Alliant Techsystems Inc., Lake City Ammunition Division
MATERIAL SAFETY DATA SHEET

Cartridge, .50 CAL Armor Piercing Incendiary (API), Mark 211 (MK 211)

I. GENERAL INFORMATION

Company's Name: Alliant Techsystems Inc., Lake City Ammunition Division
Company's Street: PO Box 1000
Company's City: Independence
Company's State: MO
Company's Country: US
Company's Zip Code: 64051
Company's Info Ph #: (816) 796-7488
Date MSDS Prepared: 8/6/2001 Revision Date: 2/23/2005

Transportation Accidents Call CHEMTREC: 1-800-424-9300

Warning: Ammunition is intended for use only by properly trained and qualified persons in compatible, properly maintained weapons. Any other use may result to damage to weapons and equipment or injury to the user. When fired, bullets exit the weapon at lethal velocity.

II. INGREDIENTS/IDENTITY INFORMATION

<table>
<thead>
<tr>
<th>HAZARDOUS INGREDIENTS</th>
<th>CAS NUMBER</th>
<th>EXPOSURE LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case (see below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brass</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Propellant (see below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrocellulose</td>
<td>9004-70-0</td>
<td>PEL (C) 0.2 ppm/2 mg/m³, TLV 0.05 ppm</td>
</tr>
<tr>
<td>Nitroglycerin</td>
<td>55-63-0</td>
<td>PEL (T) 15.3 mg/m³/(R) 3 mg/m³, TVL (R) 2 mg/m³</td>
</tr>
<tr>
<td>Graphite</td>
<td>7782-42-5</td>
<td></td>
</tr>
<tr>
<td>Primer Composition (see below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead Styphnate</td>
<td>15245-44-0</td>
<td>PEL 50 µg/m³, TLV 0.05 mg/m³ (As inorganic lead)</td>
</tr>
<tr>
<td>Barium Nitrate</td>
<td>10022-31-8</td>
<td>PEL 0.5 mg/m³, TLV 0.5 mg/m³ (As Barium)</td>
</tr>
<tr>
<td>Antimony Sulfide</td>
<td>1345-04-6</td>
<td>PEL 0.5 mg/m³, TLV 0.5 mg/m³ (As Antimony)</td>
</tr>
<tr>
<td>PETN (Pentaerythritol Tetranitrate)</td>
<td>78-11-5</td>
<td>NE</td>
</tr>
<tr>
<td>Aluminum powder</td>
<td>7429-90-5</td>
<td>PEL (T) 15 mg/m³/(R) 5 mg/m³, TVL (Metal dust) 10 mg/m³/(Pyro powders) 5 mg/m³</td>
</tr>
<tr>
<td>Gum Arabic</td>
<td>9000-01-5</td>
<td>NE</td>
</tr>
<tr>
<td>Calcium Silicide</td>
<td>12013-56-8</td>
<td>NE</td>
</tr>
<tr>
<td>Tetracene</td>
<td>7440-02-2</td>
<td>NE</td>
</tr>
<tr>
<td>Magnesium Oxide</td>
<td>1309-48-4</td>
<td>PEL (Fume) 15 mg/m³, TLV 10 mg/m³</td>
</tr>
<tr>
<td>Brass</td>
<td>N/A</td>
<td>NE</td>
</tr>
<tr>
<td>Projectile (see below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>7440-50-8</td>
<td>PEL (Fume) 0.1 mg/m³ (Dust) 1 mg/m³, TVL (Fume) 0.2 mg/m³ (Dust) 1 mg/m³</td>
</tr>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>PEL 50 µg/m³, TLV 0.05 mg/m³ (As inorganic lead)</td>
</tr>
<tr>
<td>Tungsten Carbide Cobalt</td>
<td>7440-33-7</td>
<td>PEL NE, TLV 5 mg/m³ (As Tungsten Metals)</td>
</tr>
<tr>
<td>Explosives Composition A-4</td>
<td></td>
<td>Contact NAMMO Raufoss for additional Information</td>
</tr>
<tr>
<td>Pyrotechnic Mix (see below)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS 41 Mix</td>
<td></td>
<td>Contact NAMMO Raufoss for additional Information</td>
</tr>
<tr>
<td>RS 109 Mix</td>
<td></td>
<td>Contact NAMMO Raufoss for additional Information</td>
</tr>
</tbody>
</table>

