Standardized Process for the Development of Military-Unique Emissions Factors

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What are Air Emissions?

- **Air emissions**: Gases & particles released from a source into the air
- **“Criteria Pollutants”**: Harmful to human health & the environment
  - lead (Pb)
  - particulate matter (PM)
  - carbon monoxide (CO)
  - nitrogen dioxide (NO\(_2\))
  - ozone (O\(_3\))
  - sulfur dioxide (SO\(_2\))
- **Hazardous Air Pollutants (HAPs)**, EPA list (187 pollutants) known or suspected to cause cancer or other serious health effects (e.g. reproductive effects, birth defects)
What are Emissions Factors (EFs)?

- Value used to estimate quantity of substance released to the atmosphere
- Determined by instrumental measurements
- Available data/measurement accuracy affects EF certainty
- More certainty provides greater confidence in estimating releases
- Developed for preparing regional & national emissions inventories
- AP 42, Fifth Edition *Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources* – current EPA EF database
<table>
<thead>
<tr>
<th>Chapter 1</th>
<th>External Combustion Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 2</td>
<td>Solid Waste Disposal</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Stationary Internal Combustion Sources</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Evaporation Loss Sources</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Petroleum Industry</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Organic Chemical Process Industry</td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Liquid Storage Tanks</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Inorganic Chemical Industry</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Food and Agricultural Industries</td>
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<tr>
<td>Chapter 10</td>
<td>Wood Products Industry</td>
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<tr>
<td>Chapter 11</td>
<td>Mineral Products Industry</td>
</tr>
<tr>
<td>Chapter 12</td>
<td>Metallurgical Industry</td>
</tr>
<tr>
<td>Chapter 13</td>
<td>Miscellaneous Sources</td>
</tr>
<tr>
<td>Chapter 14</td>
<td>Greenhouse Gas Biogenic Sources</td>
</tr>
<tr>
<td>Chapter 15</td>
<td>Ordnance Detonation</td>
</tr>
</tbody>
</table>

http://www.epa.gov/ttnchie1/ap42/
Emissions Factors (EFs) & AP 42

- **EPA EF development guidance:** Procedures for Preparing EF Documents, EPA-454/R-95-015, Nov 97
  - EFs submitted with test methods
  - EFs rated "A" thru "E" — Assess factors representing emissions sources
  - On EPA public Web site for public review and comment

- **EF applications expanded to:**
  - Develop site-specific emissions estimates
  - Determine permit and regulatory requirement applicability
  - Conduct risk assessments
  - Demonstrate compliance
  - Establish permit limits
  - Report Toxic Release Inventory
Examples of Military EFs & Emissions Estimates

\[ E = EF \times A \]

emission = emission factor \( \times \) activity

<table>
<thead>
<tr>
<th></th>
<th>lb per item (Rating C)</th>
<th>lb emissions from 1000 grenades</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>1.7E-02</td>
<td>17</td>
</tr>
<tr>
<td>Pb</td>
<td>5.0E-04</td>
<td>0.5</td>
</tr>
<tr>
<td>NOx</td>
<td>1.1E-03</td>
<td>1.1</td>
</tr>
<tr>
<td>PM-10</td>
<td>3.1E-02</td>
<td>31</td>
</tr>
</tbody>
</table>

AP 42, Fifth Edition, Volume I Chapter 15: Ordnance Detonation Section 15.5 Grenades

M67 Fragmentation Hand Grenade
### Examples of Military EFs & Emissions Estimates

**MK66 Mod 3 Motor**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>EF (lb/lb NEW)</th>
<th>Quality Rating</th>
<th>lb pollutant per rocket fired</th>
<th>Motors fired to achieve 1 lb pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>9.7E-03</td>
<td>C</td>
<td>.070</td>
<td>15</td>
</tr>
<tr>
<td>PM-10</td>
<td>2.3E-02</td>
<td>B</td>
<td>0.16</td>
<td>6</td>
</tr>
<tr>
<td>Benzene</td>
<td>5.2E-05</td>
<td>C</td>
<td>3.6E-04</td>
<td>2,800</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>1.2E-06</td>
<td>C</td>
<td>8.6E-06</td>
<td>120,000</td>
</tr>
</tbody>
</table>
Examples of Military EFs & Emissions Estimates

- **Military waste munitions disposal permits**: require air pathway risk assessments
- **Hazard Risk Assessment (HRA)** — Used to assess risk to human health & the environment

Video clip buried detonation plays in slide show mode
DoD Emissions Factors (EFs) Development Process

- All-Service management of DOD-developed EF data used to estimate military mission-related air pollutant releases
  - Review data before release to the public
  - Internal DoD peer review
    - measurement methods
    - test descriptions
    - data quality
    - suitability for publication
    - applicability for DoD use

- Clean Air Act Services Steering Committee coordination ensures all-Service representation & consistency
  - Environmental Data Quality Workgroup available to help resolve issues
Motivation to improve EPA’s Emissions Factors (EFs) Program


- **EPA Can Improve Emissions Factors Development and Management** March 2006 EPA IG Report No. 2006-P-00017

- **EPA solicited comments on how to improve its EF development program**, 14 October 2009, (74 FR 52723)
  - Sustainable program producing high quality EFs
  - Provide quantitative precision & accuracy
  - Encourage the appropriate use of EFs
  - Better define public participation
DoD Comments on EPA Advanced Notice of Proposed Rulemaking (ANPRM)

• Need a simple, easy-to-use, clearly defined process
• Endorsed timely public review to allow feedback & information exchange
• Expand EF use for purposes other than preparing emissions inventory
• Recommended using standard data analysis for EF precision & accuracy
• Concurred with establishing a Web-based standardized process
• Recommended using experimental/modeled EFs when direct site-specific measurements are not feasible or produce unreliable results
EPA Draft Emissions Factors (EFs) Development Process

- **Recommended Procedures for Developing EFs**
  - Emphasis on stationary sources
  - Use WebFIRE interactive EF database to calculate EFs
    - Electronic Reporting Tool for submissions of emissions test data
    - Allows generating both “EPA Developed” and “User Defined” EFs
    - Quality rating system based on a Test Report Quality Ranking Tool
  - Third Party (state regulator) review is included in quality rating

- **Finalized guidance will supersede previous EPA EF development guidance, EPA-454/R-95-015, Nov 1997**
DoD Comments on EPA Draft Emissions Factors (EFs) Development Process

• Concern Quality Ranking Tool doesn't improve data quality
  — Only improves reliability and completeness of the test report
  — Numerous concerns with the checklist
  — Experimental uncertainty, $1^\circ$ factor in ranking EF quality not properly addressed
  — Recommendations/disagreement on approach to outliers, non-detects & data combinations

• Questions on WebFIRE’s incorporation of AP 42
• Protection of Confidential Business Information
• Using WebFIRE for non-inventory purposes
Summary

• Need method to accurately estimate air pollutant emissions for DoD-unique processes & ops

• AP 42 is EPA’s existing public compilation of EFs
  – Background document providing test methods
  – Data quality rating are qualitative

• DoD developing process for all-Services peer review of military-unique EFs for public release

• EPA developing improved EF process & data management plan

• EPA published a draft EF reporting proposal
  – New Web-based process with data quality ranking
  – State regulator input to final quality ranking score

• DoD comments to EPA: some progress but data quality analysis & rating system need improvement
Questions?