

15.8 Signals and Simulators

Munitions listed in this section begin with the Department of Defense Identification Code (DODIC) letter “L.” Almost all munitions beginning with the DODIC letter L are used for signaling, although simulators used in training also fall under this category. Examples include green parachute signal flares, surface trip flares, ground burst simulators, and flash artillery simulators.

15.8.1 L305, M195 Green Star Parachute Signal Flare

15.8.1.1 Ordnance Description¹

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M195 Green Star Parachute Signal Flare (DODIC L305) is used for signaling and illumination. It uses a rocket that is launched from a hand-held device. After ignition, the rocket reaches a height of about 200 feet and produces a single, green-star illumination resembling a firework. The signal extends to a height of 700 to 750 feet and can be seen from a distance of 30 to 35 miles at night.

Signal flares are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, two M195 Green Star Parachute Signal Flares are used during each training event, which occur approximately five times a year at a given training facility.

This signal flare uses a rocket motor propulsion assembly contained in an aluminum launching tube. The M195 Green Star Parachute Signal Flare uses a parachute-suspended illuminant assembly. The illumination component consists primarily of barium nitrate and magnesium powder.

15.8.1.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M195 Green Star Parachute Signal Flare are particulate matter and carbon dioxide (CO₂). Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.1-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M195 Green Star Parachute Signal Flare. Table 15.8.1-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.1-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L305,
M195 GREEN STAR PARACHUTE SIGNAL FLARE - CARBON DIOXIDE, CRITERIA
POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS,
AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	8.8 E-02	2.8 E-01
630-08-0	Carbon monoxide (CO)	9.4 E-03	3.0 E-02
7439-92-1	Lead (Pb)	4.7 E-07	1.5 E-06
10102-44-0	Nitrogen dioxide (NO ₂)	1.1 E-04	3.4 E-04
10102-43-9	Nitrogen oxide (NO)	1.5 E-03	4.7 E-03
--	Nitrogen oxides (NO _x)	2.4 E-03	7.6 E-03
--	PM-10 ^d	1.2 E-01	3.7 E-01
7446-09-5	Sulfur dioxide (SO ₂)	7.8 E-05	2.5 E-04
--	TNMHC	1.7 E-04	5.5 E-04
12789-66-1	TSP	1.3 E-01	4.2 E-01

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.316 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.1-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L305,
M195 GREEN STAR PARACHUTE SIGNAL FLARE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	1.3 E-06	4.1 E-06
98-86-2	Acetophenone ^d	3.9 E-07	1.2 E-06
107-02-8	Acrolein ^d	1.1 E-06	3.4 E-06
107-13-1	Acrylonitrile ^d	1.3 E-06	4.0 E-06
7429-90-5	Aluminum ^e	9.3 E-05	3.0 E-04
7440-36-0	Antimony ^d	1.2 E-06	3.7 E-06
7440-39-3	Barium ^e	8.7 E-03	2.7 E-02
71-43-2	Benzene ^d	1.3 E-05	4.2 E-05
7440-41-7	Beryllium ^d	1.6 E-08	5.2 E-08
106-99-0	1,3-Butadiene ^d	3.6 E-06	1.1 E-05
123-72-8	Butanal ^e	1.5 E-07	4.7 E-07
7440-43-9	Cadmium ^d	1.2 E-06	3.7 E-06
75-15-0	Carbon disulfide ^d	1.0 E-05	3.3 E-05
56-23-5	Carbon tetrachloride ^d	2.9 E-07	9.2 E-07
463-58-1	Carbonyl sulfide ^d	2.6 E-07	8.1 E-07
7782-50-5	Chlorine ^d	3.1 E-06	9.8 E-06
7440-47-3	Chromium ^e	7.3 E-06	2.3 E-05
7440-48-4	Cobalt ^d	3.7 E-06	1.2 E-05
7440-50-8	Copper ^e	1.4 E-05	4.4 E-05
75-71-8	Dichlorodifluoromethane ^e	8.0 E-07	2.5 E-06
100-41-4	Ethyl benzene ^d	5.2 E-07	1.6 E-06
74-85-1	Ethylene ^e	5.7 E-05	1.8 E-04
7439-92-1	Lead ^d	4.7 E-07	1.5 E-06
7439-96-5	Manganese ^d	1.1 E-05	3.6 E-05
7439-97-6	Mercury ^d	1.3 E-08	4.3 E-08
1634-04-4	Methyl tert-butyl ether ^d	2.1 E-07	6.6 E-07
75-09-2	Methylene chloride ^d	1.2 E-04	3.9 E-04
78-93-3	Methyl ethyl ketone ^d	2.1 E-06	6.7 E-06
91-57-6	2-Methylnaphthalene	6.8 E-07	2.1 E-06

Table 15.8.1-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
91-20-3	Naphthalene ^d	8.0 E-07	2.5 E-06
7440-02-0	Nickel ^d	5.2 E-07	1.6 E-06
7723-14-0	Phosphorus ^d	1.2 E-05	3.7 E-05
115-07-1	Propene ^e	1.6 E-05	5.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	2.0 E-12	6.2 E-12
108-88-3	Toluene ^d	1.6 E-06	5.1 E-06
75-69-4	Trichloromonofluoromethane ^e	9.7 E-08	3.1 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	1.3 E-07	4.2 E-07
95-63-6	1,2,4-Trimethylbenzene ^e	5.5 E-07	1.7 E-06
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	1.1 E-06	3.4 E-06
95-47-6	o-Xylene ^d	3.5 E-07	1.1 E-06
7440-66-6	Zinc ^e	3.7 E-06	1.2 E-05

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.316 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.1

1. *M195 Green Star Parachute Signal Flare, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

15.8.5 L312, M127A1 White Star Parachute Signal Flare

15.8.5.1 Ordnance Description¹

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M127A1 White Star Parachute Signal Flare (DODIC L312) is used for signaling and illumination. It uses a rocket that is launched from a hand-held device. After ignition, the rocket reaches a height of about 200 feet and produces a single, white-star illumination resembling a firework. The signal extends to a height of 700 to 750 feet and can be seen from a distance of 30 to 35 miles at night.

Signal flares are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, two M127A1 White Star Parachute Signal Flares are used during each training event, which occur approximately five times a year at a given training facility.

This signal flare uses a rocket motor propulsion assembly contained in an aluminum launching tube and uses parachute-suspended illuminant assembly. The illumination component consists primarily of magnesium powder and sodium nitrate.

