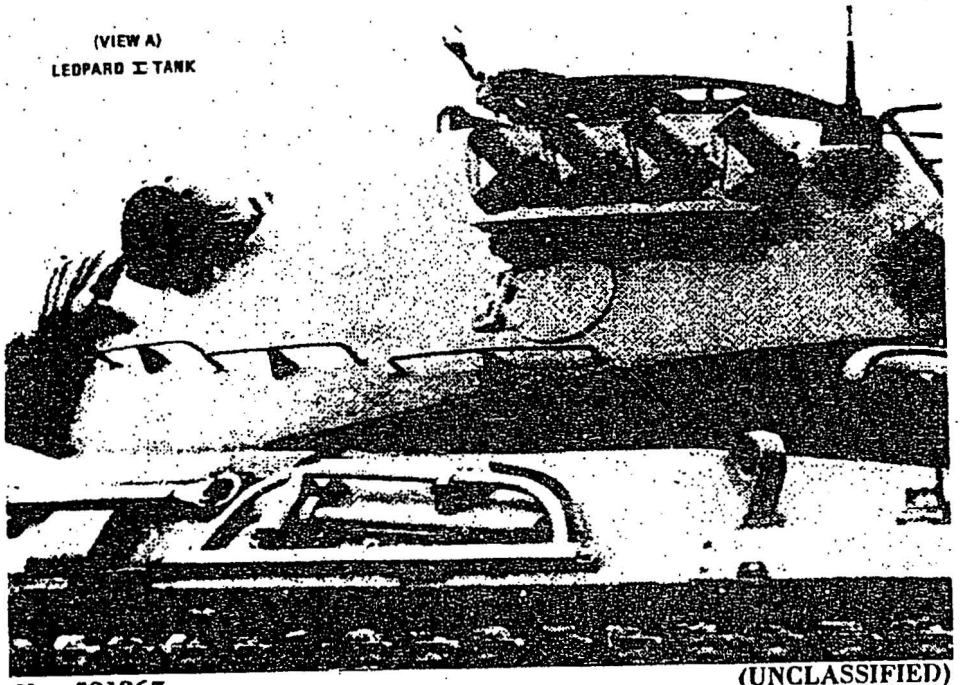
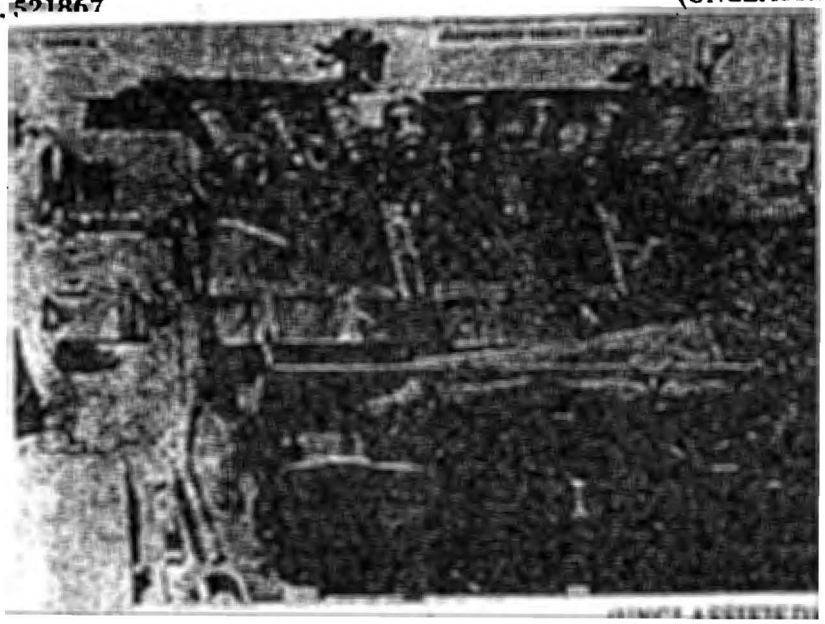
(VIEW A)
LEOPARD 1 TANK

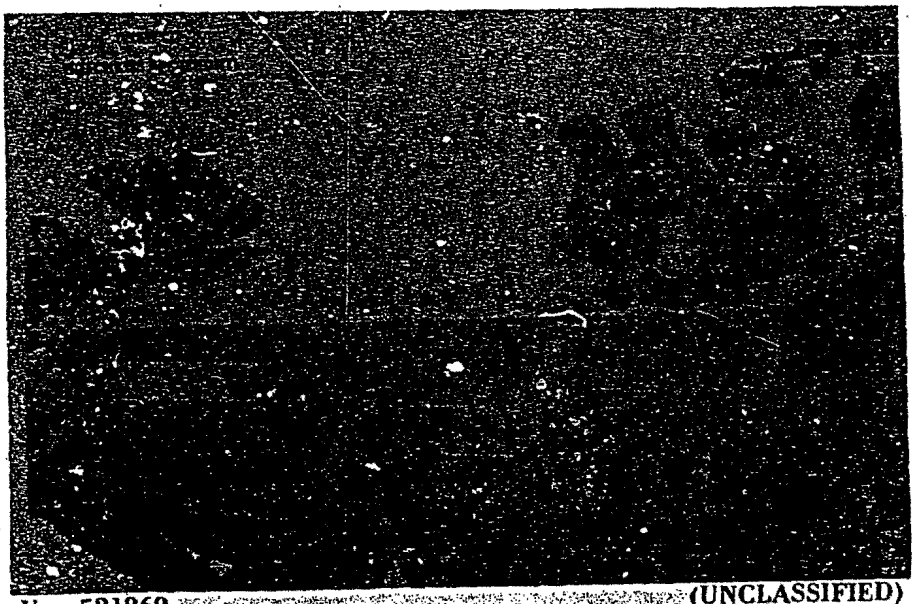


Neg. 521867 (UNCLASSIFIED)



Neg. 521868 (UNCLASSIFIED)

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U).



Neg. 521869 (UNCLASSIFIED)

Neg. 521870 (UNCLASSIFIED)

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U). (Continued)

Original

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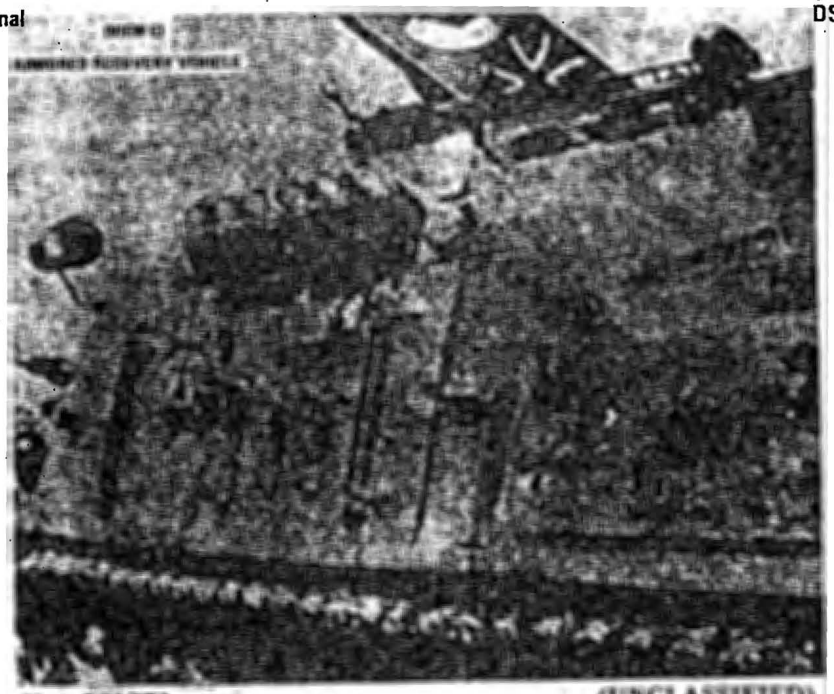


Neg. 521871 (UNCLASSIFIED)

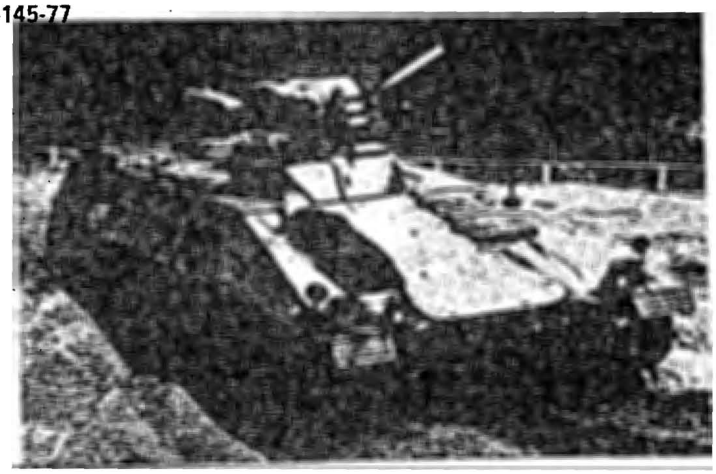
Neg. 521872

Figure 3-16. Smoke-grenade launchers on West German armored vehicles (U). (Continued)

DST-1620S-145-77

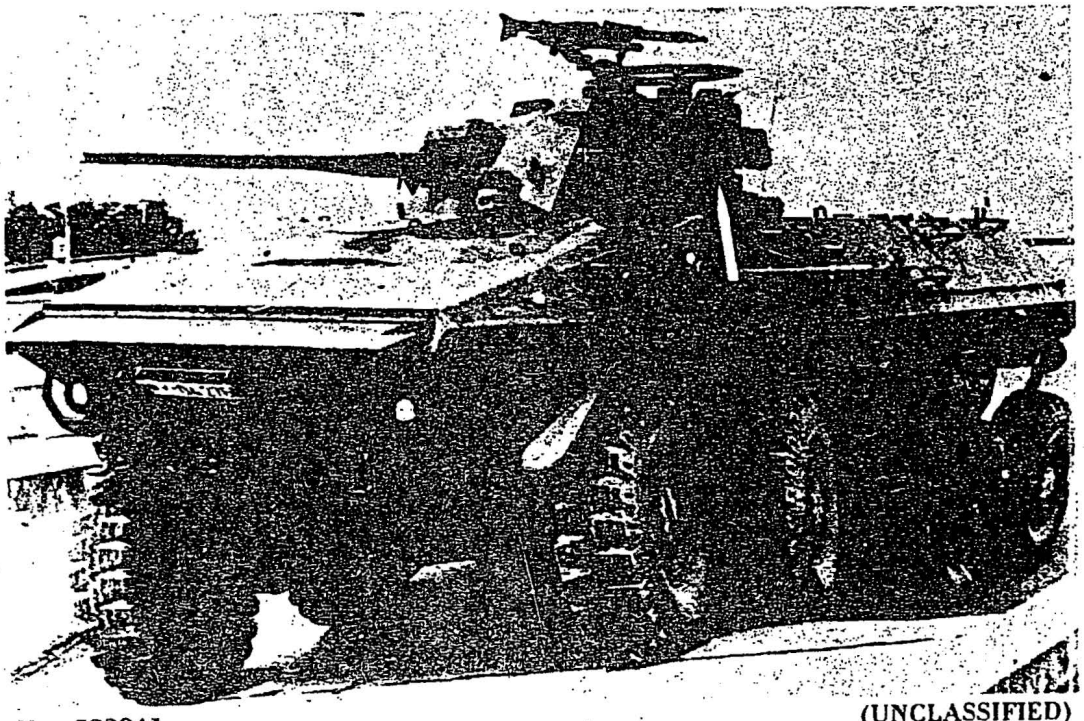
Original

Launcher tubes



Neg. 522840 (UNCLASSIFIED)

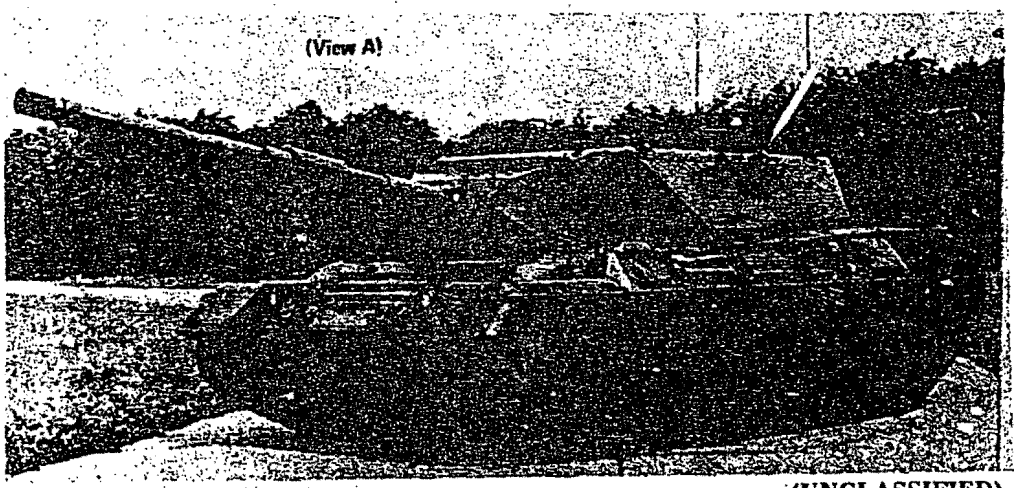
(View A)



Neg. 522841 (UNCLASSIFIED)

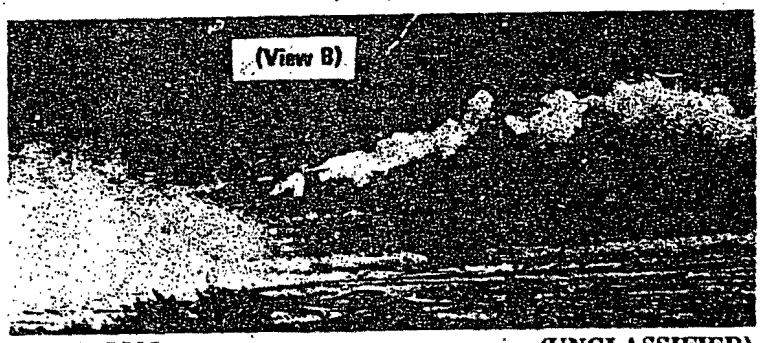
(View B)

Figure 3-17. Smoke-grenade launchers on the West German Marder MICV (top) and Luchs reconnaissance vehicle (U).



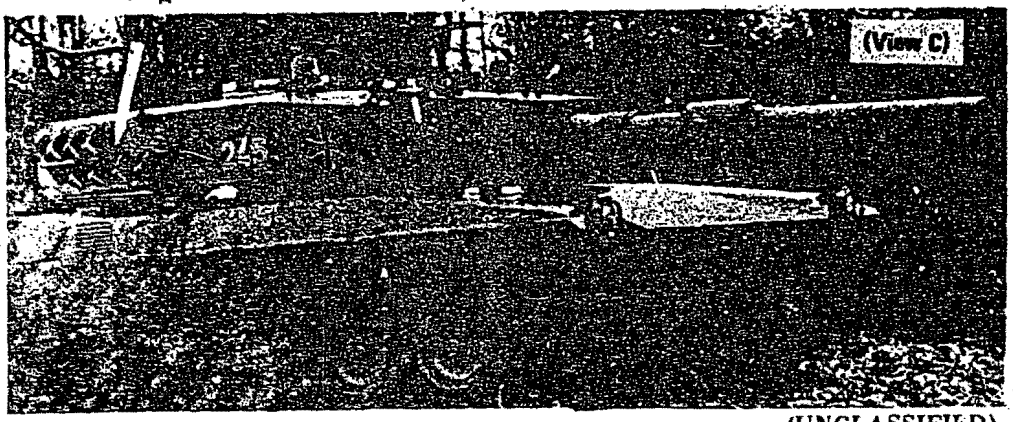
Neg. 521487 (UNCLASSIFIED)

Leopard IA4 tank



Smoke is used to screen the maneuvering of Leopard I tanks during a field exercise.

Neg. 522839 (UNCLASSIFIED)



Neg. 522842 (UNCLASSIFIED)

Leopard II (AV) prototype

Figure 3-18. Smoke-grenade/launcher system on West German tanks (U).

4. (U) The smoke grenade used by West German armored vehicles is a thin-walled metallic cylinder consisting of several components (fig 3-19). It is 176 mm long and 76.2 mm in diameter,[24] weighs 1200 grams, and contains 900 grams of chemicals, principally HC. It is of simple design and construction, safe to handle, and moisture- and shock-proof. It is operable, and can be stored or shipped within an ambient temperature range of -40° to +50°C. The smoke charge burns completely even under rain and snow conditions.

Grenade developed and produced by Buck KG of of West Germany

Neg. 521866 (UNCLASSIFIED)

Figure 3-19. West German smoke grenade developed for use on armored vehicles (U).

Original

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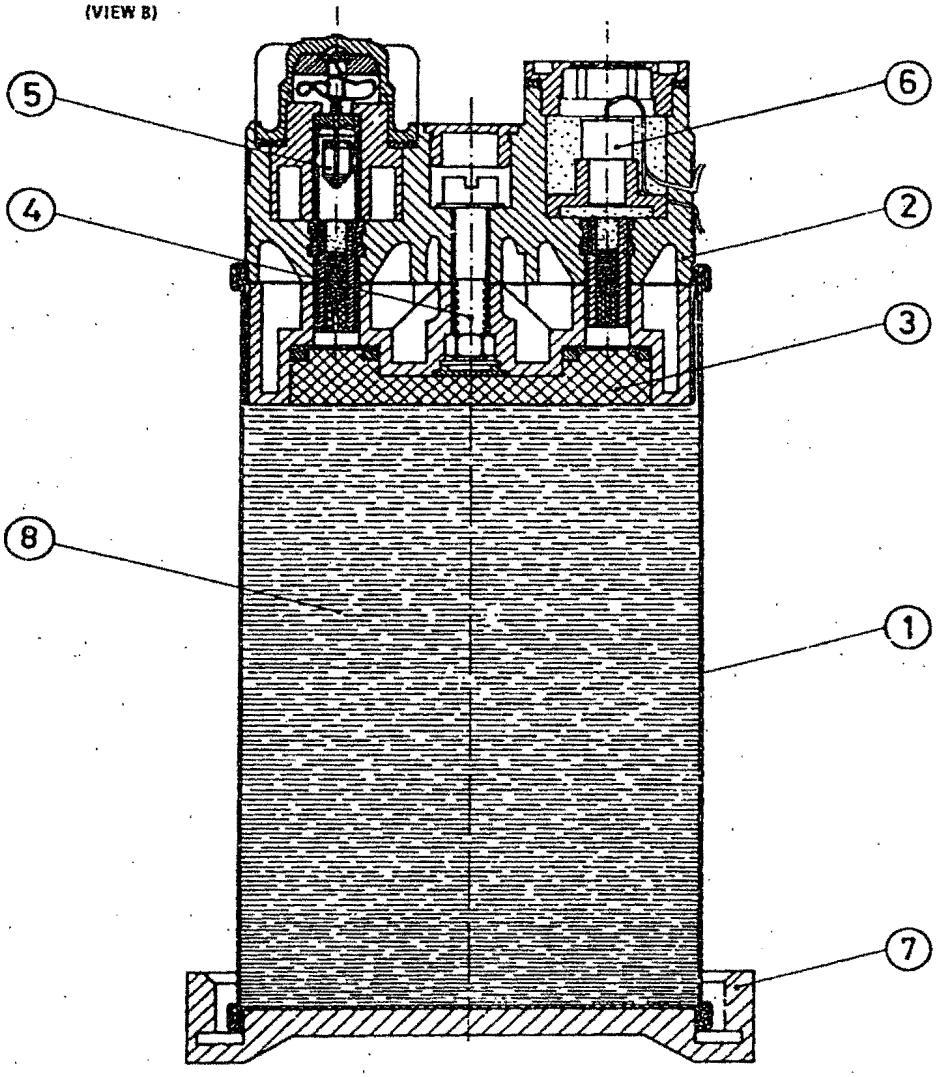

Neg. 521879

(UNCLASSIFIED)

1. Metal container (tube)
2. Contact head
3. Ignition chamber with charge
4. Cylinder head bolt
5. Mechanical fuze
6. Electrical fuze
7. Protective rubber cap
8. Smoke-producing chemicals

Figure 3-19. West German smoke grenade developed for use on armored vehicles (U). (Continued)

5. (U) The control panel and other components of the armored vehicle smoke-grenade/launcher system are shown in figure 3-20.[24]

a. (U) Each single launch tube is secured to the vehicle by a carrier mounting. The precision-made steel launch tubes are bolted to the carrier boxes in exactly defined angular positions intended to achieve maximum smoke screen width. Ignition wires are channeled so as to avoid damage from small-arms fire and shell fragments.

b. (U) The launch-tube carrier, consisting of an upper and a lower part, holds the launch tube like a clamp. Ignition current is fed from inside the vehicle through the carrier mounting into the lower part of the launch tube carrier. There the ignition cable eyes are connected to the contact inserts of the launch tube. Rubber gaskets provide watertight sealing from the tube to the tube supports and to the launcher mounting.

