POLICE WEAPONS CENTER

WATER CANNON

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WATER CANNON

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Although water cannon are not in use in the United States, several police departments in Germany and South America have employed such devices as a means of crowd control. The successful employment of mobile water cannon vehicles, especially in Germany, has resulted in frequent suggestions that they be used by police in the United States, generally as a substitute for chemical agents.

Basically, the concept of the use of water as a relatively innocuous method of crowd control is one that commends itself to police, since it provides a nonlethal means of control which can be employed against rioting mobs with greater selectivity and none of the decontamination problems associated with the use of chemical agents. While standard military and civil riot control literature in this country has traditionally referred to the use of water as an appropriate level of force, its actual use has been rather limited. However, the reluctance to use water has probably been due more to an absence of equipment and tactical doctrine than to any categorical rejection of the concept. Also, as a matter of municipal organization, water dispersing equipment has been in the hands of fire departments which have been extremely reluctant to risk their public image by involving themselves in unpopular enforcement activity.

Regarding the use of water, the FBI manual, *Prevention and Control of Mobs and Riots,* says:

- C. **Fire Hoses**
  Water from firehoses may be effective in moving small groups, in moving groups on a narrow front, or in defending a defile or roadblock. Water has been used in the recent past and has a psychological, as well as a physical effect. Water may be employed in two ways; as a flat trajectory weapon utilizing pressure, or as a high trajectory weapon akin to heavy rainfall. The latter method is especially effective during cold weather. If water is used in such ways, a harmless dye can be mixed into the stream for possible later identification of the rioters. Employed as a flat trajectory weapon, utilizing the pressure to physically move individuals, serious injury or death can result. The decision to employ water, in one or both methods, should be arrived at during the planning phase and should be based on the discretion of police and community officials.[1]

An earlier manual, FM 19-15, *Civil Disturbances and Disasters,* was recently updated to read, regarding water:

- (c) **Employment of water.** Water from a firehose may be effective in moving small groups on a narrow front such as a street or in defending a barricade or roadblock. Personnel applying the water should be protected by riflemen and in some instances by shields. In the use of water, the factors discussed in (i) and (v) below should be considered.

[1] Federal Bureau of Investigation, *Prevention and Control of Mobs and Riots* (Washington, D.C., U.S. Government Printing Office, 1967), p. 90.

(i) Water may be employed as a flat trajectory weapon utilizing pressure, or as a high trajectory weapon employing water as rainfall. The latter is highly effective during cold weather.

(ii) Harmless dye may be placed in the water for future identification of participants by staining their clothing or bodies.

(iii) The use of a large water tank (750-1000 gallons) and a powerful water pump mounted on a truck with a high pressure hose and nozzle capable of searching and traversing will enable troops to employ water as they advance. By having at least two such water trucks, one can be held in reserve for use when required.

(iv) In using water, as with other measures of force, certain restraints must be applied. Using water on innocent bystanders, such as women and children, should be avoided; avenues of escape must be provided; and the more severe use, flat trajectory application, should be used only when necessary.

(v) Since fire departments normally are associated with lifesaving practices rather than maintenance of law and order, consideration should be given to maintaining this image through the use of other than fire department equipment when using water for riot control and crowd dispersal.[2]

Where there is a readily available source of water supply, such as a modern urban hydrant system, fire trucks and pumpers can be utilized to deliver water against rioters, but this system has its limitations because of the difficulty of protecting the hoses and engines from the mob as well as the vulnerability of the hydrant system, which could be turned off from a remote location by rioters or sympathizers.

To avoid hydrant vulnerability and achieve mobility, the water cannon vehicle, a self-contained unit which permits police to confront mobs with high pressure water, was developed. Such vehicles normally carry a supply of water either as an integral part of the water cannon vehicle or in a towed trailer. Provision is also made for use of other water supply sources, such as rivers or lakes, and even, in the case of the Leipzig (East Germany) police, the municipal sewage system.

Several materials, such as tear producing agents, slippery foam, stenches and dyes, can be added to the water to discourage mobs. Experiments have even been conducted to devise a method for transmitting electrical shocks to rioters through streams of water.