15.8.5.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M127A1 White Star Parachute Signal Flare is particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.5-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M127A1 White Star Parachute Signal Flare. Table 15.8.5-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.5-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L312,
M127A1 WHITE STAR PARACHUTE SIGNAL FLARE –
CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS,
AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	3.8 E-03	1.3 E-02
630-08-0	Carbon monoxide (CO)	4.4 E-03	1.6 E-02
7439-92-1	Lead (Pb)	5.5 E-06	1.9 E-05
10102-44-0	Nitrogen dioxide (NO ₂)	9.9 E-05	3.5 E-04
10102-43-9	Nitrogen oxide (NO)	3.6 E-03	1.3 E-02
--	Nitrogen oxides (NO _x)	5.7 E-03	2.0 E-02
--	PM-10 ^d	1.7 E-01	6.1 E-01
7446-09-5	Sulfur dioxide (SO ₂)	1.3 E-04	4.7 E-04
--	TNMHC	8.5 E-05	3.0 E-04
12789-66-1	TSP	1.8 E-01	6.4 E-01

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.283 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.5-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L312,
M127A1 WHITE STAR PARACHUTE SIGNAL FLARE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	1.7 E-06	6.1 E-06
98-86-2	Acetophenone ^d	7.9 E-07	2.8 E-06
107-02-8	Acrolein ^d	1.2 E-06	4.1 E-06
107-13-1	Acrylonitrile ^d	2.0 E-06	7.0 E-06
7429-90-5	Aluminum ^e	2.2 E-05	7.9 E-05
7440-36-0	Antimony ^d	1.6 E-06	5.6 E-06
7440-39-3	Barium ^e	8.9 E-05	3.1 E-04
71-43-2	Benzene ^d	9.6 E-06	3.4 E-05
7440-41-7	Beryllium ^d	2.5 E-08	9.0 E-08
106-99-0	1,3-Butadiene ^d	1.8 E-06	6.2 E-06
7440-43-9	Cadmium ^d	1.3 E-07	4.4 E-07
75-15-0	Carbon disulfide ^d	2.0 E-05	7.1 E-05
56-23-5	Carbon tetrachloride ^d	2.0 E-07	7.2 E-07
463-58-1	Carbonyl sulfide ^d	6.9 E-07	2.4 E-06
7782-50-5	Chlorine ^d	1.0 E-04	3.6 E-04
7440-47-3	Chromium ^e	7.5 E-06	2.6 E-05
7440-48-4	Cobalt ^d	2.6 E-07	9.1 E-07
7440-50-8	Copper ^e	7.6 E-06	2.7 E-05
84-74-2	Dibutyl phthalate ^d	2.7 E-06	9.5 E-06
75-71-8	Dichlorodifluoromethane ^e	8.8 E-07	3.1 E-06
100-41-4	Ethyl benzene ^d	8.9 E-07	3.1 E-06
74-85-1	Ethylene ^e	2.1 E-05	7.4 E-05
7439-92-1	Lead ^d	5.5 E-06	1.9 E-05
7439-96-5	Manganese ^d	3.1 E-05	1.1 E-04
7439-97-6	Mercury ^d	4.1 E-08	1.5 E-07
1634-04-4	Methyl tert-butyl ether ^d	1.3 E-07	4.6 E-07
75-09-2	Methylene chloride ^d	4.7 E-06	1.7 E-05
78-93-3	Methyl ethyl ketone ^d	1.9 E-06	6.7 E-06
91-20-3	Naphthalene ^d	4.6 E-07	1.6 E-06

Table 15.8.5-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7440-02-0	Nickel ^d	9.2 E-07	3.3 E-06
7723-14-0	Phosphorus ^d	1.1 E-05	3.8 E-05
115-07-1	Propene ^e	7.4 E-06	2.6 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent	1.4 E-12	4.8 E-12
108-88-3	Toluene ^d	1.8 E-06	6.2 E-06
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	1.3 E-08	4.7 E-08
95-63-6	1,2,4-Trimethylbenzene ^e	3.3 E-08	1.2 E-07
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	2.5 E-07	9.0 E-07
95-47-6	o-Xylene ^d	5.9 E-07	2.1 E-06
7440-66-6	Zinc ^e	4.9 E-06	1.7 E-05

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.283 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.5

1. M127A1 White Star Parachute Signal Flare, Pyrotechnics Fact Sheet, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

15.8.6 L314, M125A1 Green Star Cluster Signal Flare

15.8.6.1 Ordnance Description¹

Signal flares are pyrotechnic devices used for signaling and illumination. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Signal flares are used for communication among troops in the field and for illumination.

The M125A1 Green Star Cluster Signal Flare (DODIC L314) is used for signaling and illumination. It consists of a hand-held signal rocket that produces a cluster of five green, free-falling stars. After launch, the rocket reaches a height of about 200 feet and produces a five-star illumination, resembling a firework. The stars extend to a height of 650 to 800 feet.

Signal flares are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, two M125A1 Green Star Cluster Signal Flares are used during each training event, which occur approximately five times a year at a given training facility.

The M125A1 Green Star Cluster Signal Flare uses a rocket motor propulsion assembly contained in an aluminum launching tube. The illumination component consists primarily of barium nitrate, magnesium powder, and polyvinyl chloride.

15.8.6.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M125A1 Green Star Cluster Signal Flare are carbon dioxide (CO₂) and particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.6-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M125A1 Green Star Cluster Signal Flare. Table 15.8.6-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.6-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L314,
M125A1 GREEN STAR CLUSTER SIGNAL FLARE – CARBON DIOXIDE, CRITERIA
POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS,
AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	1.4 E-01	8.5 E-02
630-08-0	Carbon monoxide (CO)	1.0 E-02	6.2 E-03
7439-92-1	Lead (Pb)	2.0 E-06	1.2 E-06
10102-44-0	Nitrogen dioxide (NO ₂)	1.6 E-05	9.4 E-06
10102-43-9	Nitrogen oxide (NO)	1.1 E-03	6.4 E-04
--	Nitrogen oxides (NO _x)	1.7 E-03	9.9 E-04
--	PM-10 ^d	6.6 E-02	3.9 E-02
7446-09-5	Sulfur dioxide (SO ₂)	2.9 E-07	1.8 E-07
--	TNMHC	2.5 E-04	1.5 E-04
12789-66-1	TSP	7.6 E-02	4.5 E-02