Neg. 521873 (UNCLASSIFIED)

(View A - Carrier mounting assembly)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U).

Original

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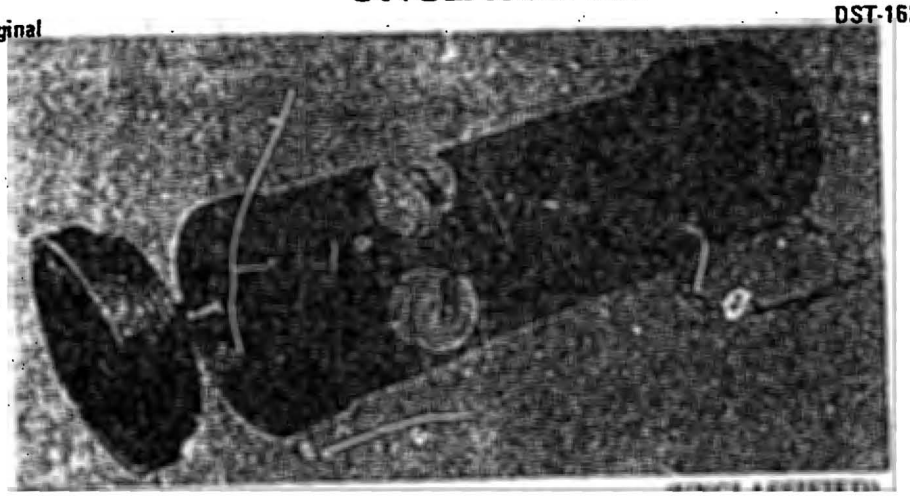


Neg. 521874

(UNCLASSIFIED)

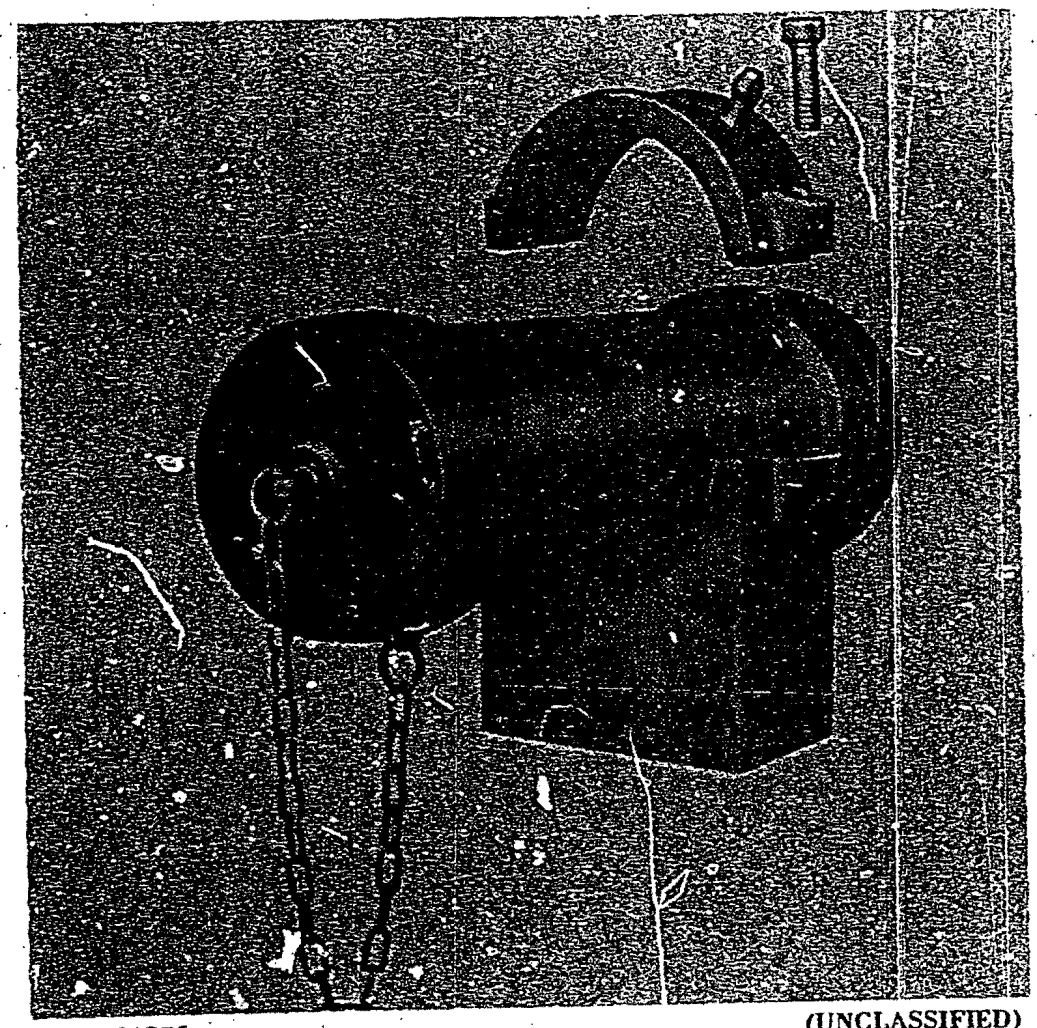
(View B - Smoke grenade launcher)

Neg. 521875

(UNCLASSIFIED)

(View C - Interchangeable, quick-release contact inserts)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)



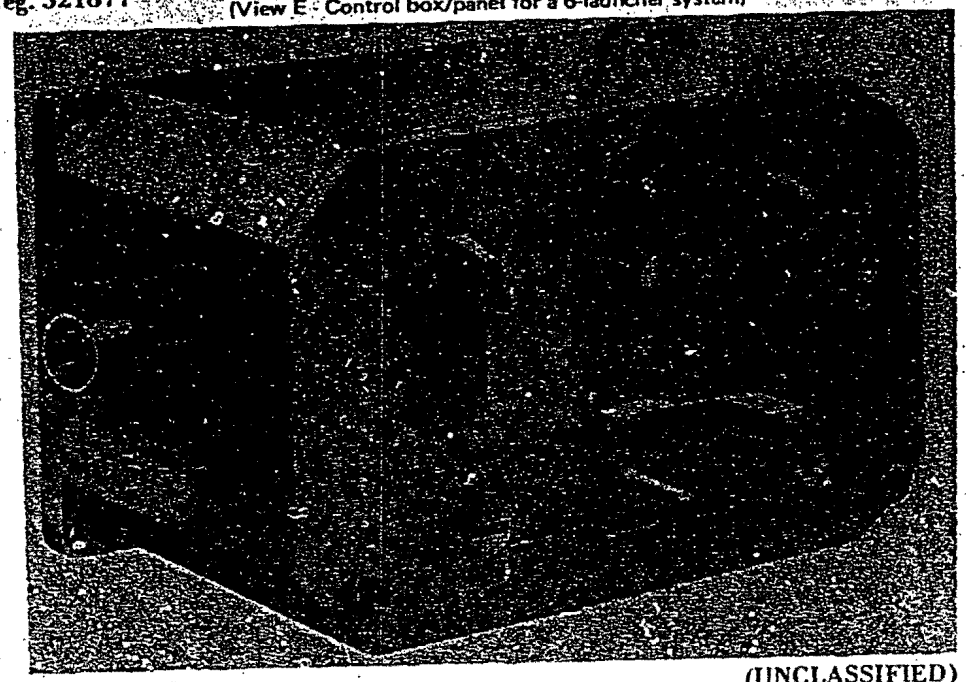
Neg. 521876

(UNCLASSIFIED)

(View D - Launcher tube carrier)

Figure 3-20. Components of the West German (Wegman-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)

Neg. 521877 (View E - Control box/panel for a 6-launcher system) (UNCLASSIFIED)

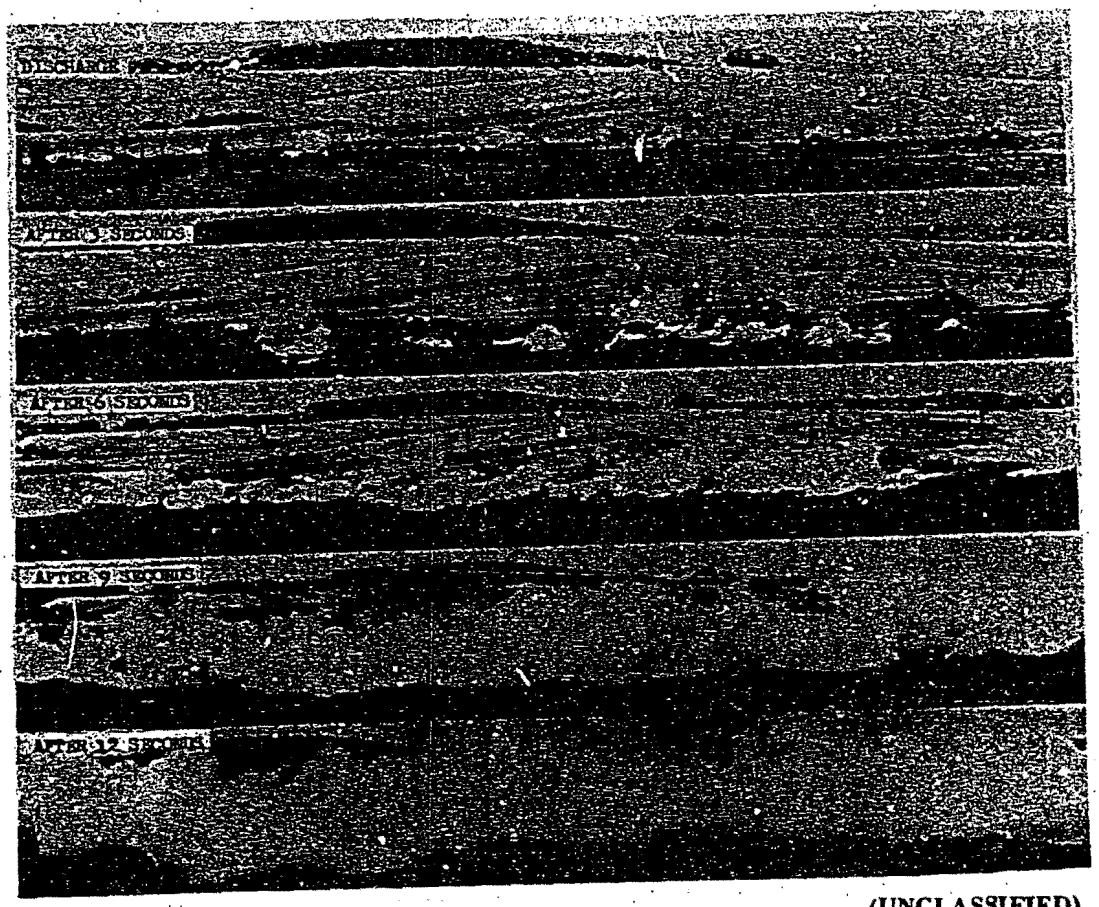


Neg. 521878 (UNCLASSIFIED)

(View F - Control box/panel for a 12-launcher system)

Figure 3-20. Components of the West German (Wegmann-Buck) smoke-grenade/launcher system for armored vehicles (U). (Continued)

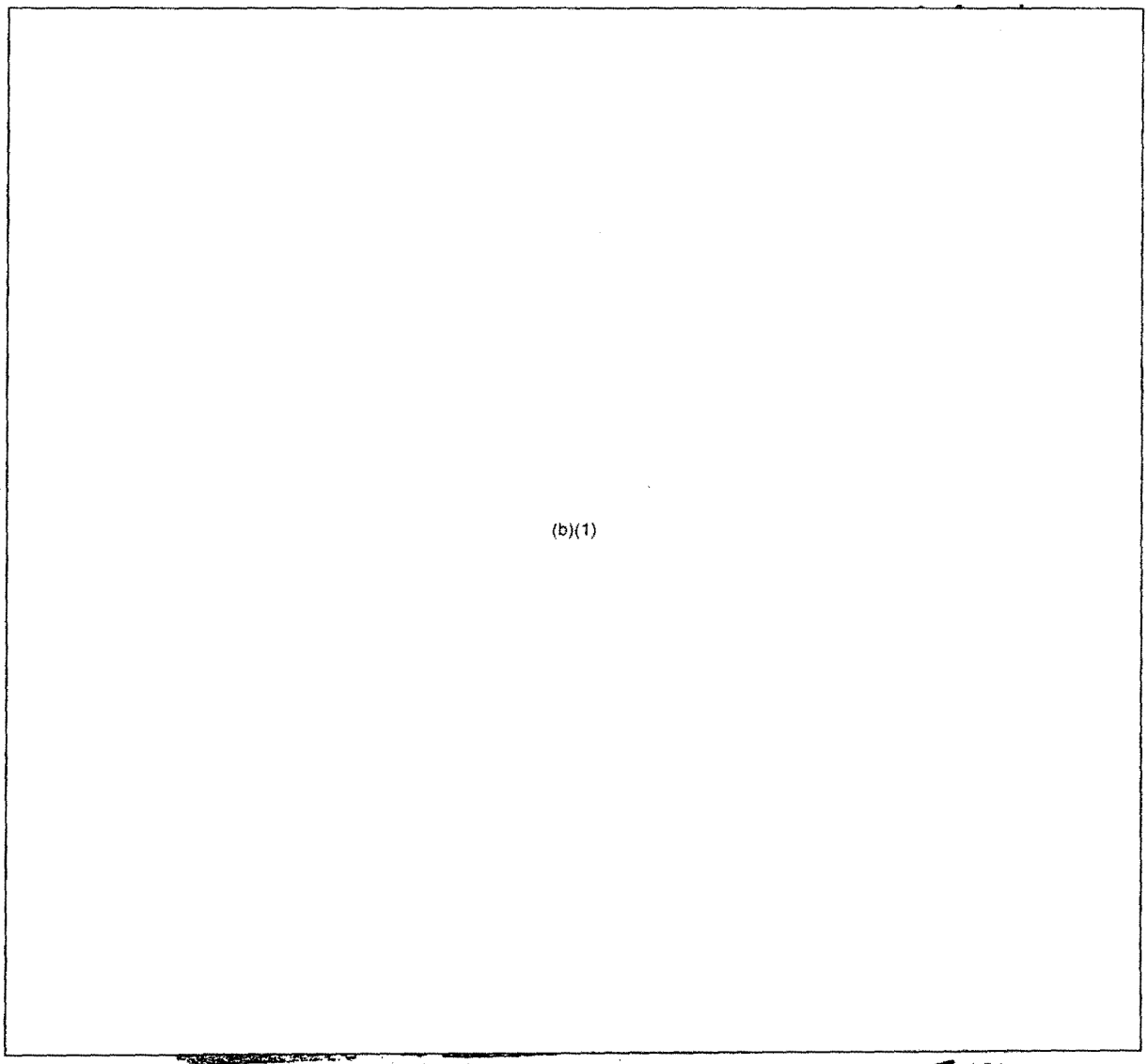
6. (U) Results achieved during a demonstration of the system discussed above are illustrated in figure 3-21.



Neg. 521883 (UNCLASSIFIED)

Figure 3-21. Demonstration of the West German (Wegman-Buck) armored-vehicle-mounted smoke-grenade/launcher system (U).

(c) (C) Leopard II tank prototype.



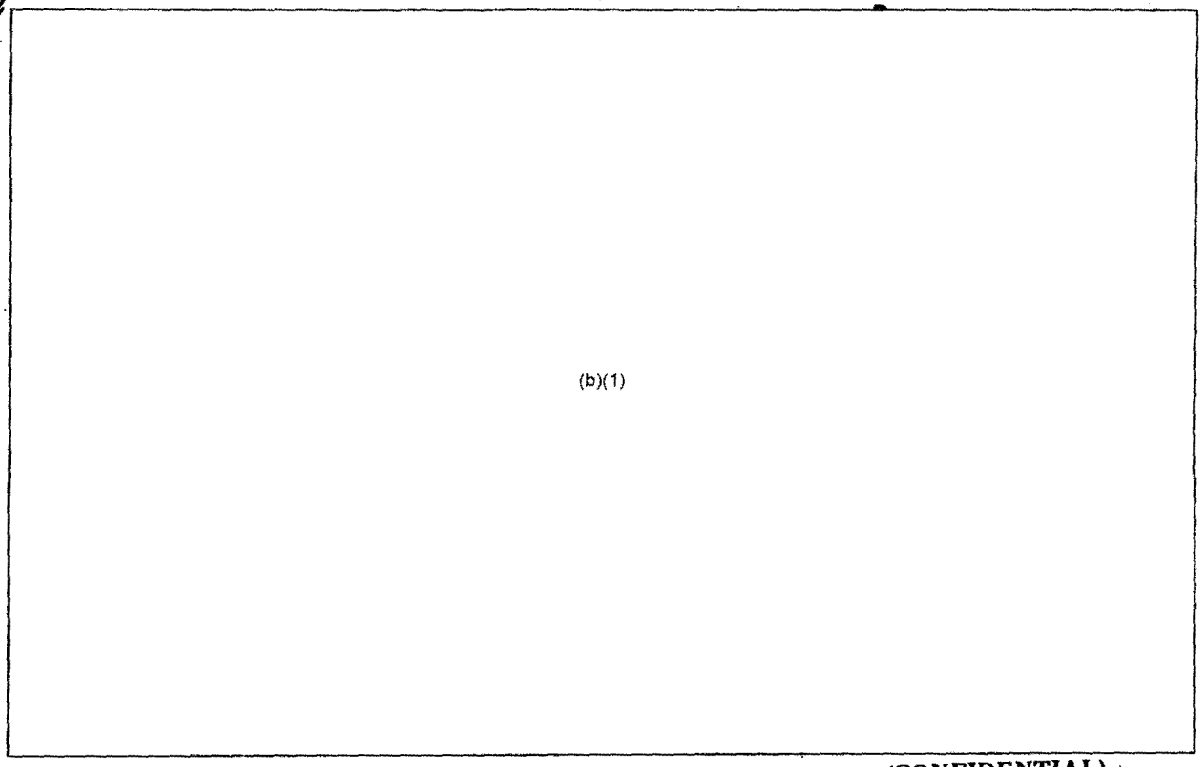
Neg. 554989

(View A - Grenade launching system)

(CONFIDENTIAL)

1. Launch tube
2. Connecting rod
3. Folding cover
4. Coverplate
5. Deflector (adjustable)

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U).