Unfortunately, it has been difficult to escape the fact that all water cannon are extremely vulnerable vehicles. Merely by waiting until the device exhausts its water supply, rioters can attack and destroy an expensive piece of virtually defenseless equipment with Molotov cocktails or other weapons. In addition to their high cost and vulnerability, water cannon have sometimes experienced serious maintenance problems with their pumping equipment. As a result of these shortcomings, the

[2]Department of the Army, *Civil Disturbances and Disasters,* FM 19-15, Change 2, (Washington, D.C.: U.S. Government Printing Office, March 1968) para. 17-4.

water cannon has been found to be unsatisfactory by the Venezuelan, Equadorian and Peruvian police and its use as a riot control device has not spread to the United States.

The use of high pressure water as an antiriot mechanism is currently most common in Germany, where the technique has been backed up by the development of water cannon of great power and precision. Equivalent American equipment does not exist, although one German manufacturer has recently established an American distribution outlet: JAFCO Systems, Inc., 5 West Street, Hyde Park, Boston, Massachusetts 02136.

The following descriptions of two German water cannon have been provided by the manufacturers. Their claims however have not been verified by the IACP. The devices described are the ISAR water cannon produced by Keller & Knappich GmbH, 89 Augsburg 3, Germany, and the Daimler-Benz water cannon, with a special upper body manufactured by Meyer-Hagen, 58 Hagen (Westfalen) Postfach 1143, Germany. Three other German firms can manufacture the upper body to fit the Daimler-Benz chassis, these are Carl Metz, 75 Karlsruhe (Baden) Germany, Klockner-Humboldt-Deutz, 79 Ulm, Postfach 543, Germany and Rosenbauer KG, POB 4021, Linz, Austria.

THE KELLER AND KNAPPICH WATER CANNON

The Keller and Knappich water cannon, illustrated in Figures 1 and 2, is described as follows:

The Body. The crew cab serves as a control station and provides space for the driver and a crew of five to six men. There are three individual seats in front and a full-length back seat; batteries, a self-contained heater and extra space for tools and supplies are fitted beneath. The heater also provides ventilation by means of two vents in the roof. The exterior of the cab consists of sheet steel, 3 mm in thickness, and the cab interior is coated with plastic. There are large windows on all sides, with panes of glass reportedly capable of deflecting .22 caliber bullets. The windows are protected against thrown objects by woven wire and mesh screens. The windshield is provided with a special washing device carrying solvents for the removal of any paint thrown by rioters. There are three doors on the right side of the vehicle and one for the driver on the left. All doors can be bolted from the inside; the third one on the right can also be locked from the outside.

Two ejection nozzles with waterproof covers are mounted on the roof. Eaves along the edges of the roof prevent the obscuring of vision by any overflow of water that would otherwise pour over the windows.

Water Tank. The water tank, constructed of sheet steel, has a volume of 2,297 gallons. Internal braces inside the tank also serve as baffle plates.