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.6-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L314,
M125A1 GREEN STAR CLUSTER SIGNAL FLARE –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	2.1 E-06	1.3 E-06
98-86-2	Acetophenone ^d	8.0 E-07	4.8 E-07
107-02-8	Acrolein ^d	1.3 E-06	7.9 E-07
107-13-1	Acrylonitrile ^d	4.3 E-06	2.6 E-06
7429-90-5	Aluminum ^e	2.5 E-05	1.5 E-05
7440-36-0	Antimony ^d	1.3 E-06	7.8 E-07
7440-39-3	Barium ^e	1.3 E-03	7.6 E-04
71-43-2	Benzene ^d	1.7 E-05	1.0 E-05
7440-41-7	Beryllium ^d	1.7 E-08	1.0 E-08
106-99-0	1,3-Butadiene ^d	3.7 E-06	2.2 E-06
123-72-8	Butanal ^e	1.4 E-07	8.5 E-08
7440-43-9	Cadmium ^d	8.4 E-08	5.1 E-08
75-15-0	Carbon disulfide ^d	1.7 E-05	1.0 E-05
56-23-5	Carbon tetrachloride ^d	2.5 E-07	1.5 E-07
463-58-1	Carbonyl sulfide ^d	7.6 E-08	4.5 E-08
7782-50-5	Chlorine ^d	1.2 E-05	7.2 E-06
7440-47-3	Chromium ^e	6.5 E-06	3.9 E-06
7440-48-4	Cobalt ^d	7.8 E-07	4.6 E-07
7440-50-8	Copper ^e	9.7 E-06	5.8 E-06
84-74-2	Dibutyl phthalate ^d	9.9 E-07	6.0 E-07
75-71-8	Dichlorodifluoromethane ^e	4.9 E-07	3.0 E-07
100-41-4	Ethyl benzene ^d	1.7 E-06	1.0 E-06
74-85-1	Ethylene ^e	5.3 E-05	3.2 E-05
117-87-7	bis(2-Ethylhexyl)phthalate ^d	1.8 E-05	1.1 E-05
7647-01-0	Hydrochloric acid ^d	1.3 E-04	8.0 E-05
7439-92-1	Lead ^d	2.0 E-06	1.2 E-06
7439-96-5	Manganese ^d	1.6 E-05	9.7 E-06
7439-97-6	Mercury ^d	8.2 E-09	4.9 E-09
1634-04-4	Methyl tert-butyl ether ^d	1.2 E-07	7.0 E-08

Table 15.8.6-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-09-2	Methylene chloride ^d	9.3 E-05	5.6 E-05
78-93-3	Methyl ethyl ketone ^d	3.1 E-06	1.8 E-06
91-57-6	2-Methylnaphthalene	6.9 E-07	4.1 E-07
91-20-3	Naphthalene ^d	1.0 E-06	6.1 E-07
7440-02-0	Nickel ^d	4.9 E-07	2.9 E-07
7723-14-0	Phosphorus ^d	6.3 E-06	3.8 E-06
115-07-1	Propene ^e	1.9 E-05	1.1 E-05
100-42-5	Styrene ^d	6.7 E-07	4.0 E-07
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent	2.5 E-13	1.5 E-13
108-88-3	Toluene ^d	4.8 E-06	2.9 E-06
75-69-4	Trichloromonofluoromethane ^e	1.4 E-07	8.4 E-08
95-63-6	1,2,4-Trimethylbenzene ^e	7.1 E-07	4.3 E-07
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	1.5 E-06	9.1 E-07
95-47-6	o-Xylene ^d	1.8 E-06	1.1 E-06
7440-66-6	Zinc ^e	1.7 E-05	1.0 E-05

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 1.669 pounds per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.6

1. *M125A1 Green Star Cluster Signal Flare, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.

4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

DRAFT

15.8.10 L594, M115A2 Ground Burst Simulator

15.8.10.1 Ordnance Description

The M115A2 Ground Burst Simulator (DODIC L594) is a pyrotechnic device used exclusively in training to mimic battle sounds and flashes. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M115A2 Ground Burst Simulator creates battle noises and flashes mimicking that of shells in flight and ground explosions. It is only used on land and is hand-thrown, similar to a live grenade. It creates a high-pitched whistle that starts 6 to 10 seconds after ignition and lasts 2 to 4 seconds. Detonation follows, producing a flash and loud bang.

The M115A2 Ground Burst Simulator is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, five M115A2 Ground Burst Simulators are used during each training event, which occur approximately five times a year at a given training facility.

The M115A2 Ground Burst Simulator consists of a cylindrical paper tube containing a photoflash charge and a whistling assembly. This flash component consists of potassium perchlorate and aluminum powder. The whistler assembly is joined to a fuse lighter by a length of safety fuse.

15.8.10.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M115A2 Ground Burst Simulator is particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.10-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M115A2 Ground Burst Simulator. Table 15.8.10-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.10-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L594, M115A2 GROUND BURST SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	3.4 E-03	2.4 E-02
630-08-0	Carbon monoxide (CO)	2.1 E-03	1.5 E-02
7439-92-1	Lead (Pb)	4.1 E-06	2.9 E-05
10102-44-0	Nitrogen dioxide (NO ₂)	1.5 E-04	1.1 E-03
10102-43-9	Nitrogen oxide (NO)	3.5 E-03	2.5 E-02
--	Nitrogen oxides (NO _x)	5.5 E-03	3.9 E-02
--	PM-10 ^d	1.9 E-01	1.4
7446-09-5	Sulfur dioxide (SO ₂)	1.5 E-04	1.1 E-03
--	TNMHC	1.3 E-04	9.1 E-04
12789-66-1	TSP	1.6 E-01	1.1

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.141 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.10-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L594,
M115A2 GROUND BURST SIMULATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	2.6 E-07	1.8 E-06
98-86-2	Acetophenone ^d	6.1 E-07	4.3 E-06
107-02-8	Acrolein ^d	2.7 E-06	1.9 E-05
7429-90-5	Aluminum ^e	1.9 E-02	1.3 E-01
7440-36-0	Antimony ^d	2.7 E-05	1.9 E-04
7440-38-2	Arsenic ^d	2.6 E-07	1.9 E-06
7440-39-3	Barium ^e	6.0 E-05	4.3 E-04
71-43-2	Benzene ^d	8.8 E-06	6.3 E-05
7440-41-7	Beryllium ^d	4.8 E-08	3.4 E-07
106-99-0	1,3-Butadiene ^d	9.7 E-07	7.0 E-06
123-72-8	Butanal ^e	1.7 E-07	1.2 E-06
85-68-7	Butylbenzylphthalate ^f	2.1 E-06	1.5 E-05
7440-43-9	Cadmium ^d	3.8 E-07	2.7 E-06
75-15-0	Carbon disulfide ^d	5.1 E-05	3.6 E-04
56-23-5	Carbon tetrachloride ^d	9.7 E-08	6.9 E-07
463-58-1	Carbonyl sulfide ^d	3.9 E-07	2.8 E-06
7782-50-5	Chlorine ^d	5.5 E-05	4.0 E-04
7440-47-3	Chromium ^e	1.2 E-06	8.3 E-06
7440-48-4	Cobalt ^d	5.9 E-07	4.2 E-06
7440-50-8	Copper ^e	3.9 E-05	2.8 E-04
84-74-2	Dibutyl phthalate ^d	2.2 E-06	1.6 E-05
100-41-4	Ethyl benzene ^d	7.5 E-07	5.4 E-06
74-85-1	Ethylene ^e	3.2 E-05	2.3 E-04
7647-01-0	Hydrochloric acid ^d	6.4 E-05	4.6 E-04
7439-92-1	Lead ^d	4.1 E-06	2.9 E-05
7439-96-5	Manganese ^d	3.7 E-05	2.7 E-04
7439-97-6	Mercury ^d	1.8 E-08	1.3 E-07
75-09-2	Methylene chloride ^d	9.0 E-06	6.4 E-05
78-93-3	Methyl ethyl ketone ^d	1.8 E-06	1.3 E-05

