



Protection for the unexpected threat

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Rationale: changes in threat

Traditional CBRN threats deal with CBWA produced by state actors.

Large scale attacks anticipated.

Intelligence available, preparation of protective measures according to perceived threat level.

New situation

Broader spectrum of agents including new synthetic compounds available in civilian settings

No preliminary warnings based on intelligence.

Small(er) scale



CBRN Protection

Mission : Reducing and mitigating chemical and biological threats through innovative, applied scientific solutions

Ambition: To have an initiating role in adapting to trends in CBRN by offering innovative strategies on: small-scale threats, prevention & preparedness, all hazard and systems approaches

Pillars to achieve this:

- Threat and Risk Analysis
- Detection and Identification
- Medical Countermeasures
- Physical Protection



Examples of (possible) small scale incidents

1997 Tokyo subway incident Aum Shinrikyo with Sarin

2002: Use of ventilation ducts to spread aerosol anaesthetic
(conjecture: fentanyl) in theatre in Russia

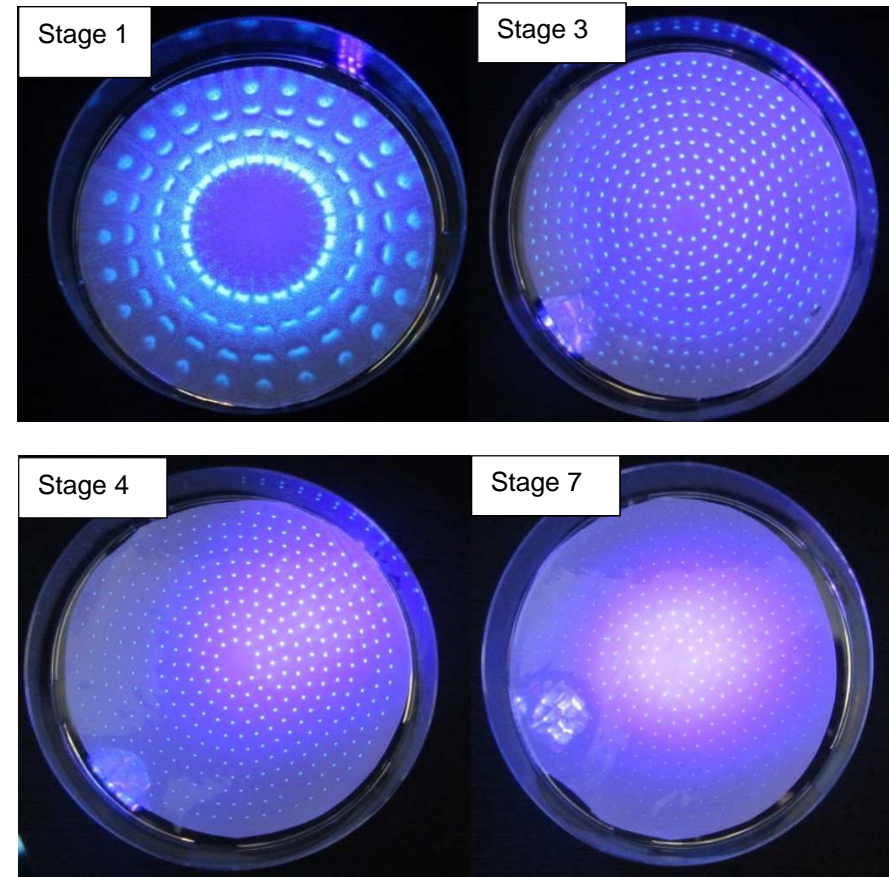
2008: alleged use of TICs by Tamil tigers in Sri Lanka

2012: Use of chemical weapons in Syria

Research examples: confetti cannon, exploding bag of liquid (IED)



Confetti cannon with fluorescent powder



Lung deposition measured with Anderson 8-stage impactor for 5 minutes after powder jet



Assignment: Develop a method to choose optimal COTS solution, MOTS or Design to Specs

Strategy

1. Identify options for types/categories of masks
2. Identify parameters for assessment
3. Define demands/criteria for each option

Possible categories for unexpected threats

1. Permanently wearable masks (dusty environment)
2. Escape masks
3. All-in-one operations mask



Further Evaluation

Parameters:

Respiratory protection only or eyes and/or skin as well

Comfort: weight, pressure points, chafing, thermal burden/
insulation, breathing resistance
strong relation with expected wearing time

Quick don: easy to don fast, fool proof under stress

Protection level: PF/leakage
Spectrum: aerosol only or also gases and vapors
Gas/vapor protection: which gases, protection time