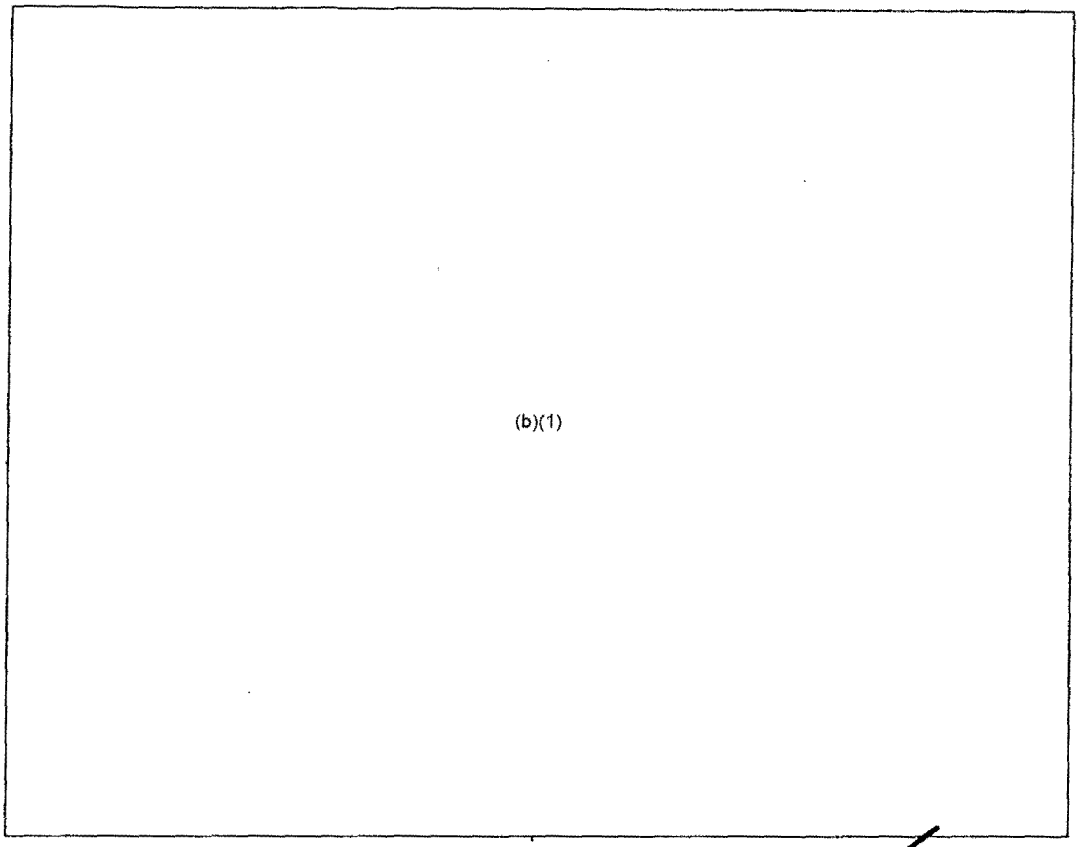
(CONFIDENTIAL)

Neg. 554990

(View B - Sectional view of the grenade launching system)

1. Front breech
2. Launch tube
3. Launch tube support
4. Rear breech
5. Mounting
6. Support ring
7. Traversing lock
8. Ball-bearing race
9. Lock (folding cover)
10. Slipring
11. Coverplate
12. Deflector (adjustable)
13. Folding cover
14. Connecting rods

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U). (Continued)



Neg. 554991

(CONFIDENTIAL)

(View C - Diagram of the grenade/launcher system as viewed from inside the turret of a Leopard II tank prototype.)

1. Locking handle
2. Firing button
3. Microswitch
4. Pin
5. Pointer
6. Laying scale
7. Lock
8. Coverplate
9. Bearing (folding cover)
10. Tooth segment

Figure 3-22. Smoke-grenade/launcher system designed for the Leopard II tank prototype (U) (Continued).

NOT RELEASABLE TO FOREIGN NATIONALS

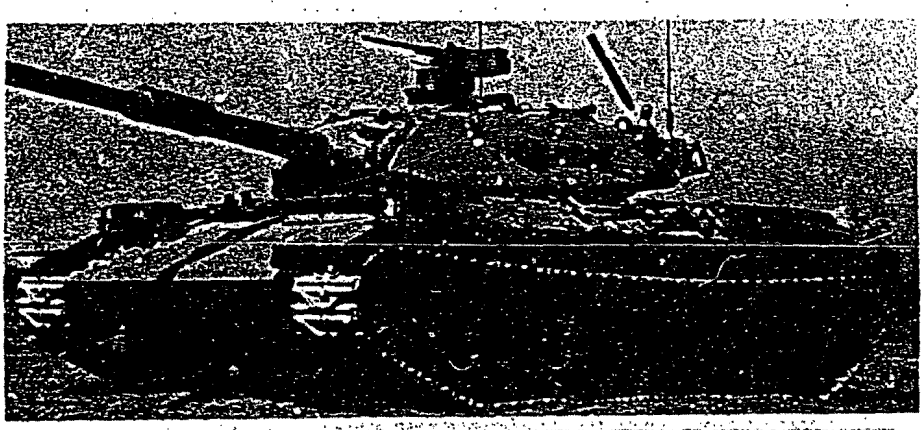
(5) (C-NOFORN) Japan.

(b)(1)

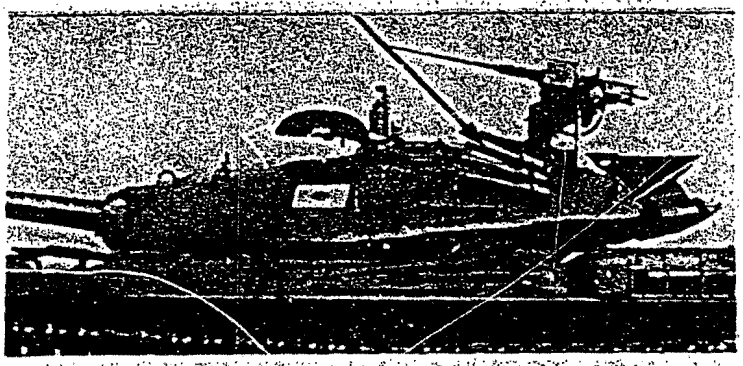
(b) (C-NOFORN) Japanese Type 74 tank and Type 73 armored personnel carrier.

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

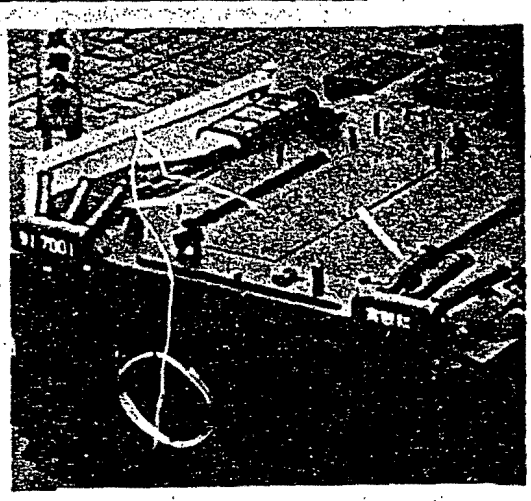


Type 74
(105-mm gun)
Tank



Type 74
tank turret

Type 73 APC prototype (Komatsu)



Type 73 APC prototype (Mitsubishi)

Neg. 522858

(UNCLASSIFIED)

Figure 3-23. Smoke-grenade launching systems on Japanese armored vehicles (U).

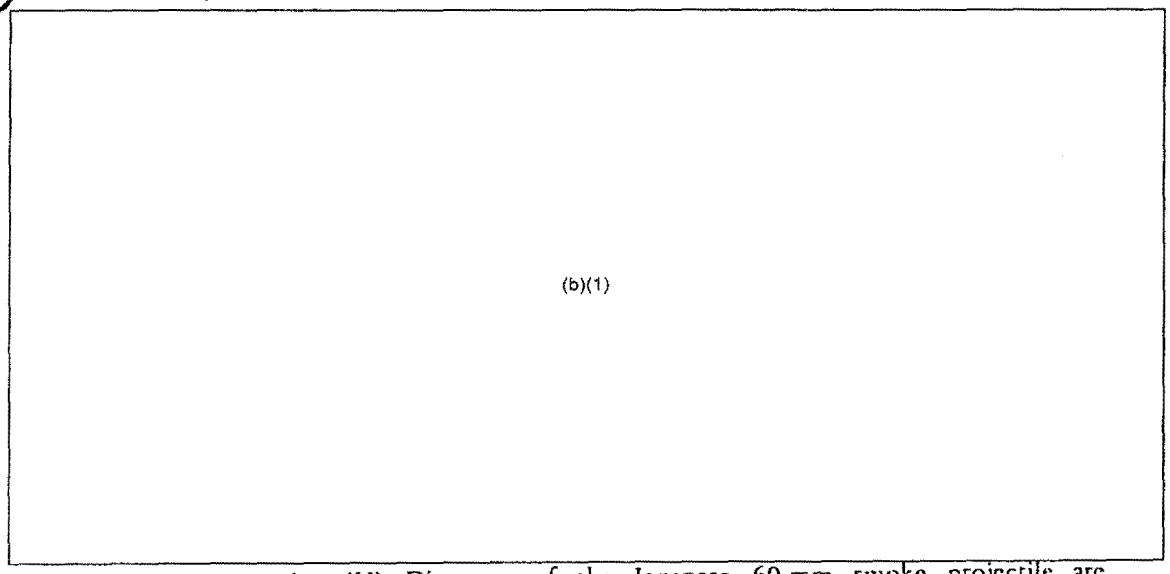
NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

[redacted]

(b)(1)

[redacted]



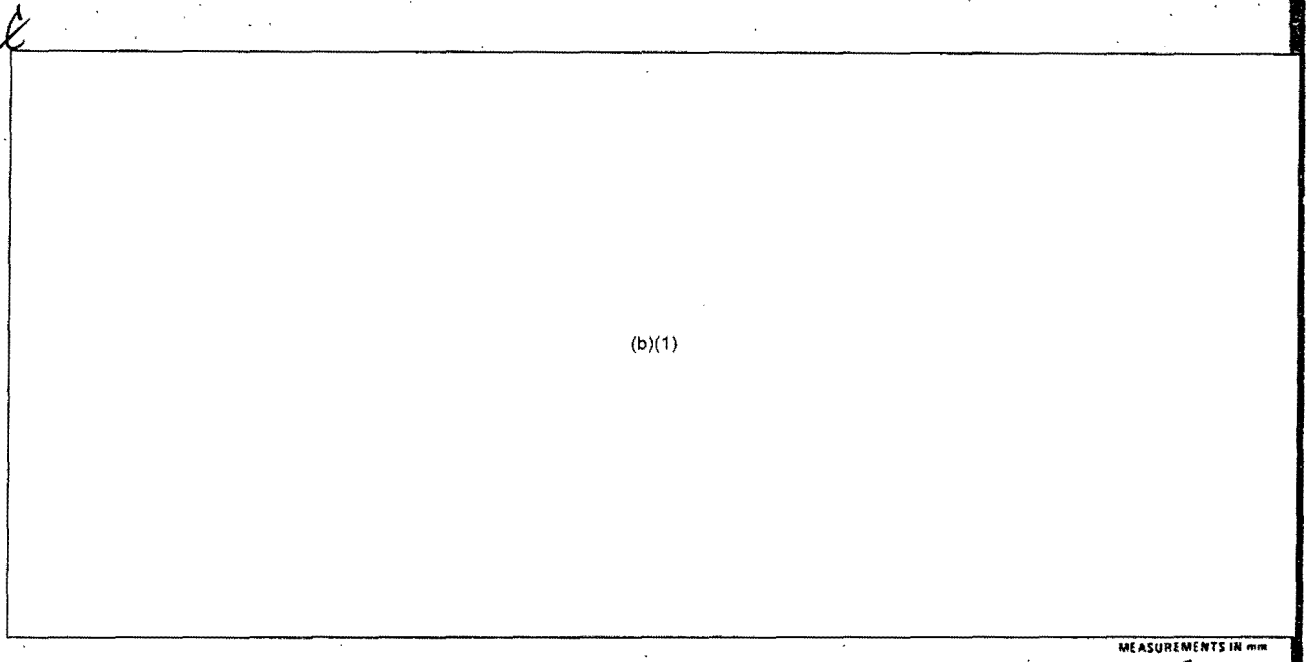
4. (U) Diagrams of the Japanese 60-mm smoke projectile are provided in figures 3-25 and 3-26.[30 31]

(6) (U) Sweden.

(a) (U) General. For more than a decade Swedish armored vehicle experts have included smoke-grenade/launcher systems in their designs. The Swedish Army's main battle tank—the 105-mm gun "S" tank—and armored recovery vehicle are two examples of such application (fig 3-27).[32]

(b) (U) Swedish "S" tank.

1. (U) Since the "S" tank is turretless, Sweden's designers put the tank's smoke-grenade launchers on the observation cupola located in the roof above the commander's position. Four launch tubes are mounted on each side of the cupola (fig 3-27),[32] which is is seated on ball bearings and equipped with a ring gear. The cupola can be traversed electrohydraulically and manually; a gyro is used to stabilize it in traverse so that, regardless of how the tank turns, ground sighting can be maintained automatically. The commander can set the cupola in a certain position and lock it; from the locked position it can be traversed mechanically 200° in either direction.



Neg. 554968

Figure 3-25. Japanese 60-mm smoke projectile (C-NOFORN).

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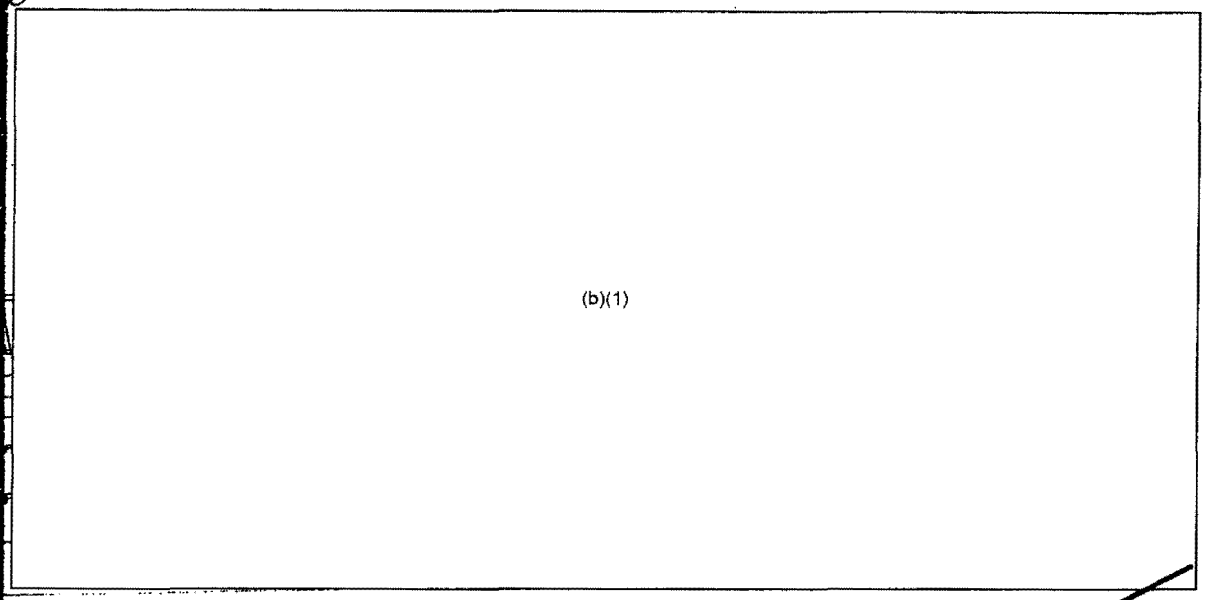
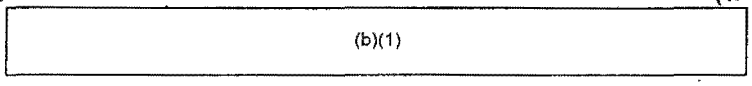
CONFIDENTIAL

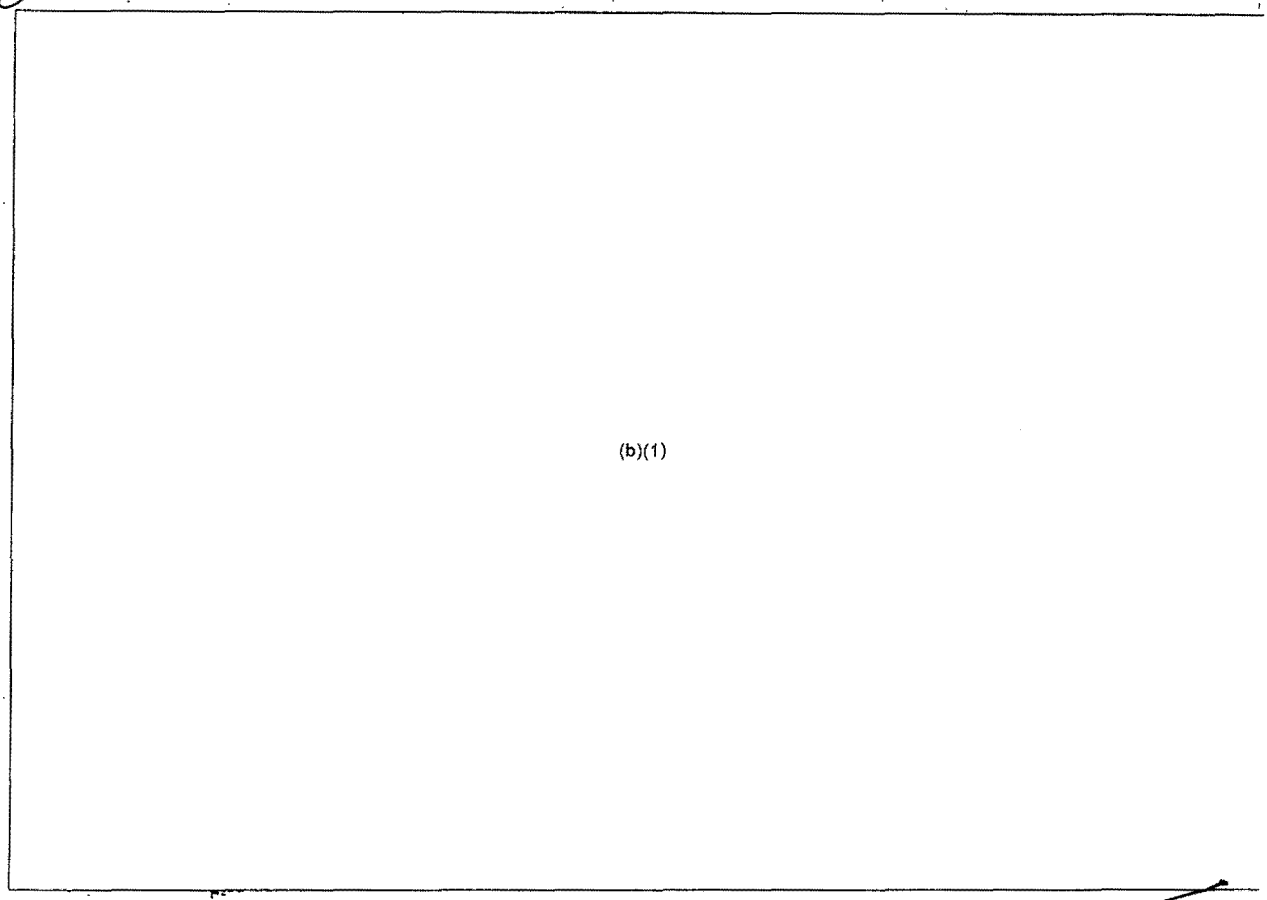


MEASUREMENTS IN mm

(CONFIDENTIAL-NOFORN)



Original



Neg. 554969

Figure 3-26. PD fuze for Japanese 60-mm smoke projectile (C-NOFORN).

