Regions of responsibilities, transfer functions and the role of simulants

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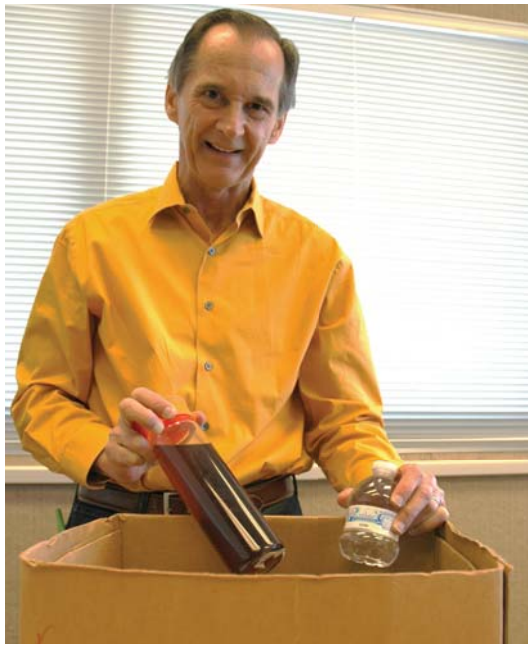
Conclusions

- Vendors want data for training ATRs
  - Boxes containing all explosives that will be on tests
  - Vendors pack and scan on their own systems
  - Test feedback
- Cannot give the vendors what they want
  - Some explosives dangerous to formulate and handle
  - Expensive to provide all explosives to all vendors

- Proposed solutions
  - Provide limited or no explosives to vendors
  - Scan other explosives on none vendor systems, e.g., sm. samples on MicroCT
  - Use simulants or theoretical data
  - Provide boundaries of features (e.g., density and atomic number) – denoted as regions of responsibility (RORs)
  - System to system transfer functions

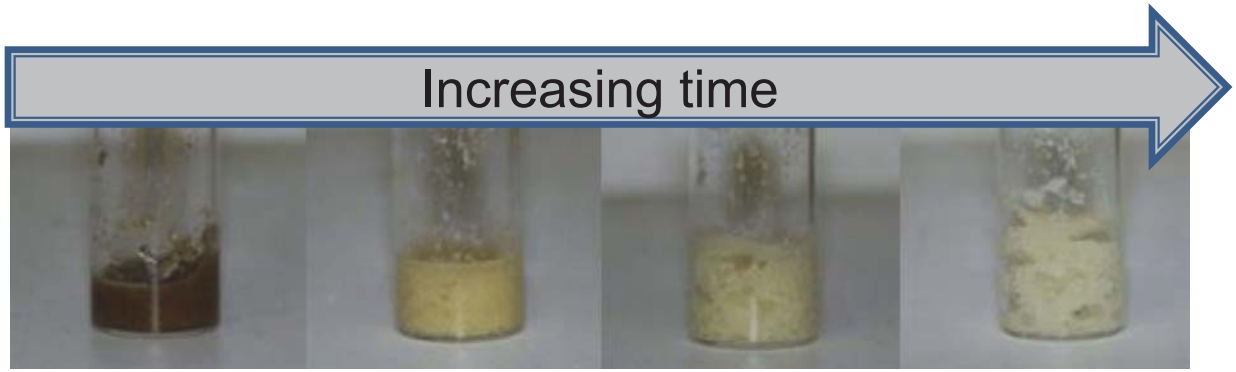
Why Do Vendors Want Boxes of Explosives?