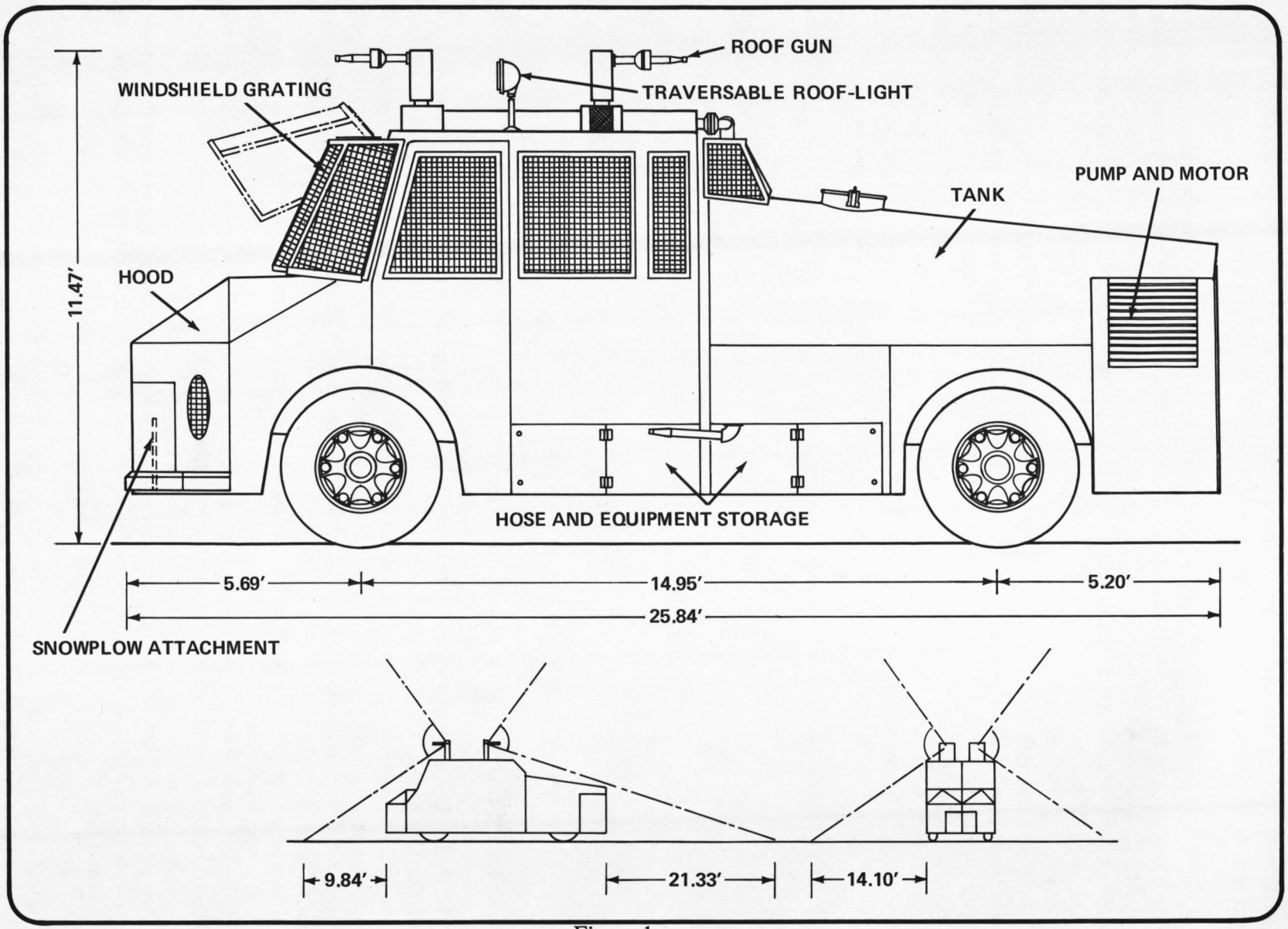

Figure 1
THE KELLER AND KNAPPICH "ISAR"
WATER CANNON
(Side View)