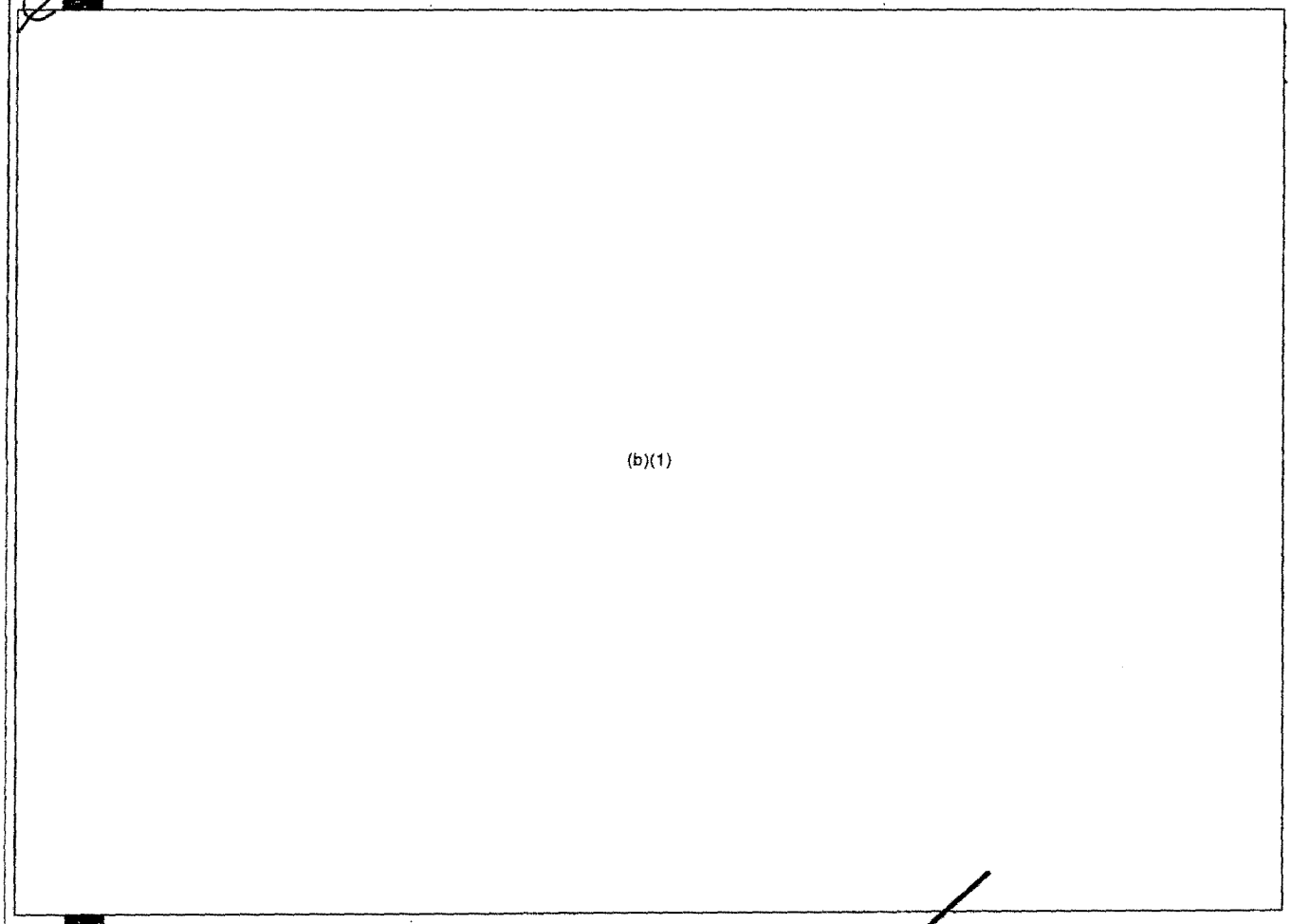
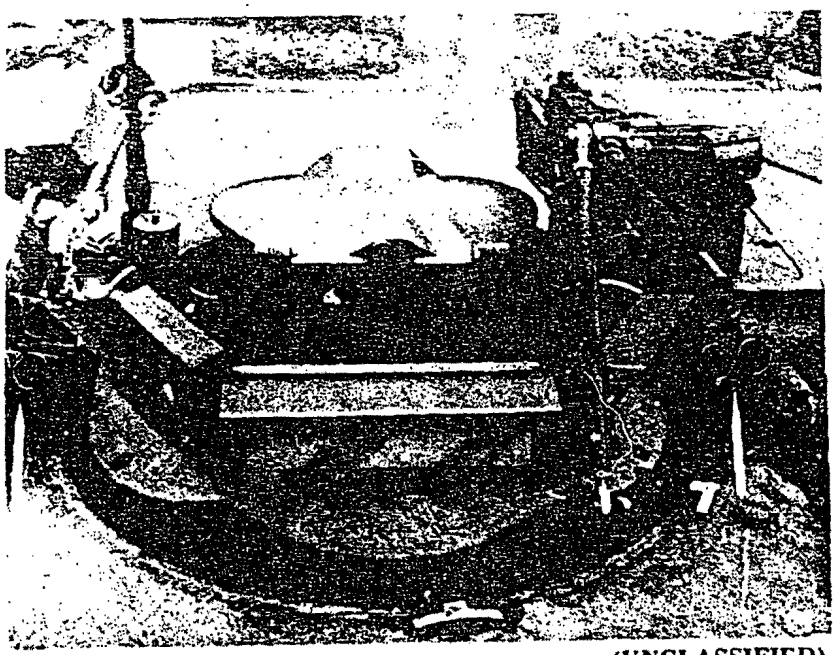
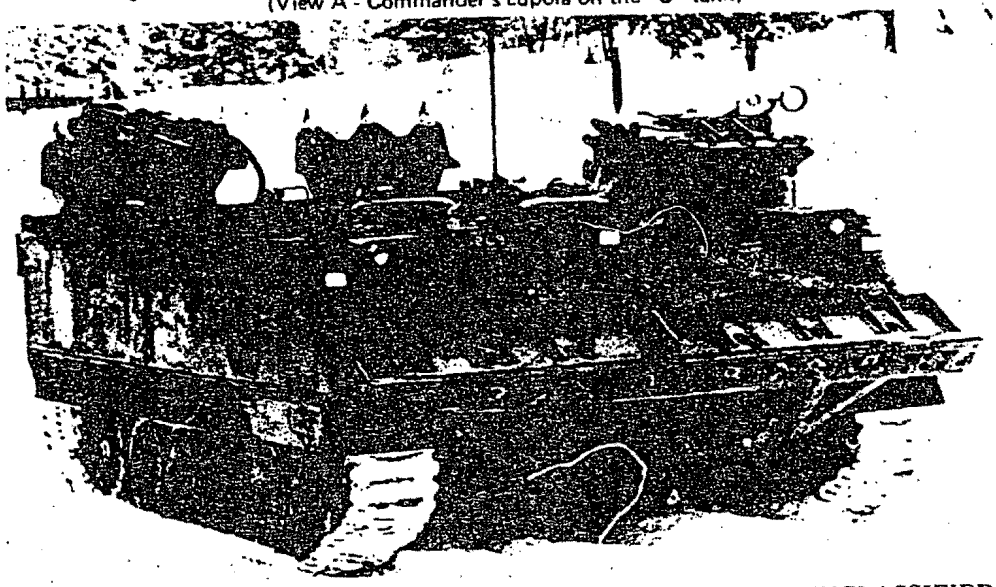


Figure 3-26. PD fuze for Japanese 60-mm smoke projectile (C-NOFORN).



Neg. 522833 (UNCLASSIFIED)

(View A - Commander's cupola on the "S" tank)



Neg. 517570 (UNCLASSIFIED)

(View B - Armored recovery vehicle)

Figure 3-27. Smoke-grenade/launcher system on Swedish armored vehicles (U).

NOT RELEASABLE TO FOREIGN NATIONALS

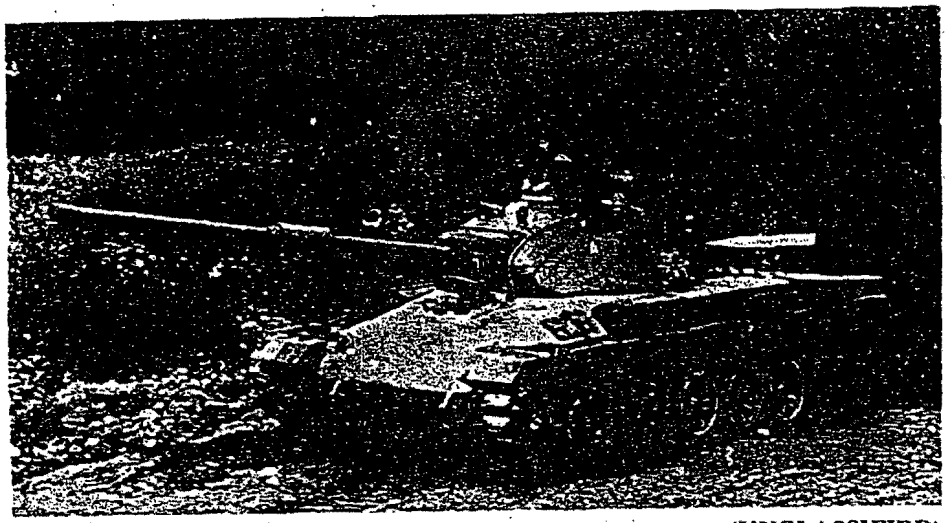
2. (U) The smoke-grenade launchers provide a smoke screen about 35 meters from the launch vehicle.[32] The launch tubes are directed in such a manner that when four grenades are fired—two are fired from each side simultaneously—they effectively cover a 90° arc. The design of the observation cupola makes it possible to redirect the launchers rapidly. Firing is controlled by the tank commander using the control panel of the observation cupola. To operate the system, the commander sets the smoke launcher toggle switch in the "on" position and depresses the firing button, which fires the first four grenades. He presses the button a second time to fire the remaining four grenades.

(7) (C) Switzerland.

(b)(1)

(b) (C) Swiss tank-mounted 80-mm smoke grenade 51.

(b)(1)



Neg. 522843 (UNCLASSIFIED)

(View A - PZ-68 tank)

Figure 3-28. Smoke-grenade launchers on Swiss army tanks (U).

Original

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Neg. 522844

(UNCLASSIFIED)

(View B - PZ-61 tank turret)

Neg. 522845

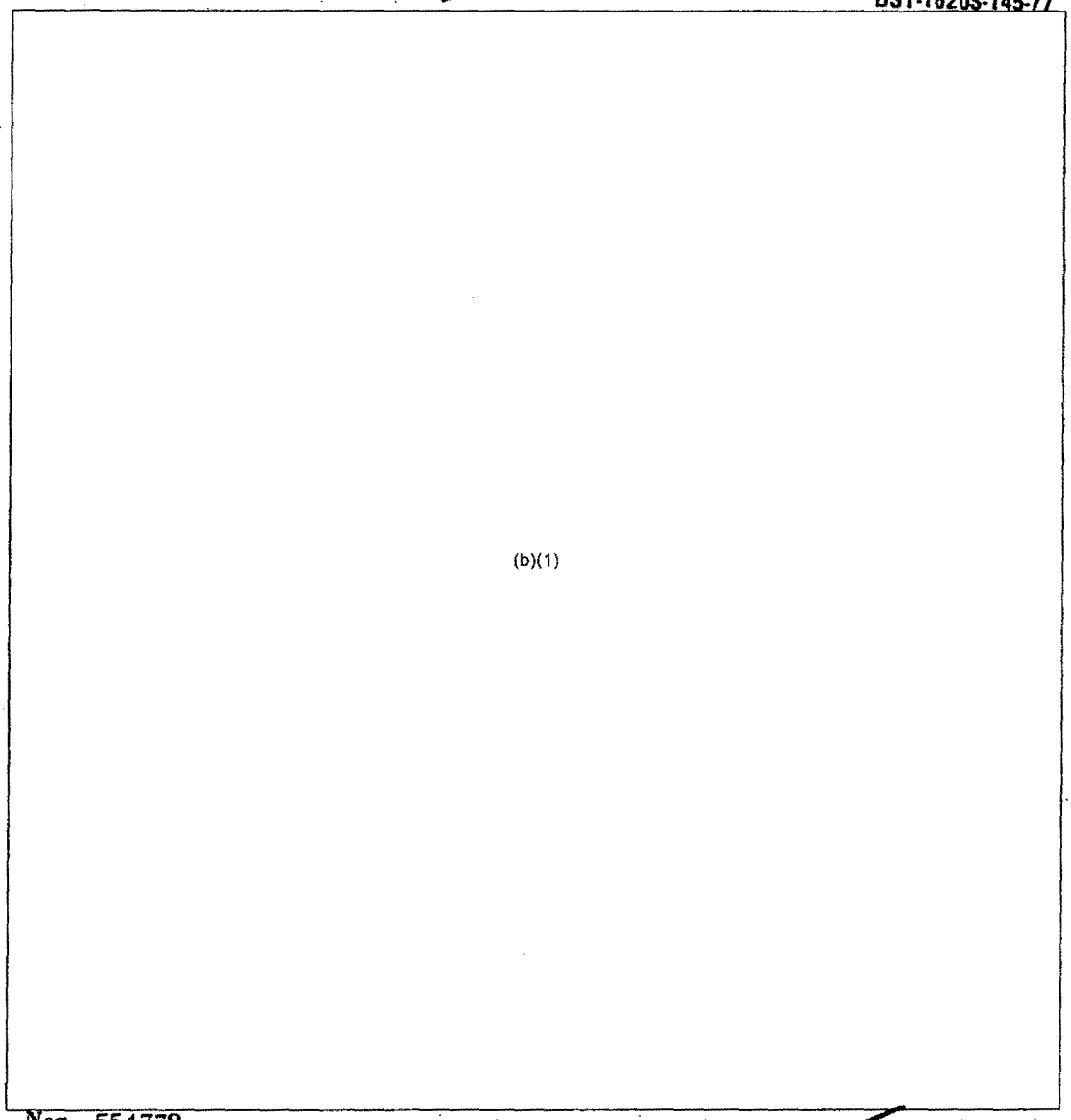
(UNCLASSIFIED)

(View C - Swiss Centurion tank during field exercise)

Figure 3-28. Smoke-grenade launchers on Swiss army tanks (U). (Continued)

(8) (✓) United Kingdom.

(b)(1)



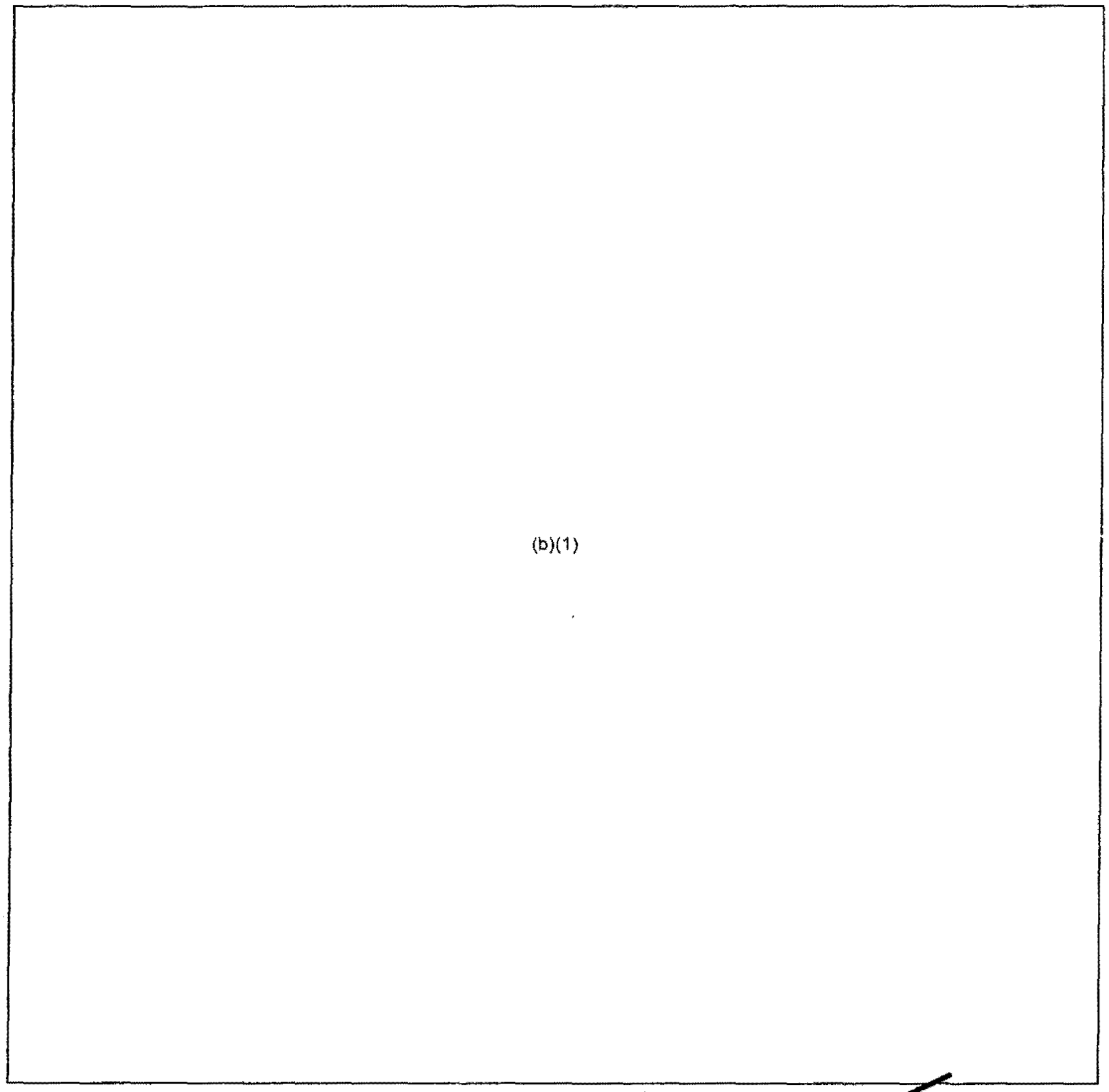
Neg. 554778

(~~CONFIDENTIAL~~)

(View A - Smoke grenade discharger No. 1, MK 1)

1. Mounting
2. Contacts
3. Launch tubes (barrels)

Figure 3-29. Smoke-grenade/launcher system developed for British Centurion tanks (U).