Table 15.8.10-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
91-57-6	2-Methylnaphthalene ^f	3.1 E-07	2.2 E-06
91-20-3	Naphthalene ^d	1.3 E-06	9.3 E-06
7440-02-0	Nickel ^d	2.1 E-06	1.5 E-05
7723-14-0	Phosphorus ^d	6.6 E-05	4.7 E-04
115-07-1	Propene ^e	7.0 E-06	5.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	1.7 E-12	1.2 E-11
108-88-3	Toluene ^d	1.8 E-06	1.3 E-05
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	1.9 E-08	1.3 E-07
95-63-6	1,2,4-Trimethylbenzene ^e	6.7 E-07	4.8 E-06
540-84-1	2,2,4-Trimethylpentane ^f	4.2 E-07	3.0 E-06
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	8.3 E-07	5.9 E-06
95-47-6	o-Xylene ^d	6.4 E-07	4.6 E-06
7440-66-6	Zinc ^e	3.0 E-05	2.1 E-04

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.141 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.10

1. *M115A2 Ground Burst Simulator, Pyrotechnics Fact Sheet*. U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD. Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

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15.8.11 L596, M110 Flash Artillery Simulator

15.8.11 Ordnance Description¹

The M110 Flash Artillery Simulator (DODIC L596) or “gunflash” is a pyrotechnic device that is used to mimic the sounds and flames of battle. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M110 Flash Artillery Simulator is used as a “blank” during training exercises in place of an actual weapon. It produces a flash that is similar to the 90 mm Gun M2 series and the 155 mm Howitzer M1 series. Conducting this simulation during training exercises allows service men and women to prepare for real-life situations.

The M110 Flash Artillery Simulator is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, ten M110 Flash Artillery Simulators are activated during each training event, which occur approximately five times a year at a given training facility.

The M110 Flash Artillery Simulator contains a pyrotechnic charge referred to as the flash composition. This charge is made up mostly of magnesium powder and potassium perchlorate. Prior to setup, the simulator is filled with approximately 1/4 cup of gasoline to enhance blast and flash effects. It is electrically initiated and functions instantaneously when current is applied to the electric squib. The simulator is dangerous, producing fragmentation out to 50 yards while exposing users to the hazards of gasoline-enhanced flash burns.

15.8.11.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M110 Flash Artillery Simulator are carbon dioxide (CO₂) and particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.11-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP). Table 15.8.11-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.11-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L596,
M110 FLASH ARTILLERY SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS,
TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	2.5 E-01	1.3
630-08-0	Carbon monoxide (CO)	6.8 E-03	3.6 E-02
7439-92-1	Lead (Pb)	1.1 E-05	5.8 E-05
10102-44-0	Nitrogen dioxide (NO ₂)	3.1 E-04	1.7 E-03
10102-43-9	Nitrogen oxide (NO)	1.1 E-03	5.7 E-03
--	Nitrogen oxides (NO _x)	2.0 E-03	1.0 E-02
--	PM-10 ^d	4.5 E-02	2.4 E-01
7446-09-5	Sulfur dioxide (SO ₂)	1.8 E-04	9.4 E-04
--	TNMHC	4.9 E-03	2.6 E-02
12789-66-1	TSP	5.8 E-02	3.1 E-01

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.188 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.11-2 EMISSION FACTORS FOR THE DETONATION OF
DODIC L596, M110 FLASH ARTILLERY SIMULATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
208-96-8	Acenaphthylene ^f	1.0 E-06	5.6 E-06
107-02-8	Acrolein ^d	1.8 E-05	9.4 E-05
7429-90-5	Aluminum ^e	3.1 E-04	1.7 E-03
7440-36-0	Antimony ^d	4.5 E-05	2.4 E-04
7440-39-3	Barium ^e	3.4 E-03	1.8 E-02
71-43-2	Benzene ^d	2.1 E-03	1.1 E-02
106-99-0	1,3-Butadiene ^d	4.4 E-05	2.3 E-04
7440-43-9	Cadmium ^d	3.0 E-07	1.6 E-06
75-15-0	Carbon disulfide ^d	1.8 E-05	9.8 E-05
463-58-1	Carbonyl sulfide ^d	5.1 E-06	2.7 E-05
7782-50-5	Chlorine ^d	4.7 E-05	2.5 E-04
7440-47-3	Chromium ^e	8.5 E-06	4.5 E-05
7440-48-4	Cobalt ^d	9.6 E-07	5.1 E-06
7440-50-8	Copper ^e	7.6 E-05	4.1 E-04
106-44-5, 108-39-4	p-Cresol, m-Cresol ^d	1.3 E-06	6.8 E-06
98-82-8	Cumene ^d	4.7 E-06	2.5 E-05
110-82-7	Cyclohexane ^e	9.9 E-05	5.3 E-04
75-71-8	Dichlorodifluoromethane ^e	2.2 E-06	1.2 E-05
100-41-4	Ethyl benzene ^d	2.0 E-03	1.1 E-02
74-85-1	Ethylene ^e	4.7 E-05	2.5 E-04
110-54-3	n-Hexane ^d	2.3 E-04	1.2 E-03
7647-01-0	Hydrochloric acid ^d	1.3 E-04	6.9 E-04
7439-92-1	Lead ^d	1.1 E-05	5.8 E-05
7439-96-5	Manganese ^d	1.3 E-05	6.8 E-05
1634-04-4	Methyl tert-butyl ether ^d	2.1 E-03	1.1 E-02
75-09-2	Methylene chloride ^d	1.8 E-05	9.6 E-05
78-93-3	Methyl ethyl ketone ^d	2.2 E-05	1.2 E-04
91-57-6	2-Methylnaphthalene ^f	3.1 E-05	1.6 E-04
91-20-3	Naphthalene ^d	7.1 E-05	3.8 E-04