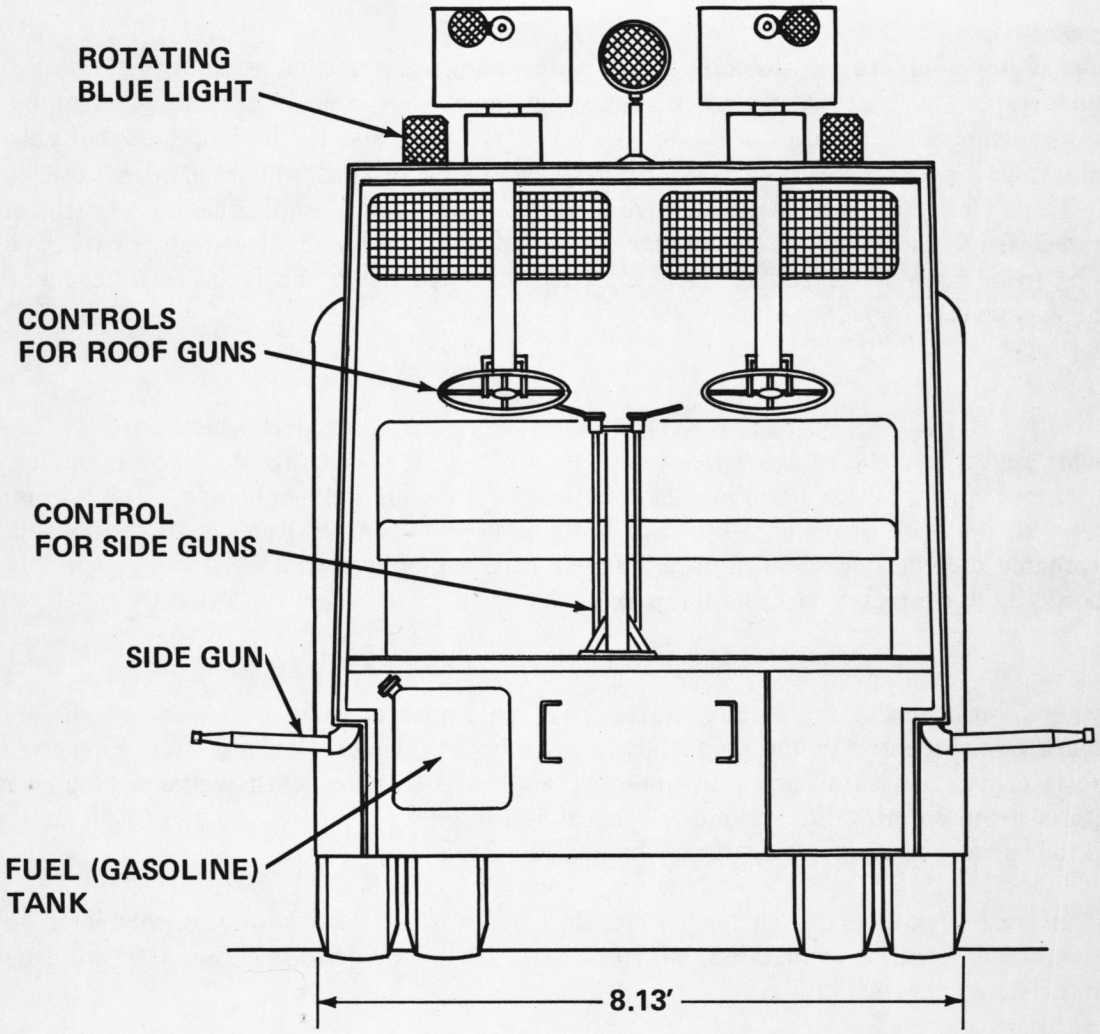

Figure 2
THE KELLER AND KNAPPICH "ISAR"
WATER CANNON
(Rear View)

The filling connection is located on the right side of the tank. A manhole on the top of the tank permits entry of inspection personnel. The water level can be observed through an inspection glass from inside the cab. Also, an audible and an optical device indicate when the water level in the tank falls to 391.4 gallons, approximately 1/5 full. The water pressure is indicated by a pressure gage inside the cab.

The interior of the tank is water resistant, and the connections are galvanized. In the winter, an electric heater prevents the water from freezing.

Water Pump and Motor Assembly. The water pump and motor assembly is installed at the vehicle's rear and is provided with a 3-mm-thick sheet steel cover. Both the water pump and its driving engine are located on a frame which is fitted crosswise to the length of the vehicle. This arrangement permits ready access for inspection, installation and removal of the complete assembly. The motor is controlled from the crew cab, and an additional push-button starter is located within the pump motor compartment. A centrifugal pump, electrically driven, is used for filling from open water sources. The electric motor for this pump is driven by the 12 V main vehicle engine.

Protective Hood. The protective hood consists of 3-mm sheet steel which protects the driving (main) engine and the vehicle's front end. Its wedge shape serves to shed any impeding debris. The upper portion of the hood may be removed for servicing the main engine. The V point of the wedge, to the back of which a snowplow attaching plate can be fitted, is also removable. These detachable members are held in place by rapid action couplings which can be opened only with a special key to protect them from tampering.