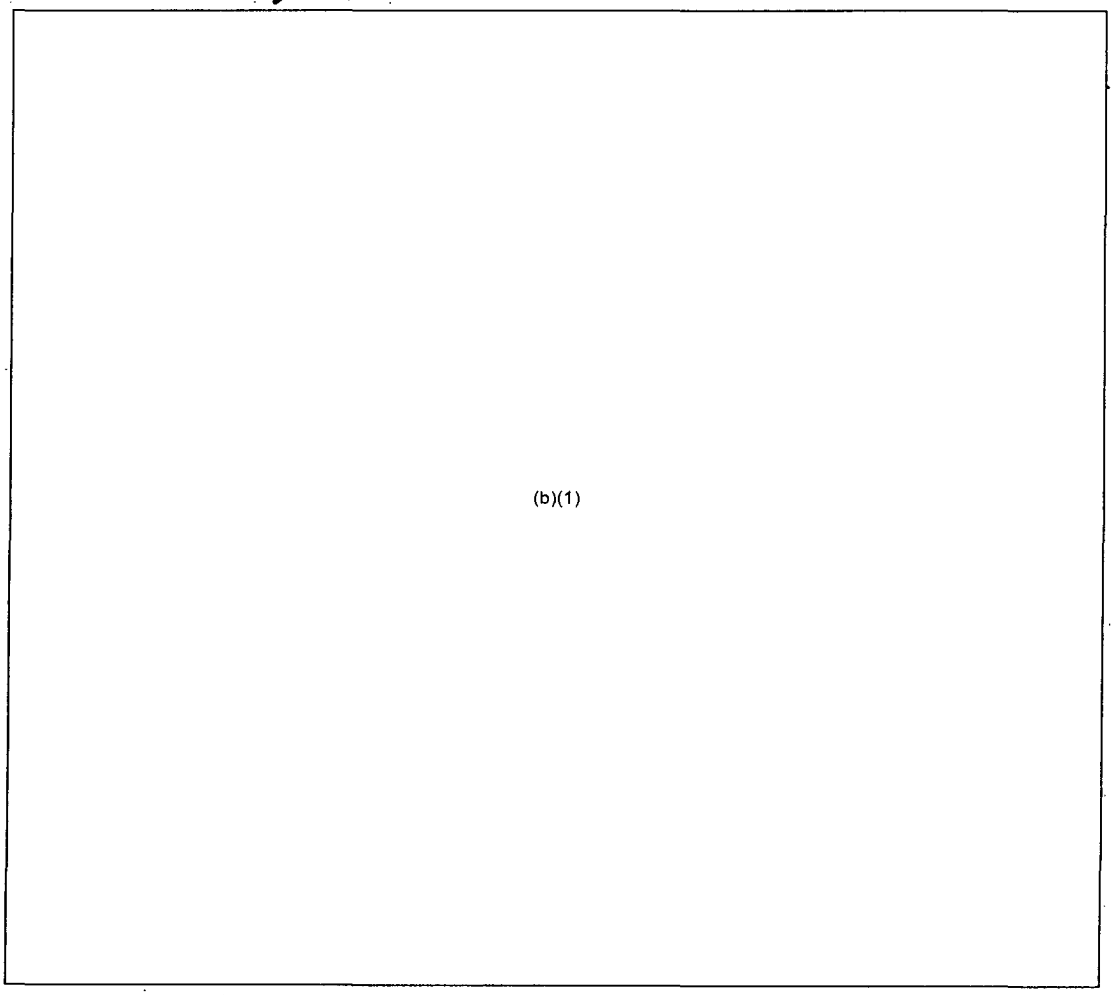
Neg. 554779 (CONFIDENTIAL)

(View B - Firing-button box)

1. Resistance unit
2. Lid
3. Terminal block
4. Gasket
5. Pushbutton

Figure 3-29. Smoke-grenade/launcher system developed for British Centurion tanks (U). (Continued)

(c) ~~(C)~~ Chieftain 120-mm gun tank.



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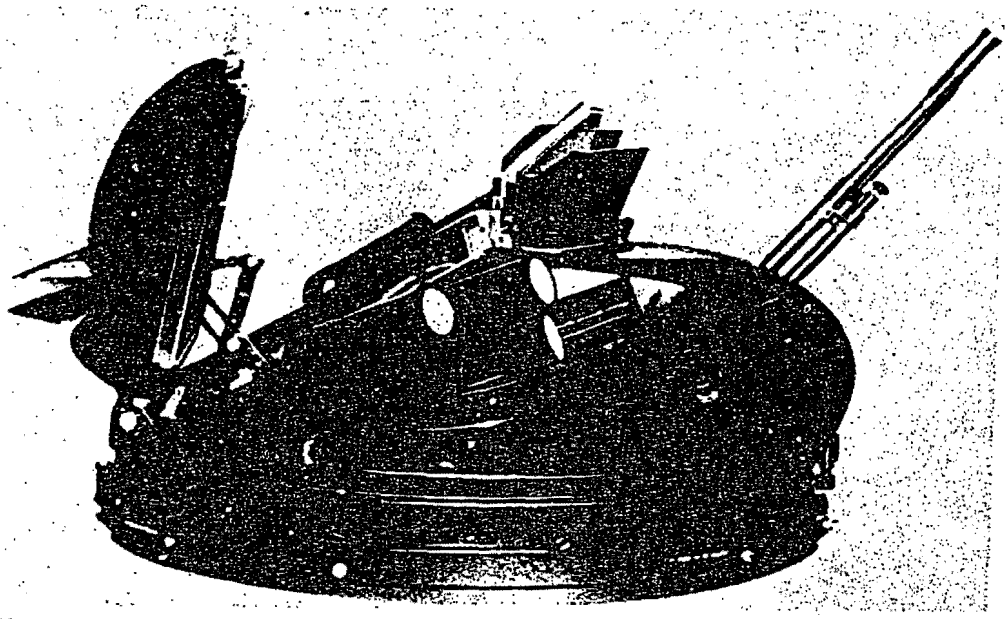
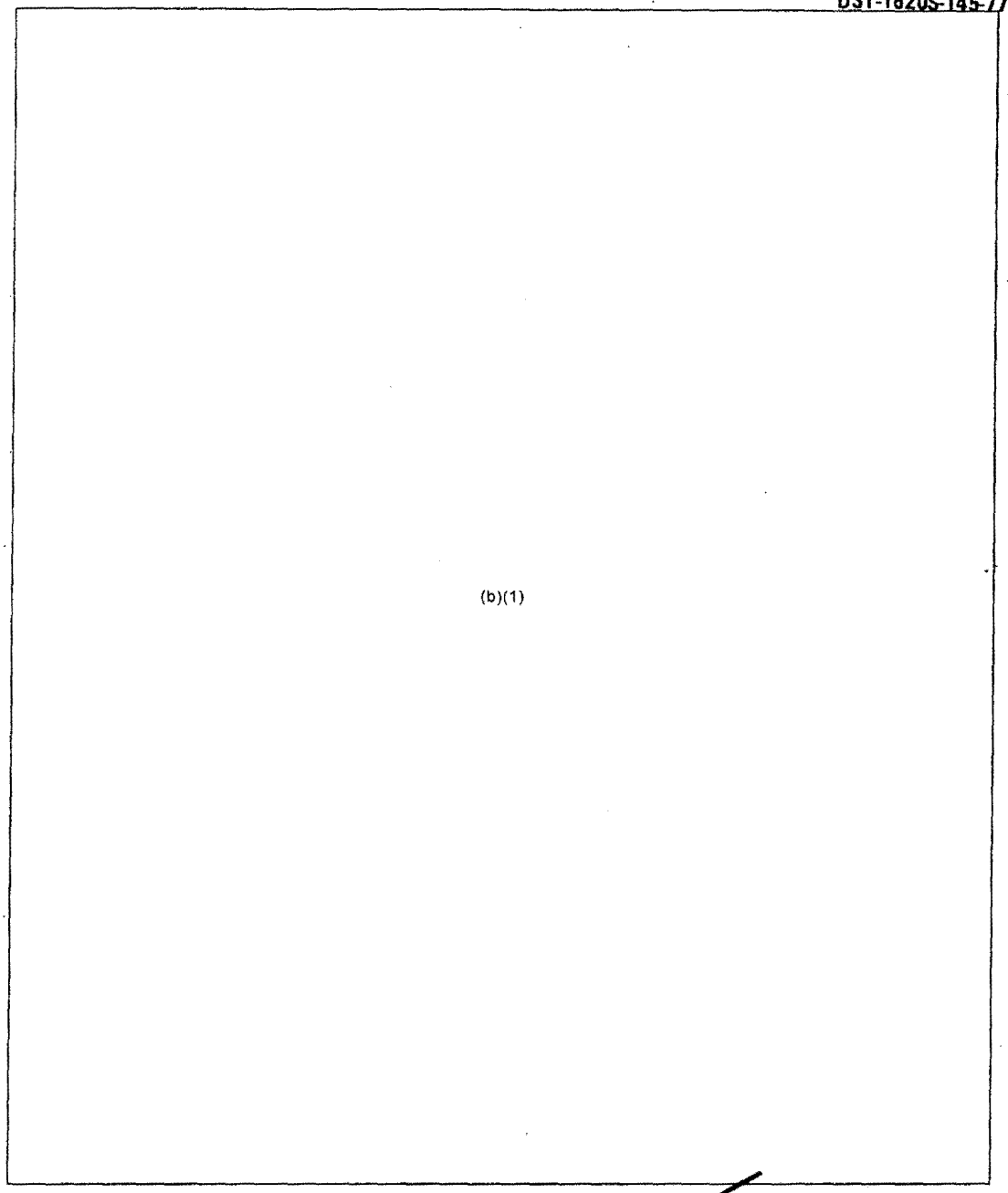
(View A - No. 9 MK 1 six-tube launch unit on Chieftain Tank turret)



Neg. 522105 (UNCLASSIFIED)

(View B - No. 12 MK 1 four-tube launch unit on a new lightweight machinegun turret No. 1 MK 1/1 designed by Peak Engineering Co., Ltd., of England)

Figure 3-30. British smoke-grenade/launcher units for armored vehicles (U).



(b)(1)

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(CONFIDENTIAL)

Figure 3-31. British L8A1 smoke grenade (U).

(9) (U) Free world light armored and recovery vehicles using smoke systems.

(a) (U) Australia. The M113A1 fire support vehicles probably use the same British smoke-grenade launchers that are mounted on the Saladin armored car and the Scorpion reconnaissance vehicle 76-mm gun turrets, which are fitted to US M113A1 APCs (Saladin—six on each side of turret; Scorpion—three on each side of gun mantlet).

(b) (U) Austria.

1. (U) Kurassier 105-mm gun antitank vehicle. This vehicle has six smoke-grenade launchers (possibly French) mounted on a French turret, three on each side of the turret.

2. (U) 4KH6FA-B Grief light recovery vehicle. This vehicle has four smoke-grenade launchers, of an unidentified type, on top of the hull.

(c) (U) Belgium. The FN4RM/62 F.A.B 4x4 armored car has 12 smoke-grenade launchers, possibly of the same type found on the British Saladin 6x6 armored cars, 6 on each side of the turret.

(d) (U) Brazil. Export models of the EE-9 Cascavel 6x6 armored car are fitted with the French H90 90-mm gun turret and have four or six smoke-grenade launchers (probably French), two or three on each rear side of the turret.

(e) (U) France.

1. (U) AMX-13D tank recovery vehicle. The AMX-13D has no launchers.

2. (U) AMX-VCG combat engineer vehicle. This vehicle has three smoke-grenade launchers, one on the right and two on the left side of the hull.

3. (U) AMX-30D tank recovery vehicle. The AMX-30D has eight smoke-grenade launchers, four on each front side of the hull.

4. (U) EBR 8x8 armored car. This vehicle has four smoke-grenade launchers, two on each side of the turret.

5. (U) AML H60 4x4 armored car. The AML H60 has no launchers.

6. (U) AML H90 4x4 armored car. This car has six smoke-grenade launchers, three on each rear side of the turret.

7. (U) AMX-VCI tracked mechanized infantry combat vehicle. The AMX-VCI has no launchers.

8. (U) AMX-10P tracked amphibious mechanized infantry combat vehicle. This vehicle has four smoke-grenade launchers, two on each rear corner of the hull.

9. (U) AML M3 4x4 amphibious armored personnel carrier (export only). The AML M3 carries four smoke-grenade launchers, two on each side of the hull.

10. (U) VXB-170 4x4 armored personnel carrier. This APC has four smoke-grenade launchers, two on each side of the hull.

11. (U) Saviem VAB 4x4 or 6x6 armored personnel carrier. There are no launchers visible on prototypes of this vehicle.

12. (U) AMX-10RC 6x6 armored reconnaissance vehicle. This vehicle has four smoke-grenade launchers, two on each rear corner of the turret.

(f) (U) West Germany.

1. (U) Standard (Leopard) armored recovery vehicle. The Leopard has six smoke-grenade launchers on the left side of the hull.

2. (U) Leopard combat engineer vehicle. These vehicles have six smoke-grenade launchers on the left side of the hull.

3. (U) UR-416 4x4 armored personnel carrier. The UR-416 has six smoke-grenade launchers (optional), three on each side of the turret.

4. (U) SW II 4x4 armored car. These cars have six to eight smoke-grenade launchers, three or four on each side of the turret.

5. (U) SPZ 12-3 (HS-30) tracked mechanized infantry combat vehicle. These vehicles have no launchers.

6. (U) Marder tracked mechanized infantry combat vehicle. Marders have six smoke-grenade launchers, two rows of three each on the left side of the gun mantlet.

7. (U) Luchs 8x8 armored reconnaissance vehicle. The Luchs carry eight smoke-grenade launchers, four on each side of the turret.

8. (U) TPZ-1 6x6 amphibious armored transporter. The TPZ-1 has six smoke-grenade launchers, all on the left side of the hull.

9. (U) TPZ-2 4x4 amphibious armored transporter. The TPZ-2 may have six smoke-grenade launchers, possibly the same as those on the TPZ-1. This vehicle and all other West German vehicles listed probably have the same launchers as those used on Leopard I 105-mm gun tanks.

(g) (U) India.

1. (U) Tracked armored personnel carrier. No launchers have been observed on prototypes of these vehicles.

2. (U) Vijiyanta tank recovery vehicle. No launchers were observed on this vehicle or on British Centurion tank recovery vehicles.

(h) (U) Israel. None of the Israeli (US) half-track APCs, (US) M113 APCs, RBY MK-1 light recovery vehicles, or the various Israeli and foreign self-propelled guns, etc., mounts a smoke-grenade launcher.

(i) (U) Italy.

1. (U) M113A1 tracked armored personnel carrier. This vehicle (co-produced in Italy) has no launchers.

2. (U) M113A1 infantry armored fighting vehicle.. The M113A1 has no launchers.

3. (U) Fiat 6616A 4x4 armored recovery vehicle. This vehicle has six smoke-grenade launchers, three on each side of the turret.

(j) (U) Japan.

1. (U) Type 60 tracked armored personnel carrier. This vehicle has no launchers.

2. (U) Type 73 tracked mechanized infantry combat vehicle. Type 73's have six smoke-grenade launchers, three on each rear corner of the hull.

(k) (U) Netherlands.

1. (U) YP-408 8x6 armored personnel carrier. This vehicle has six smoke-grenade launchers, three on each front fender.

2. (U) M113A1 tracked command and recovery carrier. This vehicle has no launchers.

(l) (U) Sweden.

1. (U) PBV-301 tracked armored personnel carrier. This vehicle has three smoke-grenade launchers, three on either side of the hull.

2. (U) PBV-302 tracked mechanized infantry combat vehicle. The PBV-302 has no launchers.

(m) (U) Switzerland. None of the Swiss vehicles appears to be fitted with smoke-grenade launchers.

(n) (U) United Kingdom.

1. (U) Ferret 4x4 scout car. Ferrets have six smoke-grenade launchers, three on each fender.

2. (U) Saracen 6x6 armored personnel carrier. The Saracen has no launchers.

3. (U) Saladin 6x6 armored car. The saladin has 12 smoke-grenade launchers, 6 on each side of the turret.

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4. (U) FV 432 armored personnel carrier. This vehicle has six smoke-grenade launchers, three each on the glacis plates above the headlights.

5. (U) Scorpion 76-mm gun armored recovery vehicle. The Scorpion has six smoke-grenade launchers, three on each side of the gun.

6. (U) Scimitar 30-mm gun armored recovery vehicle. The Scimitar has eight smoke-grenade launchers, four on each side of the gun.

7. (U) Fox 4x4 armored recovery vehicle. The Fox vehicle has a 30-mm gun and 8 smoke-grenade launchers (these use the Scimitar turret), four on each side of the gun.

8. (U) Spartan tracked armored personnel carrier and variants. The Spartan has six or eight smoke-grenade launchers, two sets of three or four on each glacis plate.

(10) (U) Conclusion. The preceding information is all that is available on free world light armored vehicles. The smoke-grenade launchers on each country's light vehicles are probably the same as those fitted to its tanks. Except for late UK vehicles (Scorpion, Scimitar, Fox, and Spartan), which probably fire RP smoke grenades, the other vehicles probably use HC- or WP-filled smoke grenades.

D. FLAME FUELS AND FLAMETHROWERS

8. (C-NOFORN) Flame Fuels

(b)(1)

9. (C-NOFORN) Flamethrowers

(b)(1)

b. (C) France.

(b)(1)

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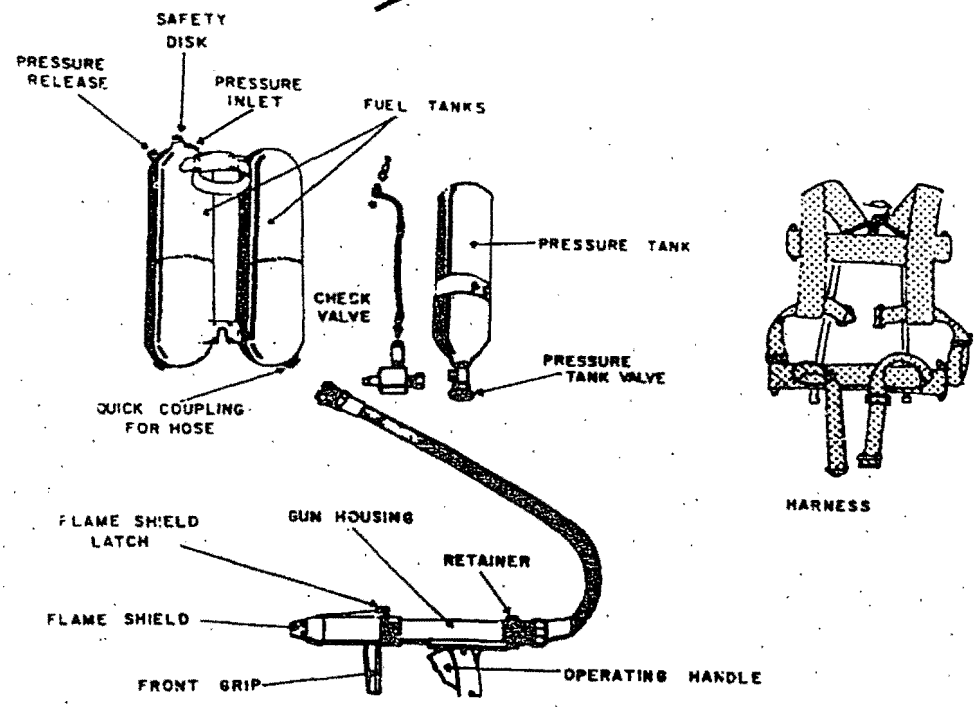

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(UNCLASSIFIED)

Figure 3-32. French Model 1954 portable flamethrower (U).