Table 15.8.11-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7440-02-0	Nickel ^d	5.1 E-07	2.7 E-06
127-18-4	Perchloroethylene ^d	5.7 E-04	3.1 E-04
85-01-8	Phenanthrene ^e	6.7 E-07	3.6 E-06
7723-14-0	Phosphorus ^d	6.1 E-06	3.3 E-05
115-07-1	Propene ^e	2.1 E-05	1.1 E-04
129-00-0	Pyrene ^f	1.9 E-07	1.0 E-06
100-42-5	Styrene ^d	1.5 E-05	8.0 E-05
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	1.4 E-12	7.5 E-12
108-88-3	Toluene ^d	5.2 E-03	2.8 E-02
95-63-6	1,2,4-Trimethylbenzene ^e	1.5 E-03	8.2 E-03
540-84-1	2,2,4-Trimethylpentane ^f	3.3 E-05	1.8 E-04
108-38-3, 106-42-3	m-Xylene, p-Xylene ^d	3.7 E-03	2.0 E-02
95-47-6	o-Xylene ^d	2.3 E-03	1.2 E-02
7440-66-6	Zinc ^e	1.7 E-05	9.1 E-05

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.188 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.11

1. *M110 Flash Artillery Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

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15.8.12 L598, M117 Flash Booby Trap Simulator

15.8.12.1 Ordnance Description¹

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M117 Flash Booby Trap Simulator (DODIC L598) is attached to a tree approximately 150 feet in front of the unit's defensive lines. A wire is tied between the device and another tree approximately 75 feet away. When an enemy approaches, he becomes entangled in the wire, which activates the M117 Booby Trap Simulator. When activated, the M117 Booby Trap Simulator creates a loud bang and a bright flash.

Booby trap simulators are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, about ten M117 Flash Booby Trap Simulators are used during each training event, which occur approximately five times a year at a given training facility.

The M117 Flash Booby Trap Simulator contains a pyrotechnic charge that consists mostly of magnesium powder and potassium chlorate. When it is activated, substances are released to the air for only a few seconds.

15.8.12.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M117 Flash Booby Trap Simulator is particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act (CAA)*, and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act [EPCRA]*) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.12-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M117 Flash Booby Trap Simulator. Table 15.8.12-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.12-1 EMISSIONS FACTORS FOR THE DETONATION OF DODIC L598, M117 FLASH BOOBY TRAP SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANEHYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
630-08-0	Carbon monoxide (CO)	5.3 E-05	6.8 E-03
7439-92-1	Lead (Pb)	2.3 E-06	3.0 E-04
10102-44-0	Nitrogen dioxide (NO ₂)	2.6 E-06	3.4 E-04
10102-43-9	Nitrogen oxide (NO)	2.9 E-05	3.8 E-03
--	Nitrogen oxides (NO _x)	5.0 E-05	6.5 E-03
--	PM-10 ^d	2.5 E-03	3.3 E-01
7446-09-5	Sulfur dioxide (SO ₂)	4.4 E-04	5.7 E-02
--	TNMHC	3.8 E-06	4.9 E-04
12789-66-1	TSP	3.2 E-03	4.2 E-01

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0077 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

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Table 15.8.12-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L598,
M117 FLASH BOOBY TRAP SIMULATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-05-8	Acetonitrile ^d	2.9 E-08	3.8 E-06
98-86-2	Acetophenone ^d	3.9 E-09	5.1 E-07
107-02-8	Acrolein ^d	1.6 E-07	2.1 E-05
107-13-1	Acrylonitrile ^d	2.5 E-08	3.3 E-06
7429-90-5	Aluminum ^e	9.3 E-06	1.2 E-03
7440-36-0	Antimony ^d	8.9 E-04	1.2 E-01
7440-38-2	Arsenic ^d	1.8 E-06	2.3 E-04
7440-39-3	Barium ^e	1.5 E-07	1.9 E-05
71-43-2	Benzene ^d	3.5 E-07	4.6 E-05
106-99-0	1,3-Butadiene ^d	7.8 E-08	1.0 E-05
123-72-8	Butanal ^e	6.1 E-09	7.9 E-07
85-68-7	Butylbenzylphthalate ^f	3.2 E-08	4.2 E-06
84-74-2	Di-n-butylphthalate ^d	6.2 E-08	8.1 E-06
7440-43-9	Cadmium ^d	6.9 E-09	9.0 E-07
75-15-0	Carbon disulfide ^d	2.9 E-06	3.7 E-04
56-23-5	Carbon tetrachloride ^d	6.6 E-08	8.5 E-06
463-58-1	Carbonyl sulfide ^d	1.2 E-08	1.6 E-06
7782-50-5	Chlorine ^d	4.3 E-04	5.6 E-02
7440-47-3	Chromium ^e	1.5 E-07	2.0 E-05
7440-48-4	Cobalt ^d	9.1 E-09	1.2 E-06
7440-50-8	Copper ^e	1.5 E-06	2.0 E-04
84-74-2	Dibutyl phthalate ^d	6.2 E-08	8.1 E-06
75-71-8	Dichlorodifluoromethane ^e	1.3 E-07	1.7 E-05
74-85-1	Ethylene ^e	4.8 E-07	6.3 E-05
110-54-3	n-Hexane ^d	8.5 E-08	1.1 E-05
7439-92-1	Lead	2.3 E-06	3.0 E-04
7439-96-5	Manganese ^d	4.2 E-07	5.4 E-05
1634-04-4	Methyl tert-butyl ether ^d	8.8 E-08	1.1 E-05
75-09-2	Methylene chloride ^d	4.5 E-07	5.9 E-05

Table 15.8.12-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
78-93-3	Methyl ethyl ketone ^d	6.0 E-08	7.7 E-06
91-20-3	Naphthalene ^d	3.0 E-08	3.9 E-06
7440-02-0	Nickel ^d	2.6 E-08	3.4 E-06
7723-14-0	Phosphorus ^d	2.4 E-05	3.1 E-03
7782-49-2	Selenium ^d	1.9 E-08	2.5 E-06
7440-22-4	Silver ^e	3.8 E-08	4.9 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	6.5 E-14	8.4 E-12
108-88-3	Toluene ^d	1.9 E-07	2.5 E-05
75-69-4	Trichloromonofluoromethane ^e	2.1 E-07	2.7 E-05
95-63-6	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	8.5 E-10	1.1 E-07
540-84-1	2,2,4-Trimethylpentane ^f	3.4 E-07	4.4 E-05
108-38-3, 106-42-3	m-Xylene, p-Xylene ^d	7.0 E-08	9.1 E-06
7440-66-6	Zinc ^e	1.0 E-06	1.3 E-04

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0077 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.12

1. *M117 Flash Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

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15.8.13 L599, M118 Illuminating Booby Trap Simulator

15.8.13.1 Ordnance Description¹

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M118 Illuminating Booby Trap Simulator (DODIC L599) is attached to a sturdy object, such as a tree. A wire is run from that object across a path that is expected to be crossed by the enemy and fastened to another object on the other side of the path. The M118 Booby Trap Illumination is activated (i.e., produces an illumination) when someone trips over the hidden wire.