NE: None Established
LEAD MAY BE RELEASED DURING FIRING OF AMMUNITION. CARE SHOULD BE TAKEN IN CLEANING OF RANGE FACILITIES MINIMIZE EXPOSURE TO LEAD. PERSONS ENGAGED IN THESE ACTIVITIES SHLD WEAR PROT CLTHG W/APPROP NIOSH/ MSHA APPRVD RESP. RANGE OPERATORS SHOULD CONSULT OSHA1910.1025 FOR DETAILS PERTAIN TO HNDLG LEAD IN WORK ENVIRONMENT.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Appearance And Odor: BRASS CASE W/LEAD, COPPER JACKETED BULLET, NO ODOR
Boiling Point: N/A
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: 3.1-8
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: NONE
Percent Volatiles By Volume: N/A

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: NOT APPLICABLE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: WATER.
Special Fire Fighting Procedures: USE NIOSH/MSHA APPROVED SCBA & FULL PROT EQUIP (FP N). USE WIDE FOG PATTERN NOZZ TO REDUCE ANY LOW VELOCITY FRAGMENTS. USE WATER TO COOL ORDINARY COMBUSTIBLES
Unusual Fire And Explosive Hazards: MAY IGNITE IF HEATED TO 250F INDEPENDENT OF AIR. UNCONFINED IGNITED CARTRIDGES CAN PRODUCE LOW VELOCITY METALLIC FRAGMENTS WHICH MAY CAUSE EYE INJURY

V. REACTIVITY DATA

Stability: YES
Conditions To Avoid (Stability): STABLE UNDER NORMAL USE CONDITIONS. INDIVIDUAL CARTRIDGES MAY IGNITE IF PRIMER IS STRUCK/IF CARTRIDGE IS EXPOSED TO EXTREME HEAT.
Materials To Avoid: INCOMPATIBLE W/ACIDS, ALKALIES, AMMONIA, AND OTHER CORROSIVE MATERIALS.
Hazardous Decomposition Products: OXIDES OF BARIUM/LEAD/ANTIMONY/ALUMINUM/ MAGNESIUM/ NITROGEN/CARBON/SULFUR. LEAD & ANTIMONY FUME MAY ALSO BE PRODUCED.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE SPECIFIED BY MANUFACTURER.

VI. HEALTH HAZARD DATA

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Hazard Acute And Chronic: INHAL: ACUTE-INHAL OF SMOKE MAY PRDCE MILD THROAT/EYE IRRIT. CHRONIC-PRLNG/RPTD OVEREXP TO FIRED CARTRIDGE GASSES & PARTICULATES MAY RSLT IN ELEVATED BLOOD LEAD LEVELS. SYMPTOMS OF CHRONIC OVEREXP TO LEAD MAY INCL ELEVATED BLOOD LEAD LEVELS, ELEVATED ZPP, WEIGHT LOSS, HDACH, DEPRESSED HEMOGLOBIN, & FATG. (EFTS OF OVEREXP)
Carcinogenicity - NTP: YES, IARC: YES, OSHA: NO

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Medical Conditions Aggravated By Exposure: EXPOSURE TO LEAD MAY AGGRAVATE ANEMIA. PERSONS TAKING BISMUTH CONTAINING MEDICATIONS SHOULD CONSULT W/THEIR MEDICAL PROVIDED PRIOR TO ROUTINE EXPOSURE TO AIRBORNE, RESPIRABLE LEAD.

EMERGENCY FIRST AID PROCEDURES

INHALATION: MOVE TO FRESH AIR. IF BRTHG STOPPED, ADMIN ARTF RESP. IF CHRONIC SYMPTOMS SHOULD APPEAR, CONSULT MEDICAL PROVIDER. RECOMMEND

SKIN: WASH HANDS THOROUGHLY W/SOAP & WATER BEFORE EATING/SMKG.

EYES: MOVE TO FRESH AIR. IF FOREIGN BODY IS SUSPECTED, WASH EYES IN FRESH WATER FOR A MINIMUM OF 15 MIN, GET MEDICAL ASSISTANCE.

INGESTION: GET MEDICAL ASSISTANCE. SEE ING 23.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps If Material Released/Spill: AVOID CONDITIONS DETAILED IN REACTIVITY DATA SECTION. IF CONTAINER SHOULD RUPTURE, PLACE ALL LOOSE CARTRIDGES FROM BROKEN SHIPPING CASES INTO A STURDY CONTAINER; SECURE CONTAINER CAREFULLY.

Neutralizing Agent: NONE

Waste Disposal Method: CONTACT MANUFACTURER. DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS (FP N).

Precautions-Handling/Storing: STORE IN DRY, COOL AREA IN ORIGINAL CONTAINER TO ASSURE PERFORMANCE. KEEP OUT OF REACH OF CHILDREN. AVOID STRIKING THE PRIMER OF UNCHAMBERED CARTRIDGES.

