Experiences from the Federation of Bosnia and Herzegovina in Residual Unexploded Aircraft Bombs Management

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1997–2007:
12 reported unexploded aircraft bombs

2007–2017:
50 reported and disposed unexploded aircraft bombs

Need for the accurate identification of the risks

Need for the evaluation of the protocols and procedures
Overview

- 44 bombs were WWII remnants of which 32 were found in urban/suburban environment.

- 6 bombs were War 1992–1995 remnants of which 1 was found in urban/suburban environment.

- With bombs found in water flows included, ¾ of all unexploded bombs were found in densely inhabited areas.

- Only three bombs were found on the ground.

- Five bombs were found under the building’s or road’s foundations and two under the previously agriculturally processed surfaces.
# Surrounding-activity analysis

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Suburban</th>
<th>Rural</th>
<th>Uninhabited</th>
<th>Underwater</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Excavations</td>
<td>12</td>
<td>21</td>
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<td></td>
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<tr>
<td>Agriculture</td>
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<td>1</td>
<td></td>
<td>4</td>
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<tr>
<td>Exhumations</td>
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<td>4</td>
<td></td>
<td>4</td>
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<tr>
<td>Demining</td>
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<td>1</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>12</td>
<td>21</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>50</td>
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</table>

* FACP database 2007–2017
## Contamination analysis

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<tr>
<th></th>
<th>British</th>
<th>US</th>
<th>German</th>
<th>Italian</th>
<th>Soviet</th>
<th>French</th>
<th>Yugo</th>
<th>TOTAL</th>
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<td>2</td>
<td>6</td>
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<td>6</td>
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<td>Impact fuze</td>
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<td>5</td>
<td>5</td>
<td>1</td>
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</table>

* FACP database 2007–2017
UXBs found in Sarajevo from 2007 to 2017

- Narow track railroad route
- UXB find site
Historical analysis

- Axis air forces targeted 9 cities unselectively during April 1941 and during rest of the war waged antiguerrilla warfare mostly over rural and uninhabited areas.

- From December of 1943 until April 1945 99 tactical and strategic attacks by Allied air forces are identified on 30 targets in 19 cities. Tactical and fighter-bomber attack records have not been revealed completely. Gross tonnage of bombs used is estimated to roughly 10,000 tons.


- 1995 NATO ops 'Deliberate force' against Serb military installations. 1026 pcs of ordnance used on 48 complexes (338 single targets) during 3 weeks period.
Attack on the marshaling yards Alipašin Most by the 301st Bomber Group USAAF, on 09. Avgust 1944
Attack on the airport by the 301\textsuperscript{st} Bomber Group USAAF, on 14. January 1944
Comparative aerial photo– Brod

Attack on the railroad bridge by the 450th and 463rd Bomber Group USAAF, on 9. Avgust 1945
Comparative aerial photo – Doboj

Attack on the railroad bridge by the 450th Bomber Group USAAF, on 20. November 1944
Attack on the railroad bridge by the 376th Bomber Group USAAF, on 23. November 1944
Used ordnance analysis

- Heaviest bomb used by Axis was German SC500 500kg and by Allies British HC4000 4000 lbs and US AN M66 2000 lbs.

- Most often used bombs were 250kg/500lbs with 30–50% CWR

- In only one case long delay fuze was found, but those fuzes were used on multiple targets both by British and US air forces. US fighter-bombers used sensitive skip-bombing fuzes.

- German bombs were fitted with electrical-impact fuzes. No German long-delay fuzes were found.

- During 1995 NATO ops. Deliberate force extensive use of precision guided munitions is noticed.
Identified risks

Plausible risk: excavation of the 250–500 kg bomb in the densely populated area.

Worst case scenario: uncovering 1000–2000 kg bomb or bomb with long delay fuze fitted in the densely populated area or its accidental uncontroled explosion upon finding or during disposal.
Disposal procedures

Federal Administration of Civil Protection has exclusive jurisdiction over ERW disposal in Federation of Bosnia and Herzegovina.

Dedicated department which incorporates 8 EOD teams and heavy equipment team, 50 persons in total.

Disposal protocol:
- isolation
- evacuation
- neutralization
- extraction
- destruction
- asanation
Isolation and evacuation

- Isolation—first authorized person in situ usually police officer

- Evacuation—local civil protection with its services

- Total closing of all road, railroad, waterway and aerial traffic
Neutralization – rendering safe procedures

- Most often by dynamic remote tools
- In special cases manually or using tape and line
- UXBs with unarmed fuzes and German electric impact fuzes are not being neutralized
Between 3 and 5 AM on roads completely closed for all other traffic

Full police escort all the way

Two element convoy; first transporting a bomb, second with emergency support following on safe distance
Containment of the destruction side-effects

Sandbag/hesco blast barriers and antiseismic ditches
Reduction of the destruction side–products

Low order techniques – shape charges and thermite cups
Needed improvements

- Expanding mine risk education program or creating awareness program to educate civil protection professionals in local communities where UXB risks are identified to provide necessary pieces of information during risky activities.

- More efficient evacuation procedures to enable obligatory evacuation in highly urgent situations.

- Collecting and analyzing all historical sources and update current UXB situation.
Thank you!

For further inquiries please contact:
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