Booby trap simulators are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, three M118 Illuminating Booby Trap Simulators are used during an entire day of training, which generally occurs five times a year at a given training facility.

The M118 Illuminating Booby Trap Simulator is filled with a pyrotechnic composition that consists mostly of potassium nitrate. The pyrotechnic charge weights about 0.18 ounce.

15.8.13.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M118 Illuminating Booby Trap Simulator are carbon dioxide (CO₂) and particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.13-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M118 Illuminating Booby Simulator. Table 15.8.13-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.13-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L599, M118 ILLUMINATING BOOBY TRAP SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATES^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-6	CO ₂	1.7 E-02	1.3
630-08-0	Carbon monoxide (CO)	2.7 E-04	2.0 E-02
7439-92-1	Lead (Pb)	5.5 E-08	4.2 E-06
10102-44-0	Nitrogen dioxide (NO ₂)	5.0 E-05	3.9 E-03
10102-43-9	Nitrogen oxide (NO)	2.0 E-06	1.5 E-04
--	Nitrogen oxides (NO _x)	1.9 E-06	1.5 E-04
--	PM-10 ^d	3.9 E-03	3.0 E-01
7446-09-5	Sulfur dioxide (SO ₂)	2.1 E-06	1.6 E-04
--	TNMHC	2.0 E-05	1.5 E-03
12789-66-1	TSP	3.8 E-03	2.9 E-01

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0134 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.13-2 EMISSION FACTORS FOR DETONATION OF DODIC L599,
M118 ILLUMINATING BOOBY TRAP SIMULATOR -
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	1.8 E-07	1.4 E-05
75-05-8	Acetonitrile ^d	3.0 E-08	2.3 E-06
98-86-2	Acetophenone ^d	1.9 E-08	1.4 E-06
107-02-8	Acrolein ^d	1.5 E-07	1.2 E-05
107-13-1	Acrylonitrile ^d	1.1 E-08	8.6 E-07
7429-90-5	Aluminum ^e	4.5 E-07	3.5 E-05
7440-36-0	Antimony ^d	8.4 E-06	6.5 E-04
7440-38-2	Arsenic ^d	1.2 E-08	9.0 E-07
7440-39-3	Barium ^e	3.0 E-08	2.3 E-06
71-43-2	Benzene ^d	1.1 E-06	8.8 E-05
106-99-0	1,3-Butadiene ^d	2.4 E-07	1.8 E-05
123-72-8	Butanal ^e	1.1 E-07	8.6 E-06
7440-43-9	Cadmium ^d	1.5 E-08	1.1 E-06
75-15-0	Carbon disulfide ^d	7.6 E-07	5.9 E-05
56-23-5	Carbon tetrachloride ^d	9.8 E-09	7.5 E-07
463-58-1	Carbonyl sulfide ^d	1.4 E-08	1.1 E-06
7782-50-5	Chlorine ^d	1.1 E-07	8.1 E-06
7440-47-3	Chromium ^e	9.3 E-09	7.2 E-07
7440-48-4	Cobalt ^d	6.7 E-09	5.2 E-07
7440-50-8	Copper ^e	7.3 E-08	5.6 E-06
84-74-2	Dibutyl phthalate ^d	6.0 E-08	4.6 E-06
75-71-8	Dichlorodifluoromethane ^e	4.9 E-08	3.8 E-06
100-41-4	Ethyl benzene ^d	2.6 E-07	2.0 E-05
74-85-1	Ethylene ^e	3.9 E-06	3.0 E-04
117-81-7	bis(2-Ethylhexyl)phthalate ^d	8.9 E-08	6.8 E-06
110-54-3	n-Hexane ^d	2.5 E-08	2.0 E-06
7647-01-0	Hydrochloric acid ^d	2.5 E-07	1.9 E-05
7439-92-1	Lead ^d	5.5 E-08	4.2 E-06

Table 15.8.13-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
7439-96-5	Manganese ^d	1.4 E-08	1.1 E-06
7439-97-6	Mercury ^d	3.8 E-10	3.0 E-08
75-09-2	Methylene chloride ^d	6.7 E-07	5.1 E-05
78-93-3	Methyl ethyl ketone ^d	2.4 E-07	1.8 E-05
91-20-3	Naphthalene ^d	8.2 E-08	6.3 E-06
7440-02-0	Nickel ^d	2.5 E-08	1.9 E-06
108-95-2	Phenol ^d	5.6 E-08	4.3 E-06
7723-14-0	Phosphorus ^d	2.3 E-05	1.8 E-03
115-07-1	Propene ^e	8.0 E-07	6.1 E-05
129-00-0	Pyrene ^f	1.1 E-08	8.7 E-07
100-42-5	Styrene ^d	1.0 E-07	7.7 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	3.2 E-14	2.5 E-12
108-88-3	Toluene ^d	3.6 E-07	2.7 E-05
75-69-4	Trichloromonofluoromethane ^e	6.2 E-10	4.8 E-08
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	2.3 E-09	1.8 E-07
540-84-1	2,2,4-Trimethylpentane ^f	4.5 E-08	3.4 E-06
108-38-3, 106-42-3	m-Xylene, p-Xylene ^d	7.3 E-07	5.6 E-05
95-47-6	o-Xylene ^d	2.5 E-07	1.9 E-05
7440-66-6	Zinc ^e	3.4 E-06	2.6 E-04

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0134 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.13

1. *M118 Illuminating Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.

3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
5. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

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15.8.14 L600, M119 Whistling Booby Trap Simulator

15.8.14.1 Ordnance Description¹

Booby trap simulators are pyrotechnic devices used to alert troops to an approaching enemy. Pyrotechnics give off smoke, light, and/or a loud noise when activated. These simulators imitate the sounds and flashes of combat. Troops are taught how to set up these devices during training exercises and how to be cautious when they are exposed to similar devices set by an enemy.