Other Precautions: REMOVE AMMUNITION FROM SERVICE IF ANY OF FOLLOWING CONDITIONS HAVE OCCURRED: PROLONGED STORAGE AT OR ABOVE 200F, EVIDENCE OF CORROSION, PHYSICAL DAMAGE, EXPOS TO OIL/SPRAY TYPE LUBRICANTS.

VIII. CONTROL MEASURES

Respiratory Protection: USE NIOSH/MSHA APPROVED LEAD DUST/FUME RESPIRATOR WHILE CLEANSING RANGE FACILITIES. CONS OSHA 1910.1025 FOR EXACT REQUIREMENTS.

Ventilation: USE IN WELL VENTILATED AREA. INDOOR SHOOTING RANGES SHOULD MAINTAIN AN AIR FLOW OF 20 CFM/SQ FT OF CROSS SECTIONAL AREA. (ING 22)

Protective Gloves: IMPERVIOUS GLOVES (FP N).

Eye Protection: SAFETY GOGGLES (FP N).

Other Protective Equipment: HEARING PROTECTION RECOMMENDED WHEN FIRING. IT SHOULD HAVE AN EPA-NRR OF 20 OR GREATER.

Work Hygienic Practices: WASH HANDS THOROUGHLY WITH SOAP & WATER BEFORE EATING OR SMOKING.

Supplemental Safety & Health Data: APPEAR/ODOR: COPPER CLAD LEAD BULLET. NO ODOR. FIRE FIGHTING PROCEDURE: BELOW IGNITABLE TEMP. EXPLO HAZ: OR SUPERFICIAL SKIN WOUNDS IF UNPROT BY STD FIRE-FIGHTER TURNOUT GEAR. EFFECTS OF OVEREXP: CHRONIC-CHRONIC OVEREXP TO LEAD MAY RSLT IN DEPRESSED HEMOGLOBIN LEVELS, HEADACHES, FATIGUE & WEIGHT LOSS, W/ELEVATED BLOOD LEAD/ZPP LEVELS. (ING 16)
**IX. TRANSPORTATION DATA**

Transportation and storage must be in accordance with, local, state, and federal regulations.

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>UN Number</th>
<th>Hazard Classification</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammunition, Incendiary</td>
<td>UN0300</td>
<td>1.4G</td>
<td>II</td>
</tr>
<tr>
<td>Cartridges, Small Arms</td>
<td>UN0012</td>
<td>1.4S</td>
<td>II</td>
</tr>
</tbody>
</table>

**X. DISPOSAL DATA**

UNUSED CARTRIDGES SHOULD BE DISPOSED OF BY INCINERATION IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

**XI. LABEL DATA**

Label Required: YES
Common Name: .50 CAL API MK 211
Chronic Hazard: YES
Signal Word: Explosive
Special Hazard Precautions: MAY IGNITE IF HEATED TO 250°F. MAY IGNITE IF PRIMER IS STRUCK. ACUTE: CONTACT WITH LARGE VOLUMES OF SMOKE MAY CAUSE MINOR EYE IRRITATION. INHALATION OF SMOKE MAY PRODUCE MILD THROAT AND EYE IRRITATION. INGESTION OF LEAD MAY RESULT IN ABDOMINAL CRAMPING, FATIGUE, CONSTIPATION, AND DISTURBANCE OF SLEEP. CHRONIC: CANCER HAZARD. INORGANIC LEAD IS LISTED AS CARCINOGENIC. SYMPTOMS OF CHRONIC EXPOSURE TO LEAD INCLUDE ELEVATED ZPP AND BLOOD LEAD LEVELS, DEPRESSED HEMOGLOBIN LEVELS, HEADACHE, FATIGUE, AND WEIGHT LOSS. LEAD APPEARS ON THE NAVY REPRODUCTIVE HAZARDS LISTS (FP N).
Protection Eye: Y
Protection Skin: Y
Protect Respiratory: Y

**XIV. ADDITIONAL INFORMATION**

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO ENGINEERING, OPERATIONS AND MANAGEMENT AND FOR PERSONS WORKING WITH OR HANDLING THIS PRODUCT.

"To the best of our knowledge the information contained herein is correct. All chemicals may present unknown health hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards which exist. Final determination of suitability of the product is the sole responsibility of the user. Users of any chemical should satisfy themselves that the conditions and methods of use assure that the product is used safely.

NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION CONTAINED HEREIN OR THE CHEMICAL TO WHICH THE INFORMATION REFERS."
FOR ALL TRANSPORTATION ACCIDENTS CALL CHEMTREC AT 1-800-424-9300