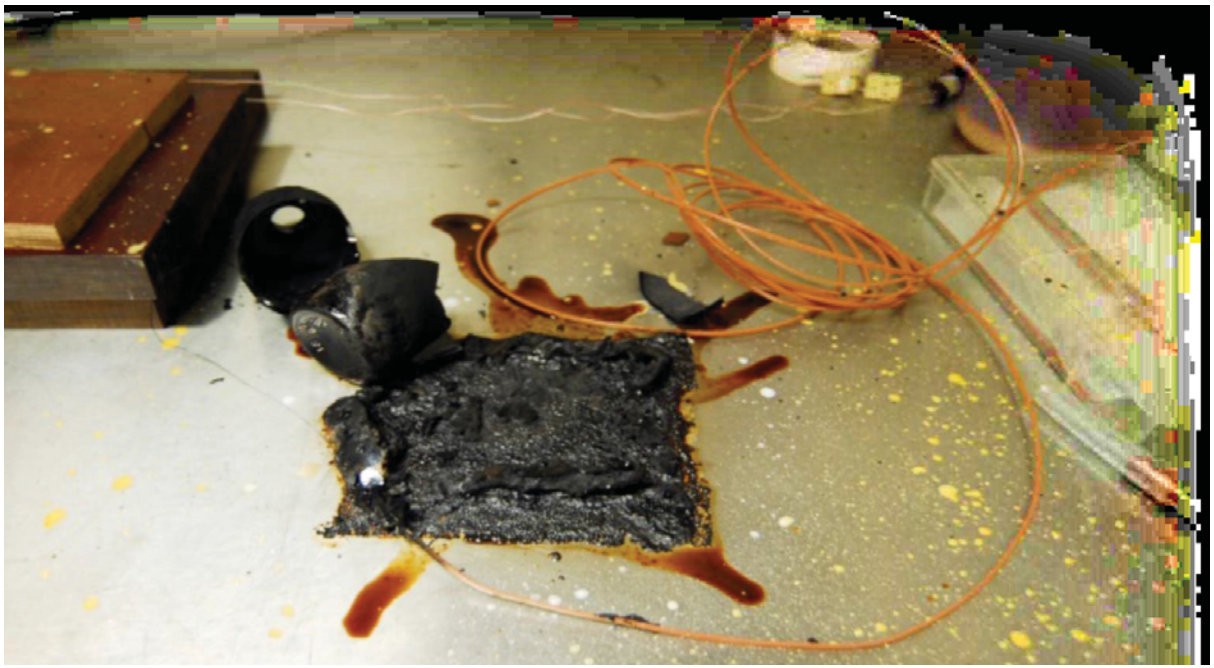
- See the population of explosives in test
- Train directly from scans on their systems
  - No need to transfer data from other systems



Why Can't Gov't Give Vendors What They Want?

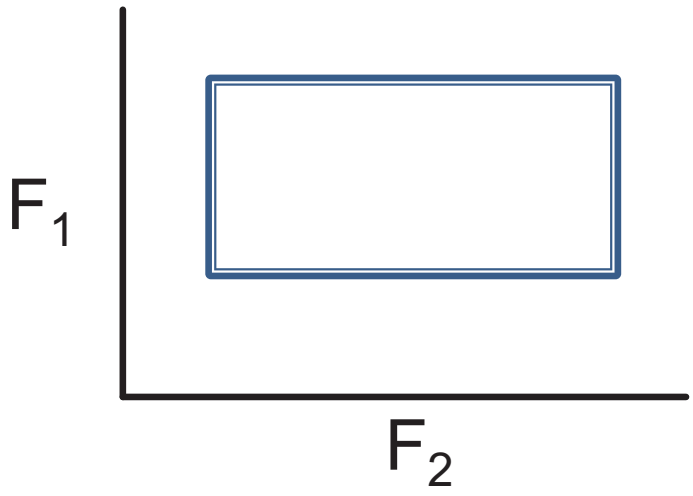
- Expense
- Safety
- Time





How to Create RORs

- Inputs from TSA and Intel
- Theoretical data of explosive threats
- Formulation of small amounts of explosives for scanning
  - Also evaluate safety, detonability and explosive performance
- Scans on MicroCT and vendor CT
- Create boundary around above information
  - Inform vendors what is on test
  - Used for quality control
  - Bounds the space
  - F1 & F2: Al, C, PE, Comp, ρ_e, Z_e, etc.



What Could Simulants Be Used For?

- Depending on the explosive features they mimic (and how well they mimic them), simulants can be used for
  - Training
    - Dogs
    - X-ray inspection systems
    - Carry-on baggage inspection system operators
  - Red team testing
  - Certification
  - Research

Issues with RORs, MicroCT, Simulants and Theory

- Vendors have to translate ROR/MicroCT or theory to their scanner
  - May be differences in resolution, scatter, kV, noise, artifacts, etc.
  - Transfer function required
    - May be difficult to create/implement and will add errors to the data
- All features used in a vendor's ATR may not be captured in ROR
  - For example, texture and corner cases
- Simulants may not be what is in the test
- If MicroCT, simulants, or theory are used, not clear what happens for real explosives in luggage

Futures

- Develop ATRs only using RORs from perhaps MicroCT or theory
  - If RORs are developed on MicroCT a transfer function is needed
  - Allow vendors to provide materials for scanning on MicroCT for transfer function
- If simulants are good enough, vendors may choose to train ATR using them
  - Safer, cost benefits, speed to deployment
  - DHS S&T with other agencies are developing an accreditation program

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