The M119 Whistling Booby Trap Simulator (DODIC L599) is attached to a sturdy object, such as a tree. A wire is run from that object across the path that is expected to be crossed by the enemy and fastened to another object on the other side of the path. The M119 Whistling Booby Trap Simulator is activated (i.e., producing a whistling sound) when someone trips over the hidden wire.

Booby trap simulators are used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, three M119 Whistling Booby Trap Simulators are used during an entire day of training, which generally occurs five times a year at a given training facility.

The M119 Whistling Booby Trap Simulator is filled with a composition consisting mostly of potassium perchlorate and sodium salicylate. The reaction between these compounds is used to produce the whistling noise, as in many consumer fireworks.

15.8.14.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M119 Whistling Booby Trap Simulator are carbon dioxide (CO₂), carbon monoxide (CO), and particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.14-1 presents emission factors for CO₂, criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M119 Whistling Booby Trap Simulator. Table 15.8.14-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.14-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L600, M119 WHISTLING BOOBY TRAP SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	4.1 E-03	3.9 E-02
630-08-0	CO	1.4 E-03	1.3 E-02
10102-44-0	Nitrogen dioxide (NO ₂)	1.4 E-05	1.4 E-04
10102-43-9	Nitric oxide (NO)	3.7 E-05	3.5 E-04
--	Nitrogen oxides (NO _x)	6.6 E-05	6.3 E-04
--	PM-10 ^d	2.4 E-03	2.2 E-02
7446-09-5	Sulfur dioxide (SO ₂)	8.1 E-06	7.6 E-05
--	TNMHC	6.2 E-05	5.8 E-04
12789-66-1	TSP	2.4 E-03	2.2 E-02

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.106 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

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Table 15.8.14-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L600,
M119 WHISTLING BOOBY TRAP SIMULATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
75-07-0	Acetaldehyde ^d	2.7 E-07	2.5 E-06
98-86-2	Acetophenone ^d	3.4 E-08	3.2 E-07
107-02-8	Acrolein ^d	2.7 E-07	2.5 E-06
71-43-2	Benzene ^d	7.1 E-06	6.7 E-05
106-99-0	1,3-Butadiene ^d	1.1 E-06	1.1 E-05
123-72-8	Butanal ^e	4.0 E-07	3.7 E-06
75-15-0	Carbon disulfide ^d	1.7 E-06	1.6 E-05
56-23-5	Carbon tetrachloride ^d	3.6 E-08	3.4 E-07
7782-50-5	Chlorine ^d	8.8 E-06	8.3 E-05
84-74-2	Dibutyl phthalate ^d	3.8 E-07	3.5 E-06
75-71-8	Dichlorodifluoromethane ^e	9.1 E-09	8.6 E-08
100-41-4	Ethyl benzene ^d	2.9 E-06	2.8 E-05
74-85-1	Ethylene ^e	1.2 E-05	1.1 E-04
7647-01-0	Hydrochloric acid ^d	2.3 E-06	2.2 E-05
1634-04-4	Methyl tert-butyl ether ^d	8.7 E-09	8.2 E-08
75-09-2	Methylene chloride ^d	1.7 E-06	1.6 E-05
78-93-3	Methyl ethyl ketone ^d	5.5 E-07	5.2 E-06
91-20-3	Naphthalene ^d	3.4 E-07	3.2 E-06
67-63-0	2-Propanol ^e	1.9 E-07	1.8 E-06
115-07-1	Propene ^e	1.9 E-06	1.7 E-05
100-42-5	Styrene ^d	5.8 E-07	5.5 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	1.0 E-13	9.5 E-13
108-88-3	Toluene ^d	1.6 E-06	1.5 E-05
75-69-4	Trichloromonofluoromethane ^e	8.4 E-08	7.9 E-07
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane ^e	2.6 E-08	2.5 E-07
95-63-6	1,2,4-Trimethylbenzene ^e	1.7 E-07	1.6 E-06
540-84-1	2,2,4-Trimethylpentane ^f	5.7 E-08	5.4 E-07

Table 15.8.14-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	7.3 E-06	6.9 E-05
95-47-6	o-Xylene ^d	2.4 E-06	2.2 E-05

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.106 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.14

1. *M119 Whistling Booby Trap Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase II Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, July 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.
5. *Background Document, Report on Revisions to 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

15.8.15 L601, M116A1 Hand Grenade Simulator

15.8.15.1 Ordnance Description

The M116A1 Hand Grenade Simulator (DODIC L601) is a pyrotechnic device used exclusively in training to mimic battle sounds and flashes. Pyrotechnics give off smoke, light, and/or a loud noise when activated. Since it is used to imitate the sounds and flashes of combat, it is a simulator.

The M116A1 Hand Grenade Simulator mimics the sounds and flashes of actual grenades used during combat and is only used on land. It is thrown in the same manner as a live grenade and creates a loud bang and flash 5 to 10 seconds after igniting. The M116A1 Hand Grenade Simulator looks and sounds very similar to a live grenade, creating a realistic combat environment.

The M116A1 Hand Grenade Simulator is used during many Army training exercises, which are held at nearly every Army training installation. At most locations, the training areas are at least 1,000 meters (over 0.5 mile) away from populated areas. Typically, about sixty M116A1 Hand Grenade Simulators are used during each training event, which occur approximately five times a year at a given training facility.

The M116A1 Hand Grenade Simulator consists of a cylindrical paper tube containing a sealed charge of photoflash powder. This charge creates the flash and bang after the M116A1 Hand Grenade Simulator is ignited. The powder consists of potassium perchlorate, magnesium powder, and aluminum powder. A fuse igniter is attached to the outside of the tube and is joined to the photoflash by a safety fuse.

15.8.15.2 Emissions and Controls²⁻⁵

The primary emissions from the detonation of the M116A1 Hand Grenade Simulator is particulate matter. Other criteria pollutants, hazardous air pollutants in the *Clean Air Act* (CAA), and toxic chemicals (i.e., those chemicals regulated under Section 313 of the *Emergency Planning and Community Right-to-Know Act* [EPCRA]) are emitted at very low levels. As these ordnance are typically detonated in the field, there are no controls associated with their use.

Table 15.8.15-1 presents emission factors for carbon dioxide (CO₂), criteria pollutants, total nonmethane hydrocarbons (TNMHC), and total suspended particulate (TSP) for the M116A1 Hand Grenade Simulator. Table 15.8.15-2 presents emission factors for hazardous air pollutants and toxic chemicals.