Piping Connections. For pumping water from open sources such as rivers and lakes, there is a suction pump located in the pump motor assembly controlled from the crew cab. The suction pipe is provided with a back pressure valve and an A-coupling with a screen to prevent solid material from entering the system. A vertical action pump is also connected to the suction pipe and the vacuum reading indicated on a manometer in the crew cab.

The pressure pump is connected to the four jet nozzles. One branch is connected to a fire extinguisher. Another connection, with two nozzles, is provided for flushing the windshield and extinguishing burning liquids.

All conduits are protected by flexible connections which prevent damage should the vehicle jackknife. The water pressure is indicated by a pressure gauge located in the crew cab. When the vehicle is used to transport drinking water, a special galvanized outlet equipped with a stopcock is provided.

Water Gun Battery. The water gun battery consists of two roof-mounted and two lateral nozzles controlled by means of a foot-operated three-way valve. All water jet guns are mounted in solid light metal molds equipped with roller bearings and are fitted with interchangable nozzles.

KELLER AND KNAPPICH WATER CANNON
Technical Data

Short-hooded with all-wheel drive MAN 13 215 HA Power 215 hp

Dimensions:

Wheel Base	185 in.
Length	318 in.
Width	100 in.
Height	141.2 in.

Weight:

Front Axle	13,227.6 lbs.
Rear Axle	28,659.8 lbs.
Total	41,887.4 lbs.

Tank Volume: 2,297.75 gal.

Auxiliary Engine: MAN D 0834 M

Constant Power – 72 hp at n* = 2030 r.p.m.
Fuel Consumption – 167 g/hp-hr. at n = 2030 r.p.m.
Short Period Power – 85 hp at n = 2300 r.p.m.
Fuel Consumption – 180 g/hp-hr. at n = 2300 r.p.m.
Max. Constant Power – 75 hp at n = 2200 r.p.m.

High Pressure Pump: KSB – WKL 80/5

Output 422.8 gal./min. at n = 2030 r.p.m.

Water Jet Guns

Roof Water Jet Guns – Aiming

Horizontal	360°
Vertical	35° downward
	55° upward

Nozzle diameter: 12, 14, and 16 mm interchangable

Lateral Water Jet Guns

Aiming	Horizontal approximately 170°
Nozzle diameter	12 mm

n* = Normal

Figure 3

The roof water jet guns are movable both in the horizontal and vertical plane, and are controlled by hand wheels located inside the cab.

The lateral water jet guns are movable in the horizontal plane only and are controlled by hand levers located inside the cab and connected to the jet pipes by flexible belts.

A set of synchronous controls makes possible the simultaneous control of all four water jet guns.

THE DAIMLER-BENZ WATER CANNON

The Frankfurt (Germany) Police Department has two water cannon manufactured by Daimler-Benz GmbH, with a special upper body fabricated by Meyer-Hagen Company (Figures 4, 9). They are equipped with a 140 horsepower engine having a stroke volume of 344 cubic inches. The total weight is 11.55 tons.

Body. The crew compartment accommodates a driver and four crew members. All windows and headlights are provided with guard grilles against stones, and the window panes are of bulletproof glass. The upper body is constructed of sheet steel, but upon special request the superstructure manufacturer delivers the vehicle with light armoring. The exterior of the vehicle is smooth and devoid of handles which might tempt demonstrators to climb on the vehicle.

Water Tank. The tank holds 1100 gallons of water. Two main water jet guns connected to the water tank are installed in an elevated position on the roof. These water jet guns can be independently aimed, both in azimuth and elevation. Additional spray pipes are installed on all four sides beneath the vehicle to prevent attack on the water cannon by rioters.