Table 3-III. Characteristics of French Portable Flamethrower (U)

(b)(1)

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(b)(1)

c. (C) Italy.

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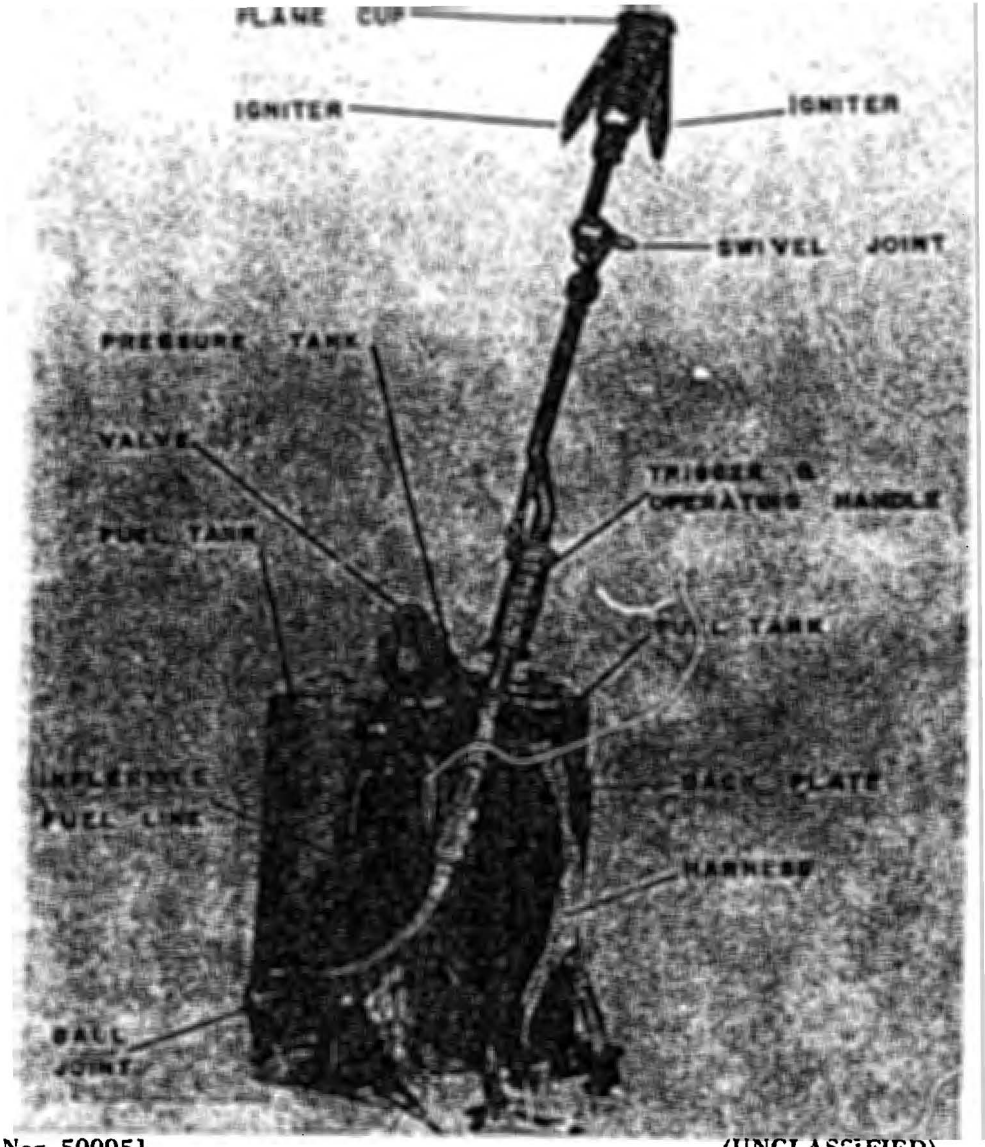

Neg. 509951 (UNCLASSIFIED)

Figure 3-33. Italian Model 55 portable flamethrower (U).

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e. (C-NOFORN) West Germany.

(b)(1)

(2) (U) Handheld flame launcher, Model DM14. The DM14 launcher is constructed of a smooth-surface cardboard tube that is reinforced in the front.[2] Near the rear are three narrow metal rings that, in addition to reinforcement, serve as hand grips. The launcher measures 35 cm in length and 3.6 cm in diameter. The total weight with fuze is 450 grams. The flame cartridge consists of 400 grams of a prepackaged phosphorus and magnesium mixture. The cartridge is held in place by a cork in each end of the tube. The propellant consists of 2 grams of black powder encased in a metal holder. A fuze inserted into the rear end of the launcher completes the assembly. The DM14 launcher is a close-combat weapon; it can be provided to the individual soldier and can be fired against personnel, buildings, and light equipment. Its maximum effective range is reported to be 80 meters.[49]

(b)(1)

(4) (U) Disposable handheld flame-grenade launcher, Model DT24A2B2, 35-mm.Buck KG, a West German munition manufacturing firm, has developed the DT24A2B2 disposable handheld flame-grenade launcher (HAFLA), which is reportedly a great improvement over the DM24A1.[11] The HAFLA has a range of 80 to 100 meters, and distributes its 240-gram RP incendiary mass over a 5x15-meter area by means of an explosive delay device. Temperatures at the conflagration point reach 1200°C. A dense nonpoisonous smoke is generated for up to 2 min. The components of the HAFLA, shown in figure 3-34, include a launching tube of pressed paper that is lined with aluminum; a plastic, folding, pistol-grip trigger mechanism containing the grenade propellant charge and a positive safety (pull ring and split pin); and a plastic-encased projectile containing the incendiary mass, the dispersion charge, and a PD time delay fuze. The launcher has an overall length of 39 cm and weighs 500 grams. The launcher is particularly useful for close-in fighting against strongpoints (bunkers, trenches, etc.), in house-to-house fighting, and against armored vehicles.

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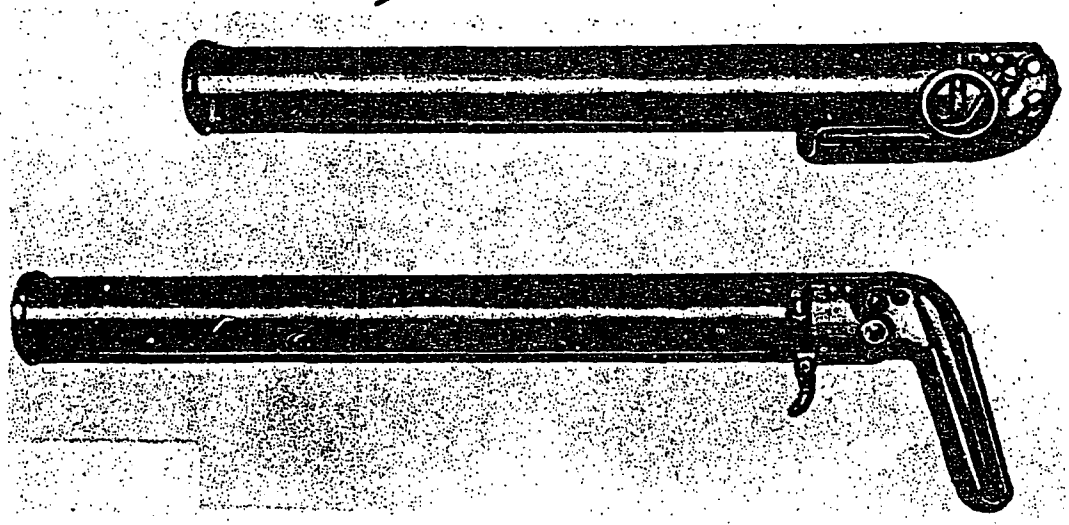

Neg. 505021 (UNCLASSIFIED)

Figure 3-34. West German Model DT24A2B2 flame-grenade launcher (U).

f. (C-NOFORN) Japan.

(b)(1)

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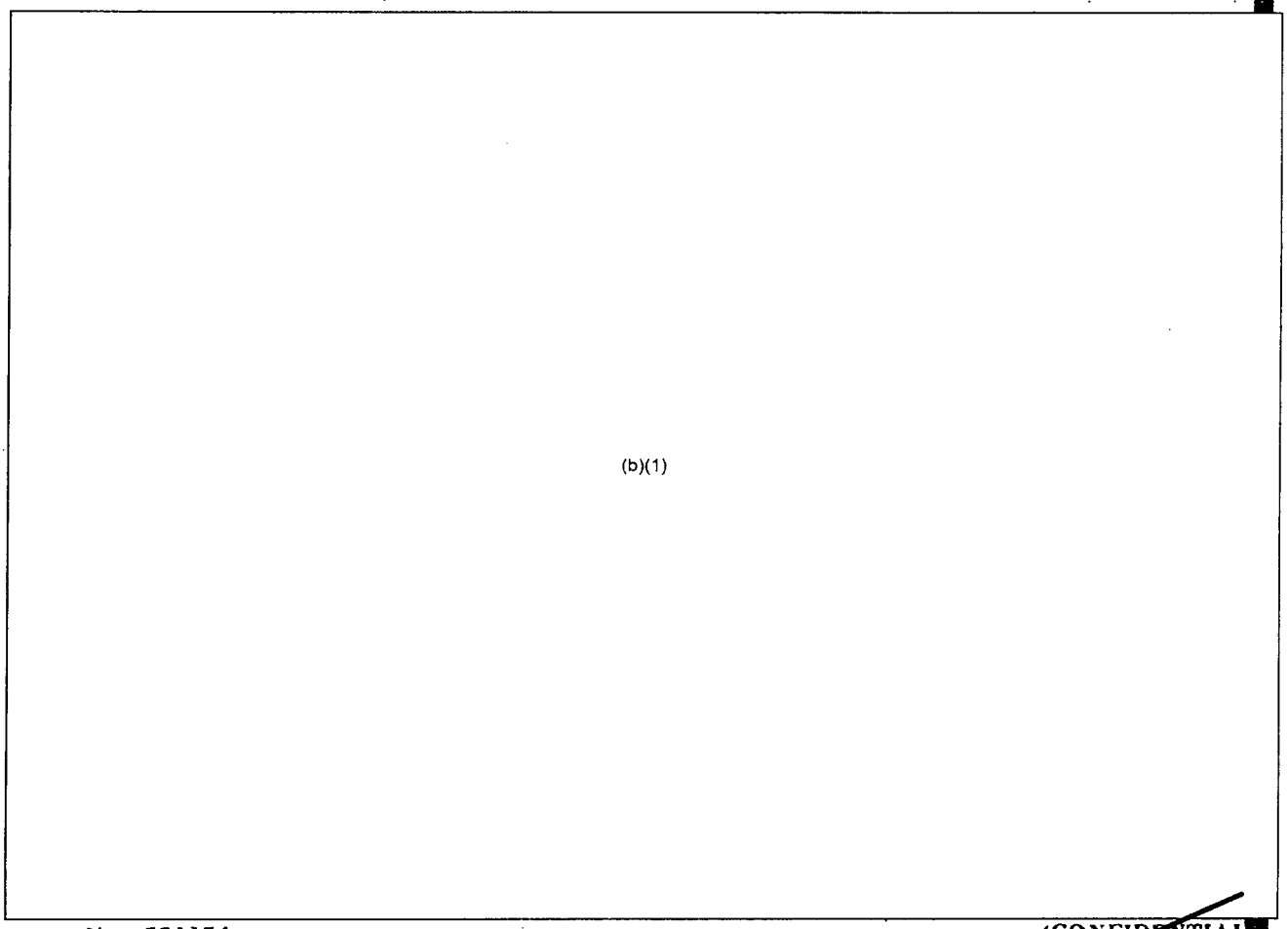

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Figure 3-35. Type 1-1 portable flamethrowers (U).

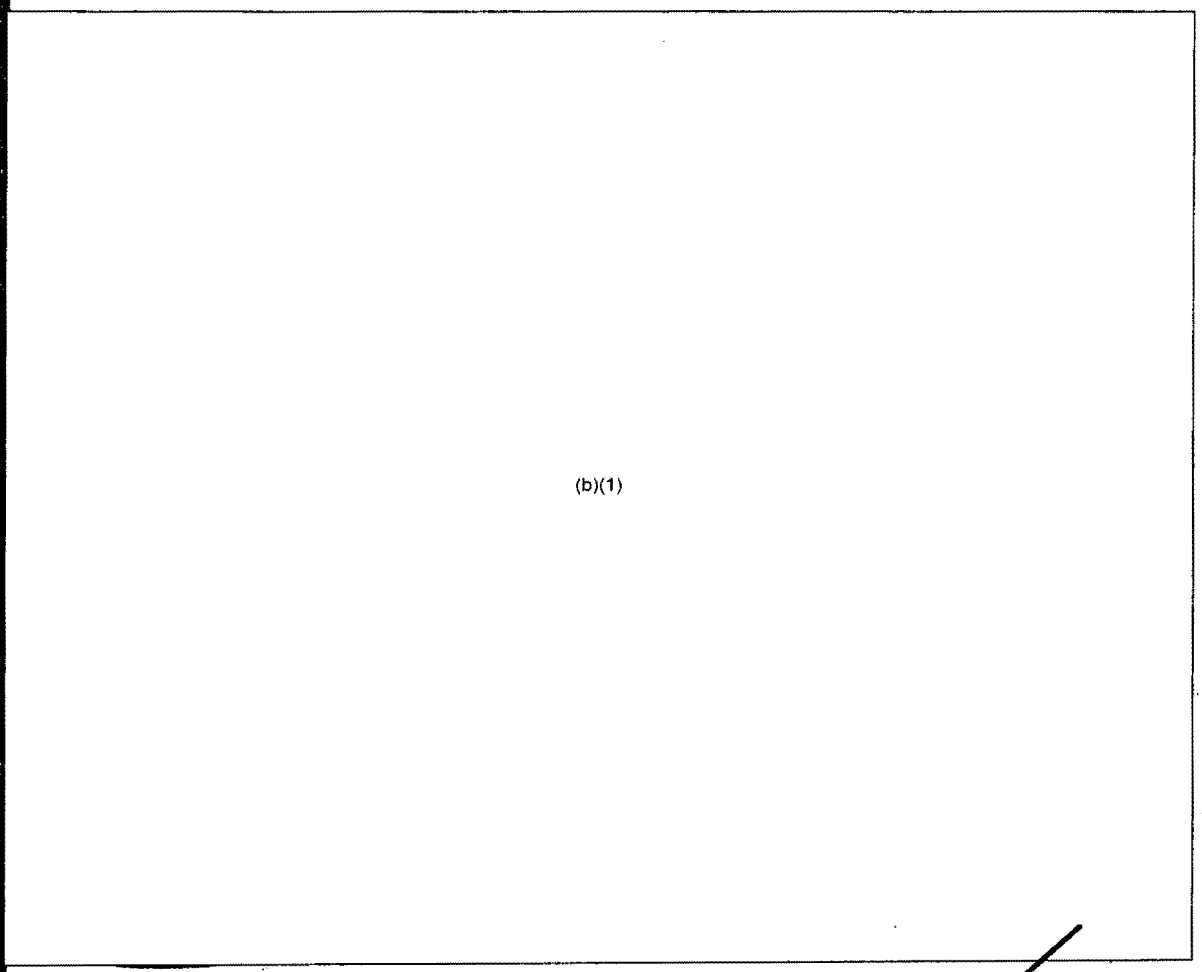

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Figure 3-35. Type 1-1 portable flamethrowers (U).

