Characteristics and effects of explosive weapons

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1. Combined blast and fragmentation radii of a single explosive weapon centred where the weapon actually detonates.

2. Blast and fragmentation radii are greater for a weapon with larger explosive content.

3. Inaccuracy of delivery means those blast and fragmentation effects will occur somewhere within a larger area. Where within the wider area the actual effects will occur cannot be precisely controlled. Repeated firings will land in slightly different locations.

4. Where multiple warheads are used, even weapons with smaller individual blast and fragmentation radii can create effects over a wide area.
Effects radii for a 2,000lb aircraft bomb – Rathaus Vienna

- Crater radius 7m: everything destroyed
- Blast pressure at 31m = 11.5psi: severe damage to concrete buildings, most people killed
- Lethal fragments likely out to 365m
- Fragmentation range in the open 1,150m (beyond the border of this diagram)
120mm mortar accuracy at maximum range (7,000m)

Effects from blast and fragmentation
30m lethal radius from point of actual impact (X)
10% probability of incapacitation at 300m
10% probability of 'suppression' at 125m

Effects from inaccuracy
Probabilities of landing at aim point (X):
within 100m = 50%
within 100m = 82%
within 400m = 99%

Actual point of detonation
Aim point (target)
# People at risk

<table>
<thead>
<tr>
<th>Location</th>
<th>Approximate population density (persons per km²)</th>
<th>Persons within the wide risk area of a 120mm mortar at maximum range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geneva, Switzerland</td>
<td>12,000</td>
<td>8,640</td>
</tr>
<tr>
<td>Manhattan, New York, USA</td>
<td>27,000</td>
<td>19,440</td>
</tr>
<tr>
<td>Mumbai, India</td>
<td>20,000</td>
<td>14,400</td>
</tr>
<tr>
<td>Cairo, Egypt</td>
<td>17,000</td>
<td>12,240</td>
</tr>
<tr>
<td>Utrecht, Netherlands</td>
<td>3,500</td>
<td>2,250</td>
</tr>
<tr>
<td>Vienna, Austria</td>
<td>4,300</td>
<td>2,760</td>
</tr>
</tbody>
</table>
122mm multi-barrel rocket system’s effects at a range of 19km – single rocket
122mm multi-barrel rocket system’s effects at a range of 19km – 40 rockets
122mm multi-barrel rocket system’s effects at a range of 19km – 40 rockets
Operational practice

The direct relationship between area effects and civilian risk is already recognised in operational practice and procedures.

- Collateral damage estimation methodologies
- Operational directives
- Accountability for risks to friendly forces

A political commitment should strengthen such practice internationally.
Available at: www.inew.org

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