Visibility: field of vision, distortion

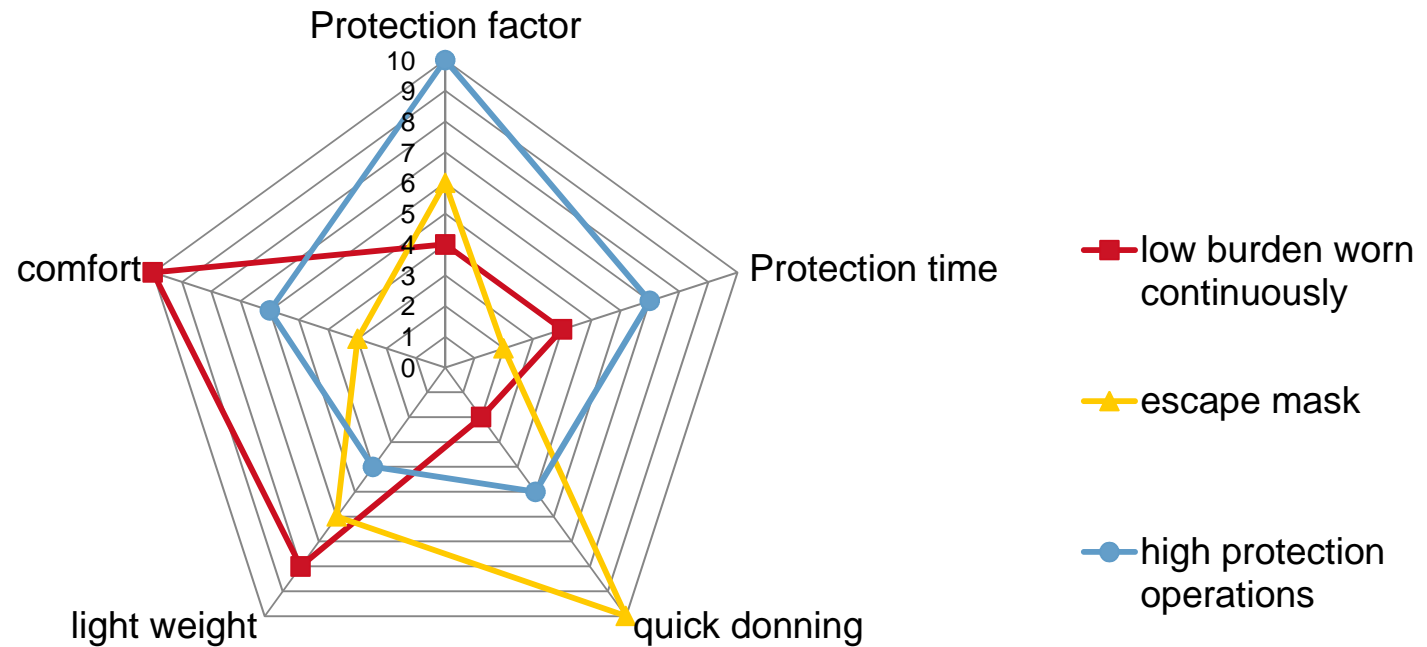
Communication: send and receive

Logistics: weight, volume, maintenance, loose (spare) parts,
shelf life

Cost



Spidergraph: A structured framework to analyze requirements visually in an accessible way. Repeat for subsets like comfort, protection, logistics





List possible locations and techniques for sealing

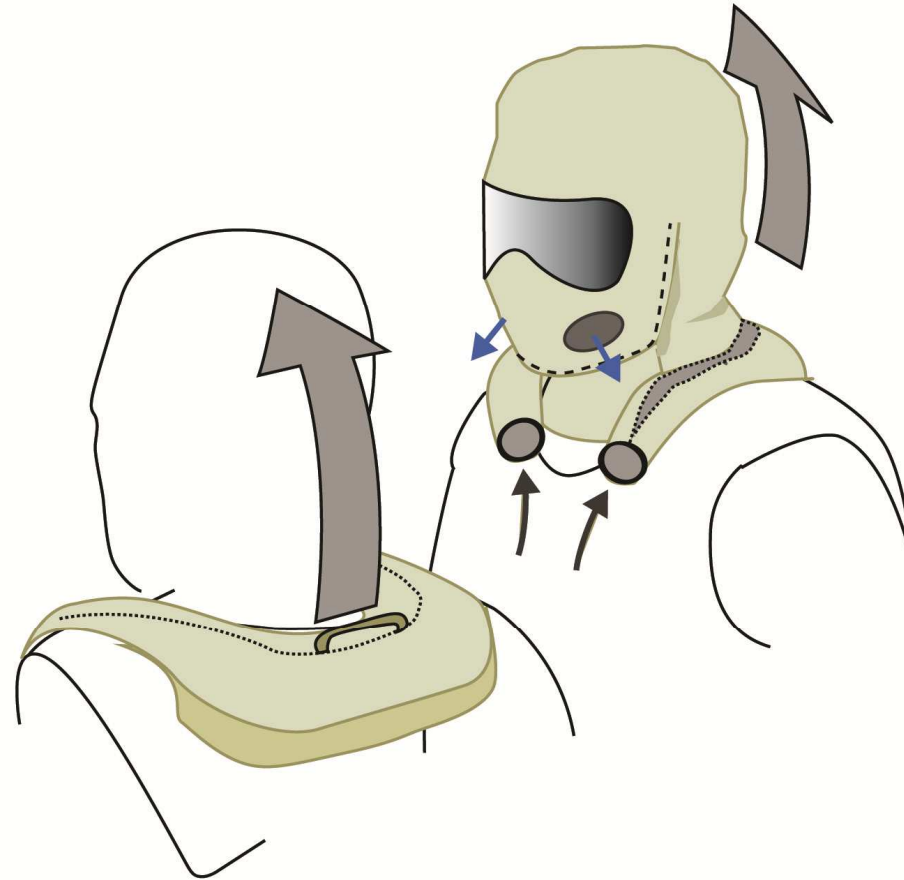
- › Without helmet:
 - › Nose, on chin, under chin, forehead, neck, shoulders

- › With helmet:
 - › Clip on helmet: is only possible with helmet specifications
 - › Ballistic vest?

- › Ideally wearable both with and without helmet
- › Identified as good possibilities
 - › Modified Readimask®: light, easy to use, low/short protection
concerns: seal on dirty face, comfort with upgraded filter
 - › Escape hood in collar with high protection, possible upgrade to long protection mode to achieve all-in-one solution



Result: virtual concept respiratory protection





Other projects involving respiratory protection

- › Project to research possible optimization of helmet and gas mask combination
- › Efforts to optimize combination of protective suit/clothing and respirator with next
- › Physical concept: rubber annulus to optimize combination of current military CBRN mask and suit.
Cooperation with TU Delft



Leakage through a typical gasmask-hood interface



Leakage through the prototype gasmask-hood interface