Water Pumps. The water pumps are driven by an air-cooled, four-cylinder, 38 horsepower Volkswagen engine, which operates independently from the main engine. Consequently, the water pressure remains stable even when the main engine is not operating. If water is ejected continuously at 147 p.s.i. with a nozzle diameter of 0.4 inches, the water reserves last 25 minutes. If water is ejected intermittently, it lasts approximately 40 to 45 minutes. At 147 p.s.i. and a nozzle diameter of 0.48 inches, the jet has a range of approximately 118 yards.

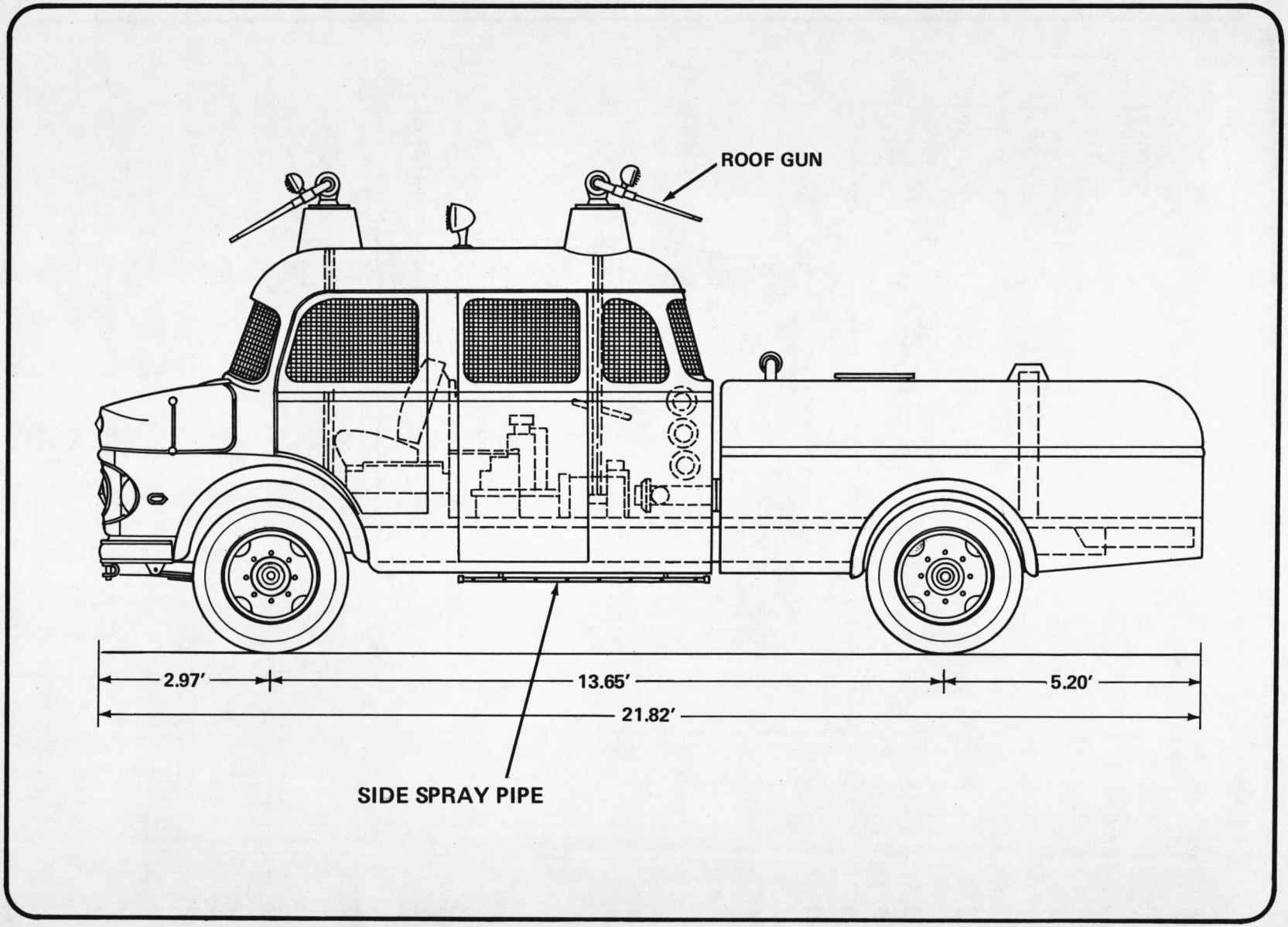

Figure 4
THE DAIMLER-BENZ WATER CANNON
(Side View)