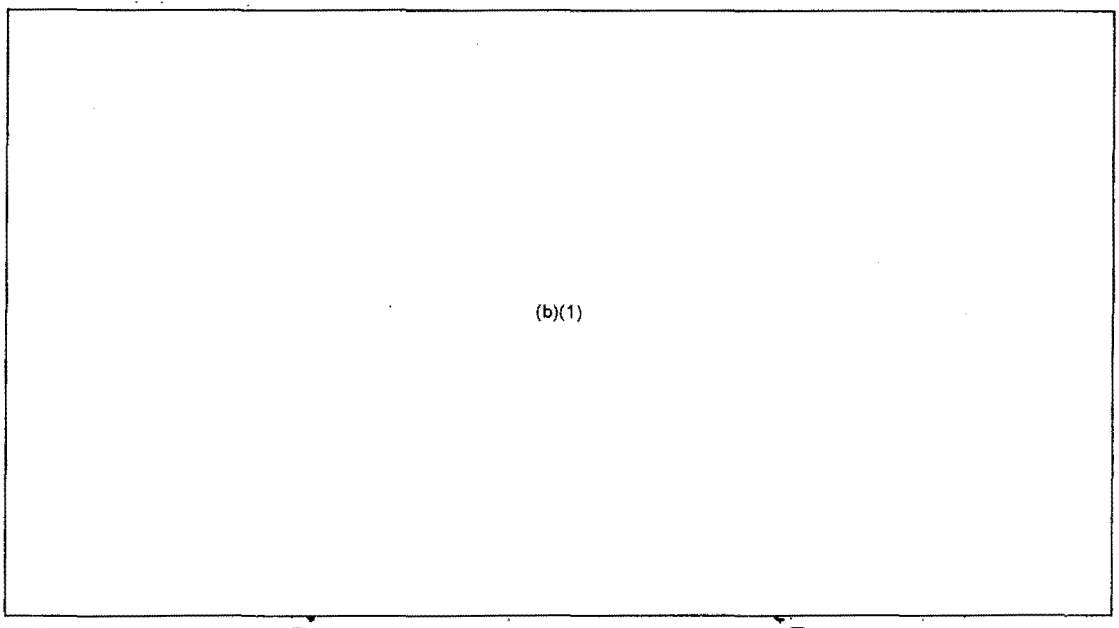

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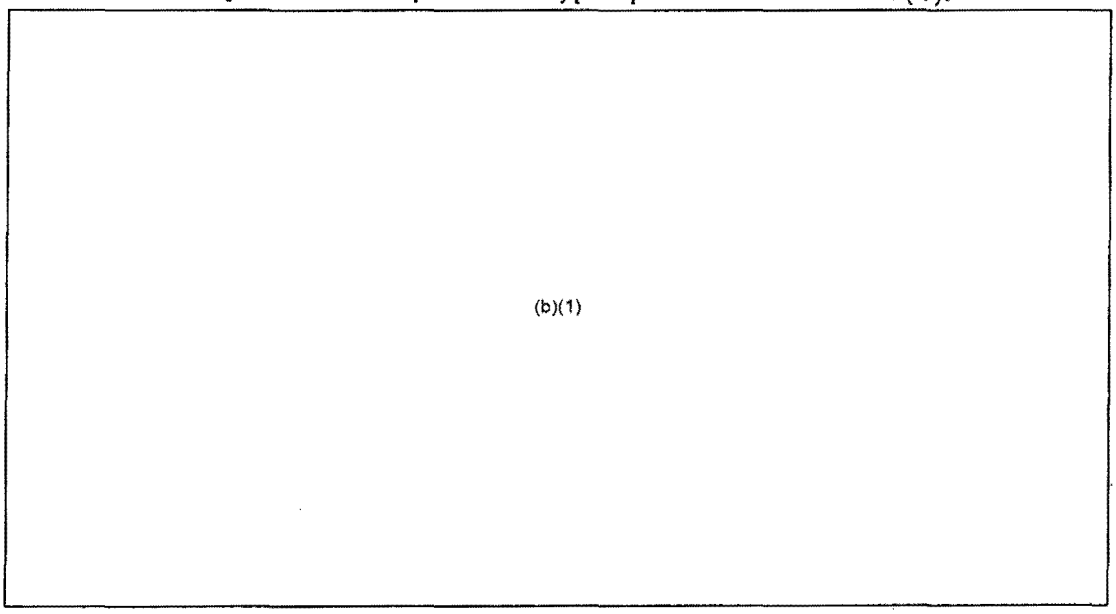
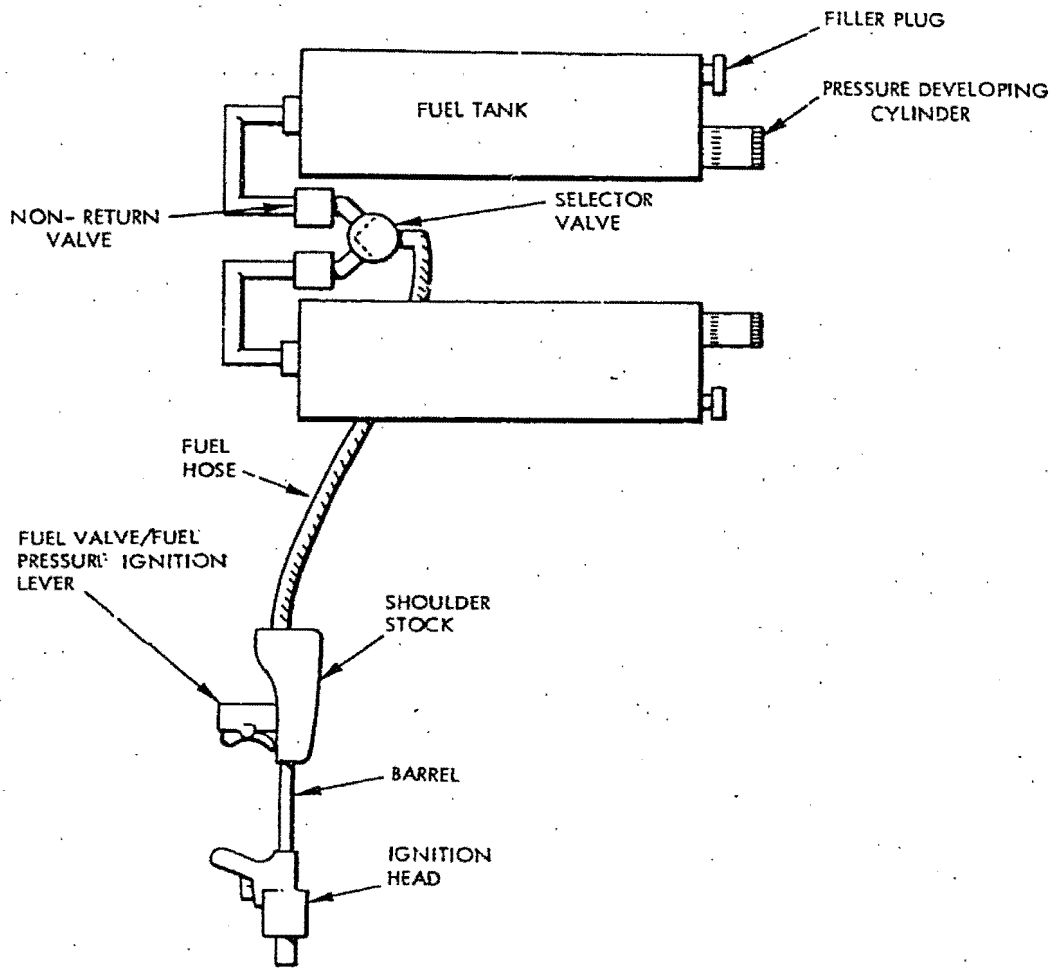
Figure 3-36. Compressor for Type 2 portable flamethrowers (U).





Neg. 513628

(UNCLASSIFIED)

Figure 3-37. New portable flamethrower (U).

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E. INCENDIARY AGENTS AND MUNITIONS

10. (C) Agents

(b)(1)

11. (C-NOFORN) Munitions

(b)(1)

(b)(1)

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F. PRODUCTION, STORAGE, AND STOCKPILES

12. (S-NOFORN) Production

(b)(1)

NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

(3) (U) Luchaire SA; Paris, a privately owned company, manufactures the following smoke munitions:

- A 90-mm smoke round for the AML Panhard and AMX-13 tank guns.
- The 47-mm smoke and incendiary rifle grenade, Model 60.
- The 47-mm instant smoke rifle grenade, Model F3.
- The 47-mm colored smoke rifle grenade.
- The 40-mm smoke practice rifle grenade, MK F1.

Luchaire is a large company comprising nine plants and employing 5200 persons; there are two major divisions, STRIM and Armament. It undoubtedly has the capability to produce substantial quantities of these smoke munitions.

(4) (U) Etablissements Ruggieri, Armament Department, Paris, manufactures the following smoke munitions:[11]

- Smoke hand grenade, Model 53-58, colored.
- Smoke hand grenade, Model F1, colored.
- Smoke hand grenade, Model F2, colored.

- Smoke hand grenade, Model F3, colored.
- Smoke rifle grenade, 50-mm Model F4, opaque.
- Smoke device, Model 59, white.
- Standard smoke-producing charge. Model F1, white.

All of the above munitions are mass-produced and used in the French Army. The smoke device is designed for use with armored vehicles, from which it is launched via a special tube attached to the vehicle. The F1 smoke charge is a 200-gram plastic bag filled with smoke agent; it is designed to be used with various engineering practice equipment such as mines.

(5) (U) Compagnie Francaise Thomson-Houston-Hotchkiss-Brandt, Nantes (47-13N 01-33W), a large armament, ammunition, and electronic equipment manufacturer, produces a line of mortar smoke ammunition. Its products include 120-mm, 81-mm, and 60-mm mortar rounds. The 120-mm round is soon to be in mass production; the 81-mm and 60-mm rounds are now in mass production. Both HC and titanium tetrachloride are used for fill.

(6) (U) La Societa E. Lacroix, a company that claims to be one of the largest pyrogenic manufacturers in Europe, also produces a line of smoke munitions. The company, located in Toulouse on 80 acres of land, manufactures a wide range of pyrotechnics, antipersonnel devices, and special products. Its smoke line includes the following:

- Smoke cartridge, 74-mm, Type F130.
- Impact-pinpointing cartridge, Type F75A.
- Tinted-smoke grenade, Type LXT290.
- Tinted-smoke hand grenade, Type 60.
- Yellow-smoke sea-marker.
- Night and day signal, Type 275.
- Nuclear-explosion simulator.

Production is believed to be available both for the armed forces and for export.

(b)(1)

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(b)(1)

Table 3-IV. Production of Chemical Warfare Munitions at Sociedade Portuguesa de Explosivox (U)

(b)(1)

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NOT RELEASABLE TO FOREIGN NATIONALS

(b)(1)

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(b)(1)

(2) (U) Standard Pyrotechnik Meissner, Speyer, produces the SPM, DM-22, and DM-1 smoke pots. This is a small company, employing only 20 people. Illuminating devices are also produced here.

(b)(1)

(5) (U) Th. Goldschmidt, AG, Essen, produces a special incendiary material used in the thermit destructor unit, which is used to destroy electronic equipment. Both of these devices are marketed by Elektro-Thermit, GmbH, Essen.

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Table 3-V. Munitions Produced by the West German Buck Company (U)

(b)(1)

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(b)(1)

(b)(1)

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15. (C) Therapy

a. (C) Smokes.

(b)(1)

(b)(1)

b. (U) Flames and Incendiaries.

(1) (U) Burning WP, thermite, and magnesium cause deep burns when they contact the skin. The initial step in the treatment of these burns is removal of agent particles from the skin. Phosphorus burns should be immersed in or soaked immediately with water to eliminate the possibility of reignition. Bicarbonate solution should then be applied to neutralize phosphoric acid, followed by a 0.5% to 2.0% solution of copper sulfate to wash the skin. All remaining fragments should then be removed. Prolonged contact between the copper sulfate solution and the burned area must be avoided to prevent systemic copper poisoning. Burns should then be treated conventionally, with the exception that oil-base ointments should not be applied.

(2) (U) The treatment for injuries from thickened fuels such as napalm consists of immediate removal of the victim to fresh air. Artificial respiration with 100% oxygen (if possible) is suggested. A tracheotomy may be necessary if there is a respiratory obstruction. Burns of the skin should then be treated.[49]

(3) (U) Information from nonaligned countries is lacking on specific treatment for smoke, flame, and incendiary casualties.

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WARNING NOTICE
Sensitive Intelligence Sources
and Methods Involved

H. RESEARCH AND DEVELOPMENT

16. (C-NOFORN-WNINTEL) Smoke Agents

(b)(1)

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WARNING NOTICE
Sensitive Intelligence Sources
and Methods Involved

(b)(1)

e. (C-NOFORN) West Germany.

(b)(1)

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(b)(1)

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Table 3-VI. Attenuation Effects* of Smoke Agents (U)

(b)(1)

*% attenuation at a given time

(CONFIDENTIAL-NOFORN)

(5) (U) Nontoxic replacements for HC and research to develop IR screening smokes are also done at NICO-Pyrotechnik, Tritou.[55] Design requirements imposed by the MOD include effective screening in the visible, near-IR (3- to 5-μm) and medium-IR (8- to 14-μm) spectral regions. Because Rayleigh scattering is ineffective at the longer wavelengths, NICO-Pyrotechnik has developed two IR screening smokes employing black-body absorbers. Reportedly, one composition attenuates 3- to 5-μm radiation and the other attenuates in the 8- to 14-μm region. Compositions of these experimental black-body smokes are unknown. Evaluation tests are scheduled for the near future. Demonstrations of the two compounds showed dense clouds of light gray smoke that became lighter as it moved downwind. The smokes also had a strong tendency to pillar, which was attributed to the very high (1400° to 1500°C) burning temperature. A new visual screening and white signalling smoke was said to have substantial advantages over standard HC mixtures. Advantages claimed were as follows:

- The mixture contains no zinc or chlorine and therefore is considered noncorrosive and nontoxic even in high concentration.
- The mixture is incorporated into an elastomeric matrix, so shelf life expectancy is unlimited.
- The mixtures requires no first-fire to ignite.

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- The intensity of the smoke is independent of moisture.
- The burn temperature is low (600°C) and there is no appreciable ash.

Smoke produced by this mixture was brilliant white and virtually odorless. An acidity indicator showed a pH of about 6.

(b)(1)

17. ~~(C-NOFORN)~~ **Munition/Dispersion Systems**

(b)(1)

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(b)(1)

(2) (C-NOFORN) West Germany.

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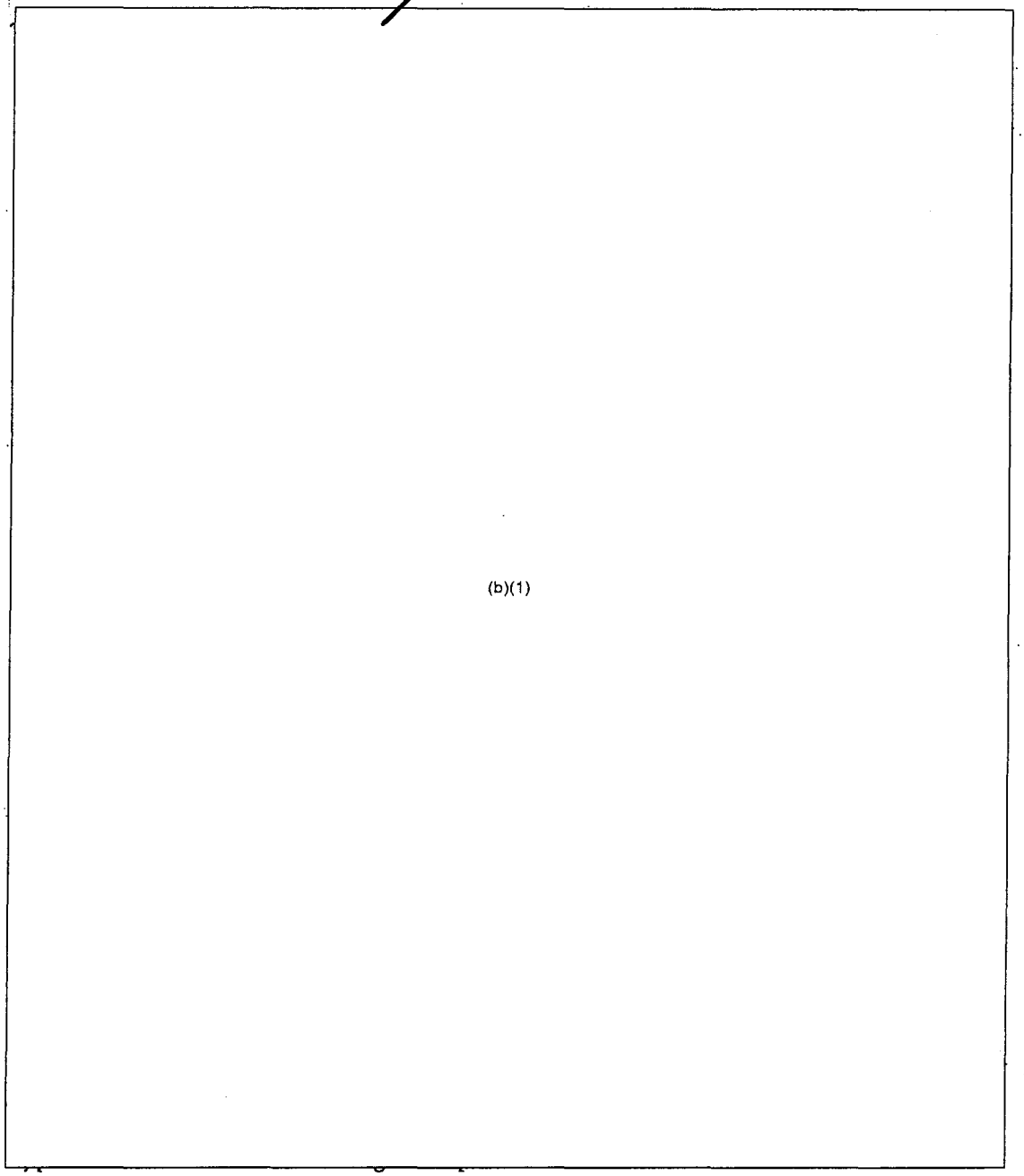

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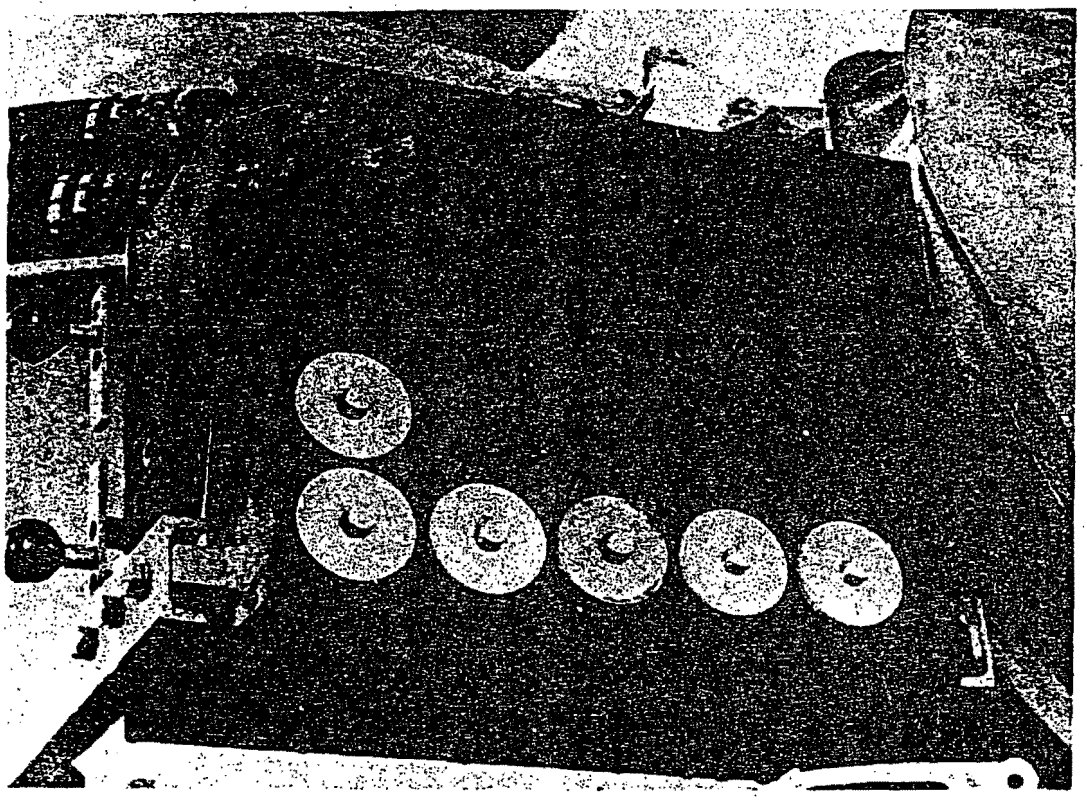

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Figure 3-38. Israeli vehicle grenade launcher (U).

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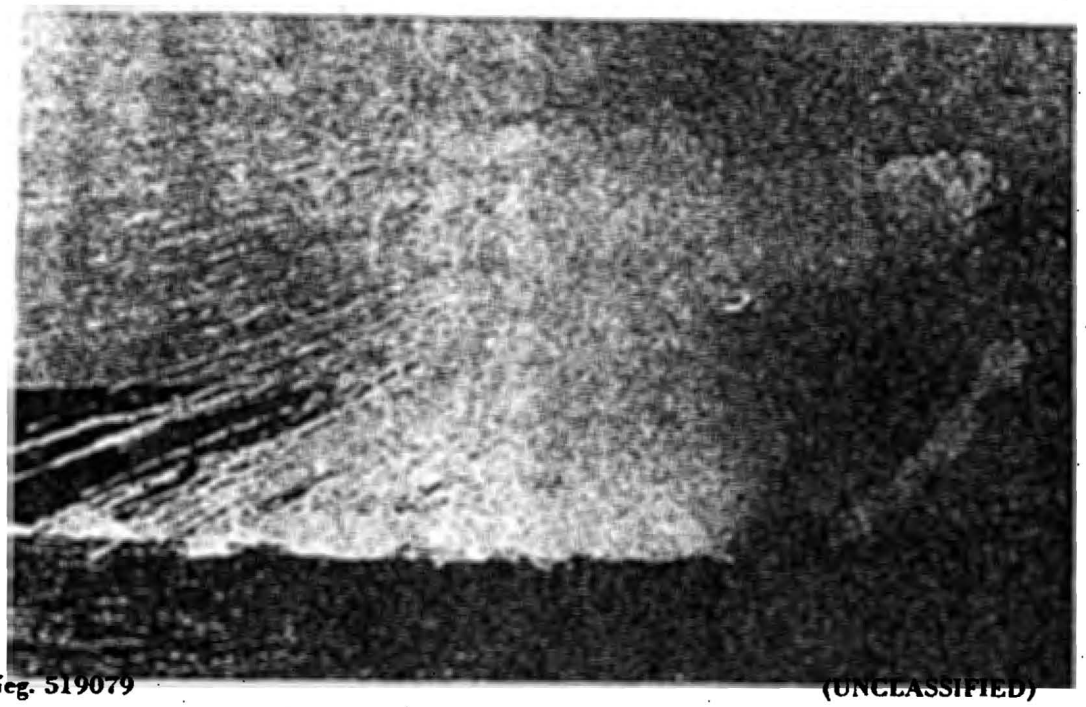

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Figure 3-39. Grenade smoke cloud at 1.1 seconds (U).