Table 15.8.15-1 EMISSION FACTORS FOR THE DETONATION OF DODIC L601, M116A1 HAND GRENADE SIMULATOR – CARBON DIOXIDE, CRITERIA POLLUTANTS, TOTAL NONMETHANE HYDROCARBONS, AND TOTAL SUSPENDED PARTICULATE^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
124-38-9	CO ₂	4.1 E-03	5.1 E-02
630-08-0	Carbon monoxide (CO)	3.7 E-04	4.5 E-03
7439-92-1	Lead (Pb)	1.4 E-06	1.7 E-05
10102-44-0	Nitrogen dioxide (NO ₂)	1.7 E-04	2.1 E-03
10102-43-9	Nitrogen oxide (NO)	3.6 E-03	4.4 E-02
--	Nitrogen oxides (NO _x)	5.6 E-03	6.9 E-02
--	PM-10 ^d	1.2 E-01	1.5
7446-09-5	Sulfur dioxide (SO ₂)	4.7 E-04	5.8 E-03
--	TNMHC	4.2 E-05	5.1 E-04
12789-66-1	TSP	1.1 E-01	1.4

^a Factors represent uncontrolled emissions. References 2 and 3.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0813 pound per item. Reference 4.

^d PM-10 = particulate matter with an aerodynamic diameter equal to or less than 10 micrometers (µm).

Table 15.8.15-2 EMISSION FACTORS FOR THE DETONATION OF DODIC L601,
M116A1 HAND GRENADE SIMULATOR –
HAZARDOUS AIR POLLUTANTS AND TOXIC CHEMICALS^a

EMISSION FACTOR RATING: C

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
98-86-2	Acetophenone ^d	3.8 E-07	4.7 E-06
107-02-8	Acrolein ^d	1.7 E-06	2.1 E-05
107-13-1	Acrylonitrile ^d	3.4 E-07	4.2 E-06
7429-90-5	Aluminum ^e	1.1 E-02	1.4 E-01
7440-36-0	Antimony ^d	2.0 E-05	2.4 E-04
7440-38-2	Arsenic ^d	2.7 E-07	3.3 E-06
7440-39-3	Barium ^e	3.9 E-05	4.8 E-04
71-43-2	Benzene ^d	1.5 E-06	1.8 E-05
7440-41-7	Beryllium ^d	3.6 E-08	4.4 E-07
106-99-0	1,3-Butadiene ^d	1.3 E-07	1.6 E-06
85-68-7	Butylbenzylphthalate ^f	1.1 E-06	1.3 E-05
7440-43-9	Cadmium ^d	2.3 E-07	2.8 E-06
75-15-0	Carbon disulfide ^d	5.4 E-05	6.7 E-04
56-23-5	Carbon tetrachloride ^d	3.1 E-08	3.8 E-07
463-58-1	Carbonyl sulfide ^d	2.7 E-07	3.3 E-06
7782-50-5	Chlorine ^d	3.9 E-06	4.8 E-05
7440-47-3	Chromium ^e	6.2 E-07	7.6 E-06
7440-48-4	Cobalt ^d	3.3 E-07	4.1 E-06
7440-50-8	Copper ^e	1.8 E-05	2.3 E-04
84-74-2	Dibutyl phthalate ^d	3.0 E-06	3.7 E-05
75-71-8	Dichlorodifluoromethane ^e	1.6 E-07	2.0 E-06
100-41-4	Ethyl benzene ^d	3.3 E-07	4.1 E-06
74-85-1	Ethylene ^e	7.7 E-06	9.4 E-05
117-81-7	bis(2-Ethylhexyl)phthalate ^d	3.4 E-07	4.2 E-06
110-54-3	n-Hexane ^d	6.1 E-08	7.6 E-07
7439-92-1	Lead ^d	1.4 E-06	1.7 E-05
7439-96-5	Manganese ^d	1.2 E-05	1.5 E-04
7439-97-6	Mercury ^d	1.6 E-09	2.0 E-08
75-09-2	Methylene chloride ^d	3.8 E-06	4.7 E-05

Table 15.8.15-2 (cont.)

CASRN ^b	Pollutant	lb per item	lb per lb NEW ^c
78-93-3	Methyl ethyl ketone ^d	5.3 E-07	6.6 E-06
91-57-6	2-Methylnaphthalene ^f	1.4 E-07	1.7 E-06
91-20-3	Naphthalene ^d	4.5 E-07	5.6 E-06
7440-02-0	Nickel ^d	1.2 E-06	1.5 E-05
7723-14-0	Phosphorus ^d	1.5 E-05	1.9 E-04
115-07-1	Propene ^e	2.6 E-06	3.2 E-05
7782-49-2	Selenium ^d	1.3 E-07	1.6 E-06
--	2,3,7,8-Tetrachlorodibenzo-p-dioxin toxic equivalent ^d	4.7 E-13	5.8 E-12
108-88-3	Toluene ^d	6.8 E-07	8.4 E-06
95-63-6	1,2,4-Trimethylbenzene ^e	2.6 E-07	3.2 E-06
540-84-1	2,2,4-Trimethylpentane ^f	2.4 E-07	3.0 E-06
108-38-3,106-42-3	m-Xylene, p-Xylene ^d	3.2 E-07	4.0 E-06
95-47-6	o-Xylene ^d	2.8 E-07	3.5 E-06
7440-66-6	Zinc ^e	1.3 E-05	1.6 E-04

^a References 2 and 3. Factors represent uncontrolled emissions.

^b CASRN = Chemical Abstracts Service Registry Number.

^c NEW = net explosive weight. The NEW for this ordnance is 0.0813 pound per item. Reference 4.

^d Reportable chemical under EPCRA Section 313 and a hazardous air pollutant under CAA Section 112(b).

^e Reportable chemical under EPCRA Section 313.

^f Hazardous air pollutant under CAA Section 112(b).

References for Section 15.8.15

1. *M116A1 Hand Grenade Simulator, Pyrotechnics Fact Sheet*, U.S. Army Environmental Center, P2/Compliance, Acquisition, and Technology Division, Aberdeen Proving Ground, MD, Undated.
2. *Sampling Results for AEC Phase I Training Ordnance Emission Characterization*, Radian International LLC, Oak Ridge, TN, March 1999.
3. *Supporting Information for Phase I and Phase II Tests at Dugway Proving Ground*, URS Corporation, Oak Ridge, TN, July 11, 2001.
4. *Hazard Classification of United States Military Explosives and Munitions*, U.S. Army Defense Ammunition Center, Logistics Review and Technical Assistance Office, McAlester, OK, Revision 11, February 2001.

5. *Background Document, Report on Creation of 5th Edition AP-42 Chapter 15 - Ordnance Detonation*, MACTEC Federal Programs, Inc., Research Triangle Park, NC, April 2004.

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