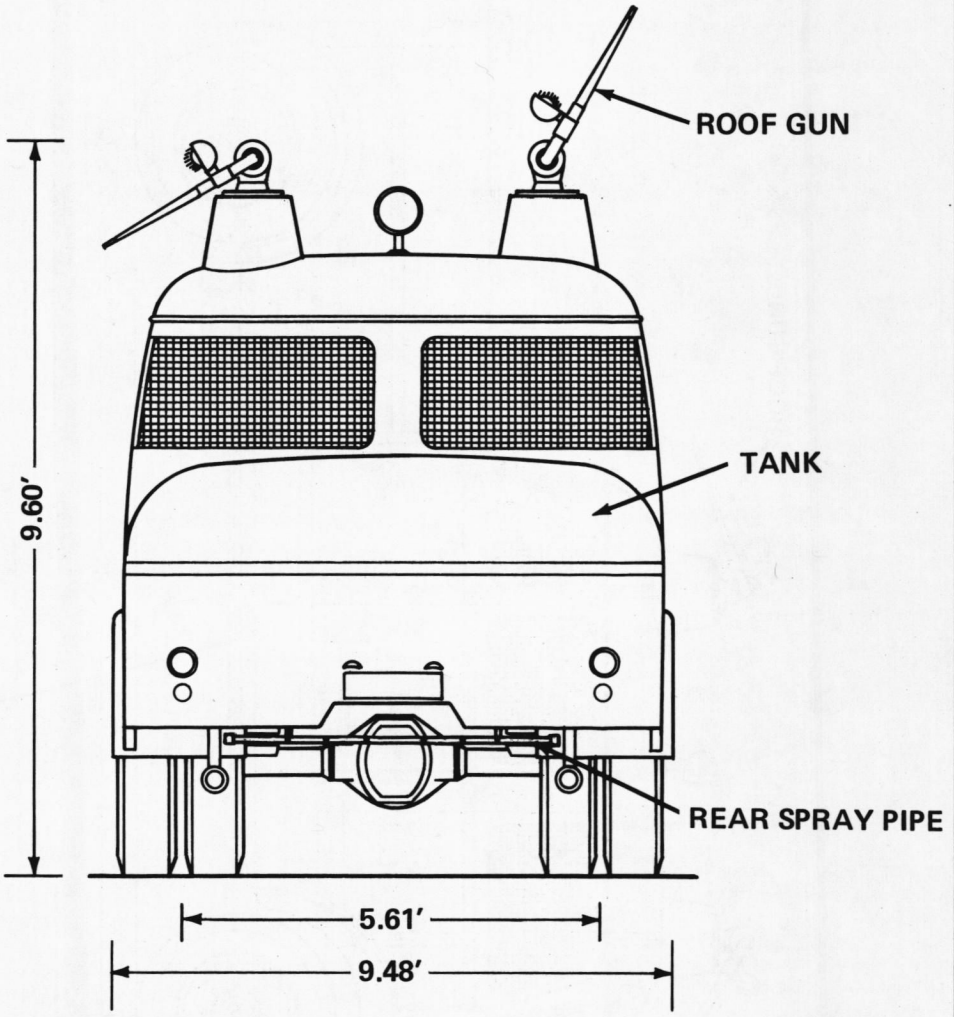

Figure 5
THE DAIMLER-BENZ WATER CANNON
(Rear View)

Tactics. The Frankfort Police does not consider water cannon employed during demonstrations as weapons, but rather as means of physical force. They are used only when simple physical force does not seem to be effective and the use of firearms should be avoided. They are used to clear streets and open areas as well as to protect buildings, facilities, and equipment. This equipment can also be used during natural catastrophes, and is, therefore, kept constantly filled with drinking water.