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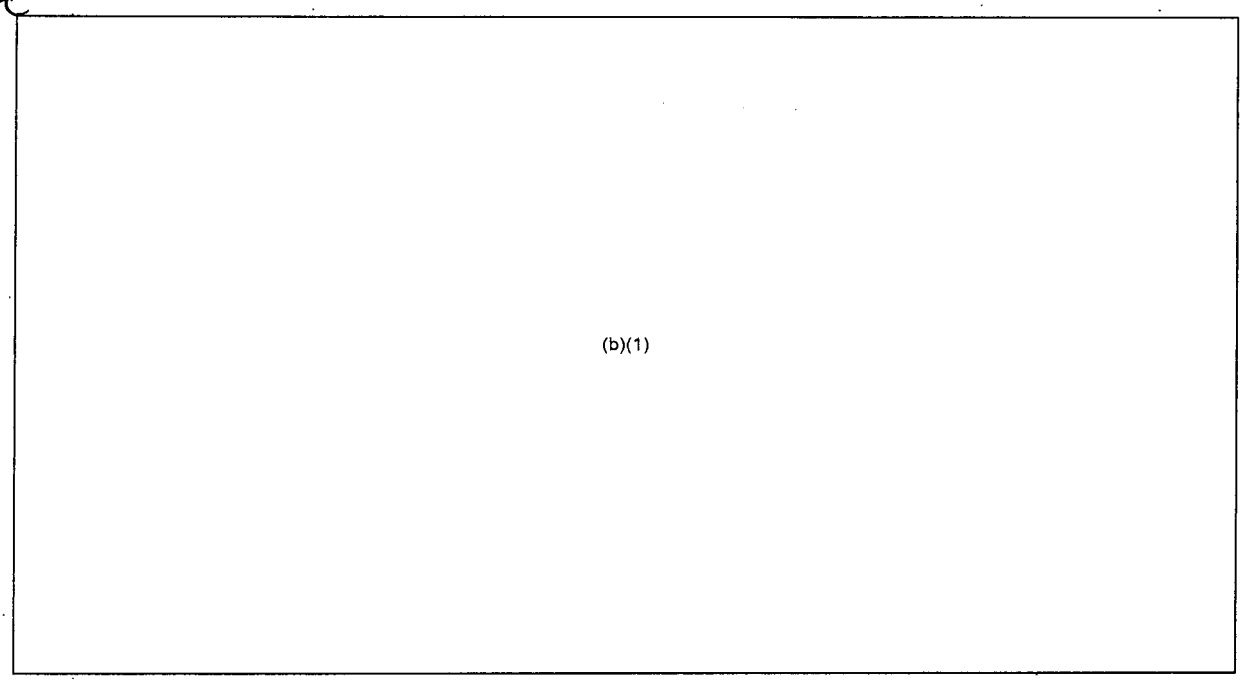

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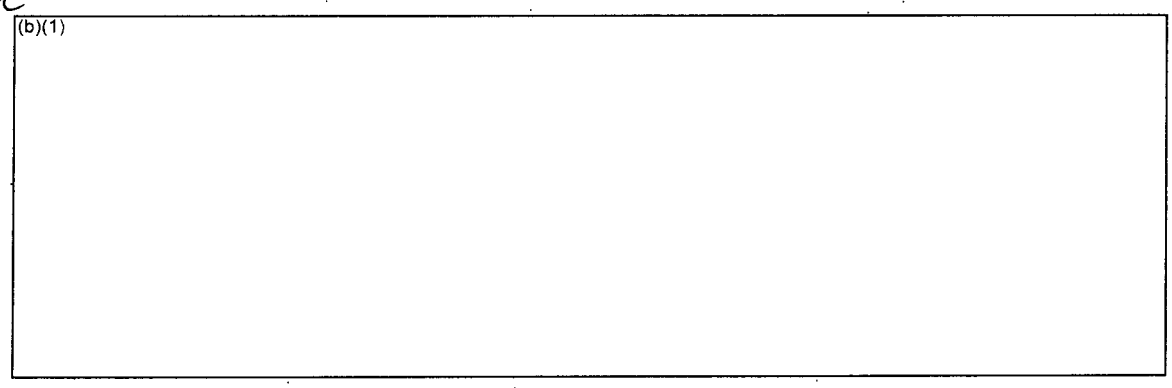
Figure 3-40. Schematic of smoke generator installed on tank engine (U).



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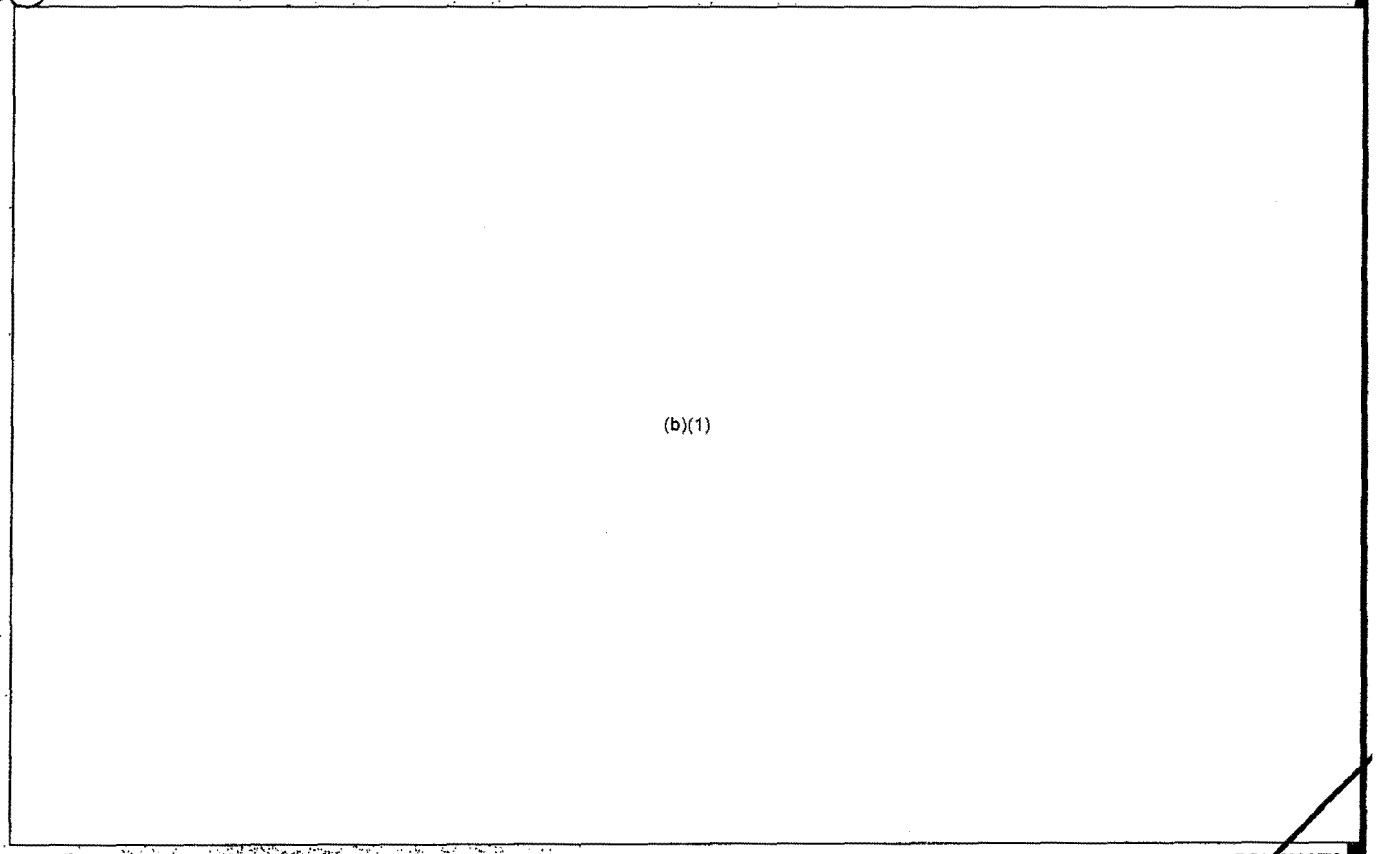

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Figure 3-41. Israeli Army smoke trailer (U).

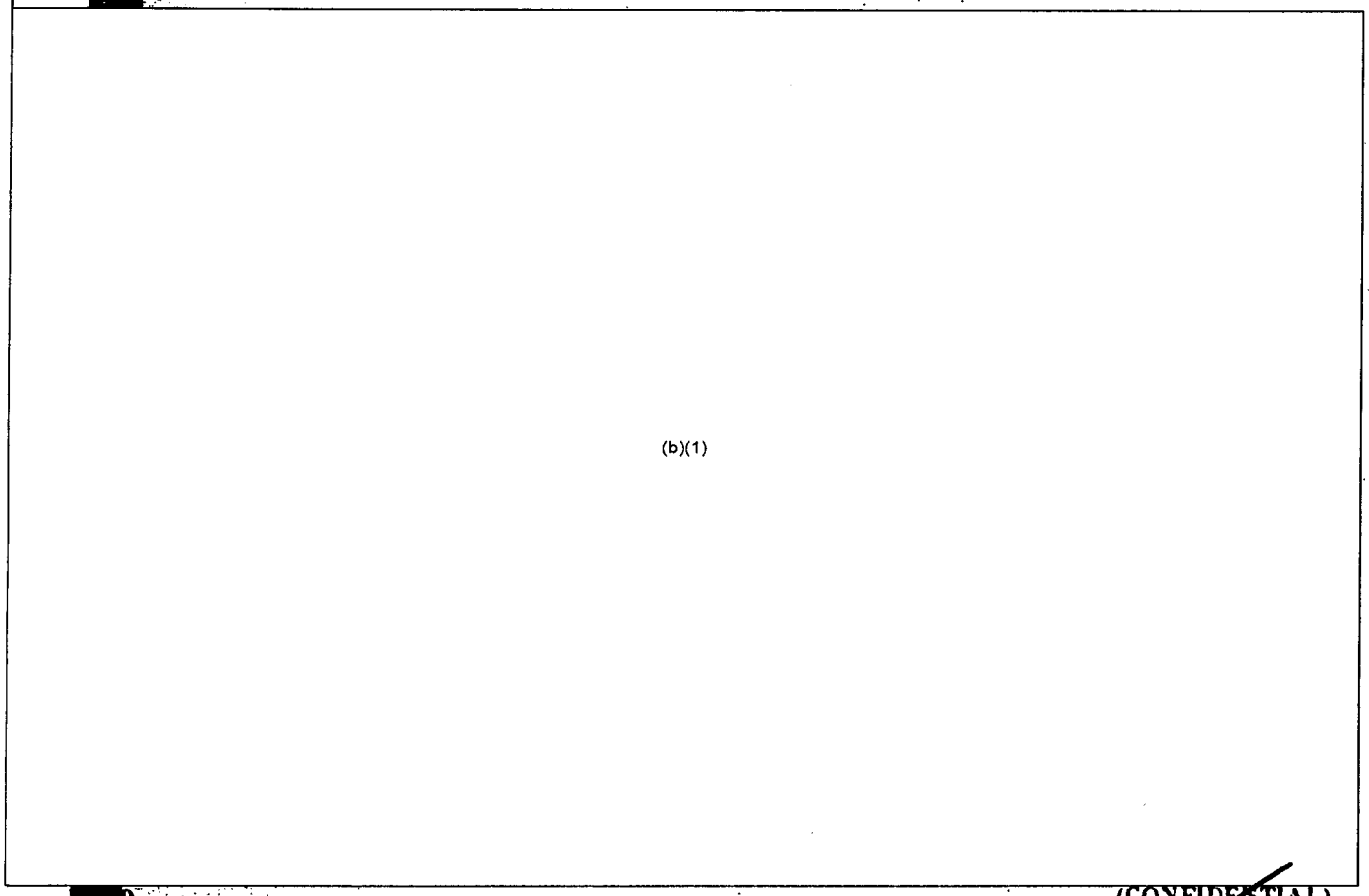

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Figure 3-41. Israeli Army smoke trailer (U).

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(4) (U) France. Reportedly, the French have constructed a new specialized smoke screen device, called the F-1, which uses a pulse jet engine.[65] The device, weighing 275 kg, uses 16 to 18 liters of gasoline and 80 to 100 liters of machine oil per hour. It is designed for installation on cars, ships, transporters, or armored vehicles. No further technical details are available.

b. (C-NOFORN) Flame and Incendiary.

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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I. AEROSPACE SMOKE, FLAME, AND INCENDIARY CAPABILITIES

18. (S-NOFORN) General

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19. (S-NOFORN) Standard Agents and Dispersion Systems.

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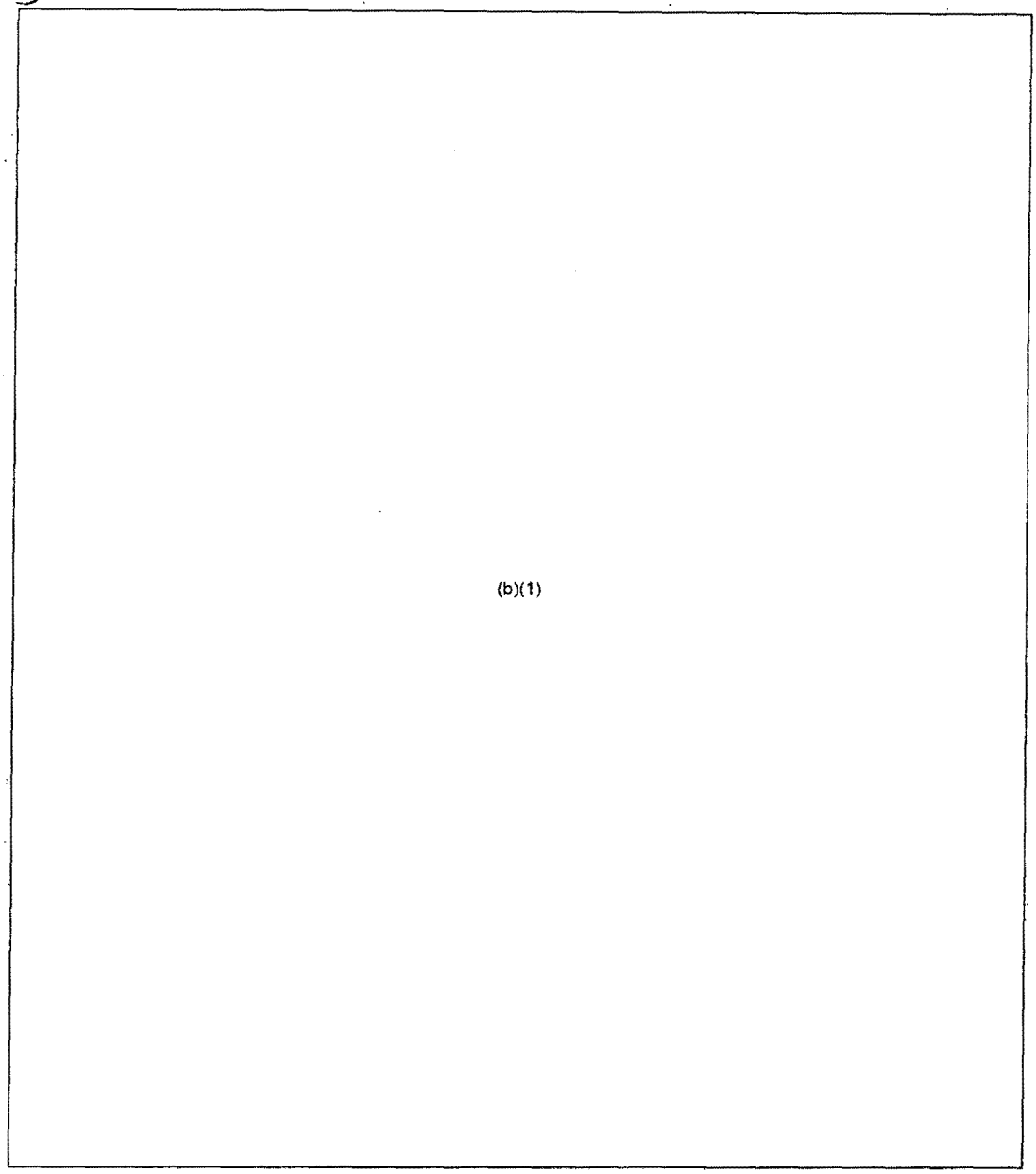

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J. TRENDS AND FORECASTS

21. (C-NOFORN) Trends

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22. (~~C-NOFORN~~) Forecasts

a. (~~C-NOFORN~~) Five-Year Projection.

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b. (~~C-NOFORN~~) Ten-Year Projection.

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U)

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1. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continu

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...dix L Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Con

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Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Con

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ix I. Comparative Technical Characteristics of ECC and Free World Mortar Smoke Projectiles (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U)

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1. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U)

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Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U)

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d) Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

Nomenclature	Length (mm)	Diam (mm)	Wt (g)	Filler	Color of smoke	Range (m)	Delay a duratic
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dix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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dix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued

Nomenclature	Length (mm)	Diam (mm)	Wt (g)	Filler	Color of smoke	Range (m)	Dela dura
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II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix II. Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued

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Technical Characteristics of Smoke Hand and Rifle Grenades—Free World (U) (Continued)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Continu

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III. Technical Characteristics of Artillery Smoke Ammunition–Free World Countries (U) (Continued)

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Appendix III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Conti

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III. Technical Characteristics of Artillery Smoke Ammunition—Free World Countries (U) (Continued)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns and Rockets—Free World Countries (U) (Continued)

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Appendix IV. Technical Characteristics of Smoke Ammunition for Tanks, Recoilless Guns, and Rockets—Free World Countries (U) (Continued)

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LIST OF ABBREVIATIONS

ACC	Asian Communist countries
AO	aerosol obscurant
APC	armored personnel carrier
API	armor-piercing incendiary
ATGM	antitank guided missile
BICT	Bundes Institut fur Chemisch Technische
CAF	Canadian Air Force
CBR	chemical-biological-radiological
CIL	Canadian Industries, Ltd
CIW	close-in-weapon
CN	chloracetophenone
CW	chemical warfare
DTAT	Directorate of Ground Armament for Nuclear, Biological, and Chemical Services
ECC	Eurasian Communist countries
EO	electro-optical
FEBA	forward edge of battle area
FFV	Forenade Fabriksverken
FLIR	forward-looking infrared
FS	chlorosulfonic acid/sulfur trioxide mixture
GSDF	ground self-defense force
HAFLA	handheld flame-grenade launcher
HC	hexachloroethane
HD	mustard gas
HDA	highly dispersed aerosols
HE	high-explosive
IABG	Industrieanlagen-Betrieb-Gesselschaft
IR	infrared
LARS	light artillery rocket launcher
LLLTV	low-light level television
MBSD	multibarrel smoke discharger
MOD	Ministry of Defense
NATO	North Atlantic Treaty Organization
NSWP	non-Soviet Warsaw Pact
PD	point-detonating
PRC	People's Republic of China
PTUR	antitank guided rocket

R&D	research and development
RAF	Royal Air Force
RP	red phosphorus
SAF	Soviet Air Force
TDA	thermal-smoke-equipment
TID	thermal imaging device
UOF	unit of fire
WP	white phosphorus
WWI	World War I
WWII	World War II

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