The Frankfort Police report the following as situations in which a water cannon can be utilized effectively in controlling a demonstration:

- If, for example, spectators to the rear of a mob are preventing the demonstrators from retreating, then the spectators are sprinkled first, thereby dispersing them and allowing an avenue of retreat to the mob. The water falling on the spectators, of course, falls in the form of a spray with no force and little consequent danger to the onlookers.

- Demonstrators can be prevented from advancing, or at least a space can be maintained between the police and a mob by creating a water barrier between the police and the demonstrators. This is done by directing the jet of water immediately to the front of the demonstrators. A water jet employed in this manner will also knock down small barricades.

- A full jet can be used against obstinate demonstrators to prevent them from pressing forward or to force them to retreat. An effective method of employment is to utilize the full force of the jet in short, intermittent bursts.

The effect of direct fire is increased and the danger of injury reduced when the water is mixed with a foaming agent such as Tutogen N. This agent consists of chemicals which have no permanent deleterious effect, and stained clothing can be rinsed out in water. The foam stings the eyes and makes the clothing clammy, heavy, and slow drying if a wetting agent has also been added to the water. When a foaming agent is added to the water, reserves last much longer. According to information from the Meyer-Hagen Company, 990 gallons of water make 8,580 gallons of foam.

In Frankfurt, the water cannon is never used with foam agents since the tanks are kept filled with drinking water at all times in the event of a public emergency.

DAIMLER-BENZ
Technical Data

Pump Capacity:

The maximum pressure is 235 p.s.i.

The nozzle is 0.4, 0.48, or 0.56 inch.

29 p.s.i. approximately 66 gal./min.
73 p.s.i. approximately 132 gal./min.
118 p.s.i. approximately 176 gal./min.
147 p.s.i. approximately 220 gal./min.
176 p.s.i. approximately 286 gal./min.
221 p.s.i. approximately 352 gal./min.

Water Consumption at 147 p.s.i.

Nozzle diameter – 0.40 in. = 44 gal./min.
Nozzle diameter – 0.48 in. = 66 gal./min.
Nozzle diameter – 0.56 in. = 88 gal./min.

Figure 6

Figure 7
DAIMLER-BENZ WATER CANNON
(Side View)

Figure 8
DAIMLER-BENZ WATER CANNON
(Oblique View)

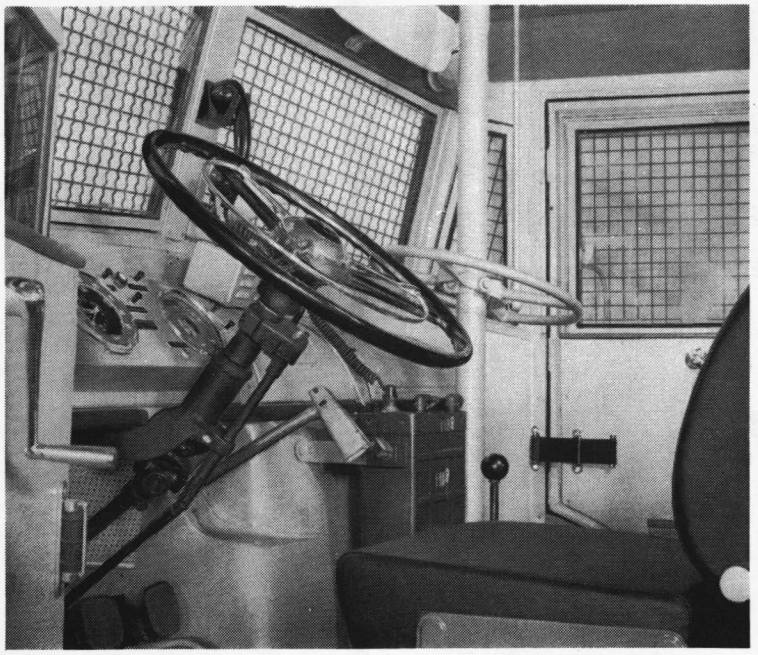

Figure 9
DAIMLER-BENZ WATER CANNON
(Interior and Operational Views)

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