NO PHOTOGRAPHY
NO VIDEO RECORDING

Innovative Research Call 2023 for Explosives and Weapons Detection

Vehicles

Vehicle Screening Scenario

Vehicle travelling at speed
such as along normal road
(e.g. 30 mph)

Vehicle stops for short time
such as at controlled entrance
or ticket barrier

Vehicle joins slow moving
queue or enters speed
restricted area (e.g. 5 mph)

Vehicle is stationary with
no occupants

At speed – Description

- Vehicle moving at speed
  - Such as along normal road (30 mph)

At speed – Possibilities

- Opportunities for assessment
  - From distance at speed
  - Screening system also in motion
  - Time available between screening and decision making

- Scenario should allow for
  - Indication of some possible larger threats

At speed – Constraints

- Vehicle constantly in motion

- Occupants remain in vehicle

- May be a limited time to assess each vehicle (possibly about a second)

Slow moving – Description

- Vehicle moving slowly, controlled
  - Such as slow moving queue at entrance, or speed restricted area (e.g. 5 mph)

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Slow moving – Possibilities

- Opportunities for assessment
  - From distance at reduced speed
  - Drive through (part of architecture)
  - Non-contact at reduced speed
  - Time available between screening and decision making
- Scenario should allow for
  - Indication of some possible threats
  - Detection of large anomalies or unusual voids

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Slow moving – Constraints

- Vehicle constantly in motion

- Occupants remain in vehicle

- Luggage / cargo in vehicle

- Limited time to assess each vehicle (likely to be in the order of a couple of seconds)

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Stopped for short time – Description

- Vehicle stopped for short time (several seconds to couple of minutes)
  - Such as at controlled entrance or ticket barrier

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Stopped for short time – Possibilities

- Opportunities for assessment
  - At reduced speed on immediate approach
  - Whilst stopped

- Scenario should allow for
  - Detection of some threats
  - Indication of some possible threats
  - Detection of anomalies or unusual voids

Stopped for short time – Constraints

- Occupants remain in vehicle

- Limited scope for removing vehicle contents

- Maximum analysis time (whilst stationary) of a couple of minutes

- Consider safety of occupants and security staff

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Stationary – Description

- Stationary vehicle

- No occupants

- Up to several minutes available for vehicle inspection

Stationary – Possibilities

- Pretty much anything is possible
  - Unload contents for separate assessment
  - Interrogate vehicle itself in detail
  - Manual techniques or technology can be applied
- Scenario should allow for detection or identification of:
  - Small and/or well concealed threats
  - Small anomalies

Stationary – Constraints

- Cannot take vehicle apart

Stationary – Description Professional Vehicle Concealments

- Stationary vehicle

- No occupants

- As much time as required for vehicle inspection

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Stationary – Possibilities

- Anything is possible
  - Unload contents for separate assessment
  - Interrogate vehicle itself in detail
  - Manual techniques or technology can be applied
- Scenario should allow for detection or identification of:
  - Well concealed threats (engineered concealments)
  - Targeted and intel led concealments (may be large)

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Stationary – Constraints

• Can take vehicle apart

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# Vehicle Screening Scenario - Summary

Key Targets

- Throughput
  - Target of *several hundred* vehicles per hour through system as a whole

- Screening proportion
  - *All* vehicles subjected to some level of screening

- *Practical* to deploy
  - Safety of operators and vehicle occupants, cost, beneficial compared to current methods

- *Detection* of a range of explosives and weapons

Individual Techniques or Technologies

- Stand-off vapour detection
  - Non-contact vapour sampling

- Stand-off trace detection
  - Detection of <100ng/cm^2 at 1 metre (rough guide)

- X-ray screening
  - Consider legal framework – health and safety of occupants (if present)

- Weigh in motion

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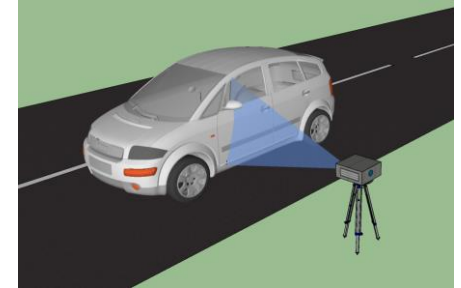
Individual Techniques or Technologies

- Physical / manual search
  - Increase speed, efficiency or reduce number of screeners required

- Screening process design
  - Maximise efficiency, screening lane layout

- Any other innovative technologies, techniques and processes

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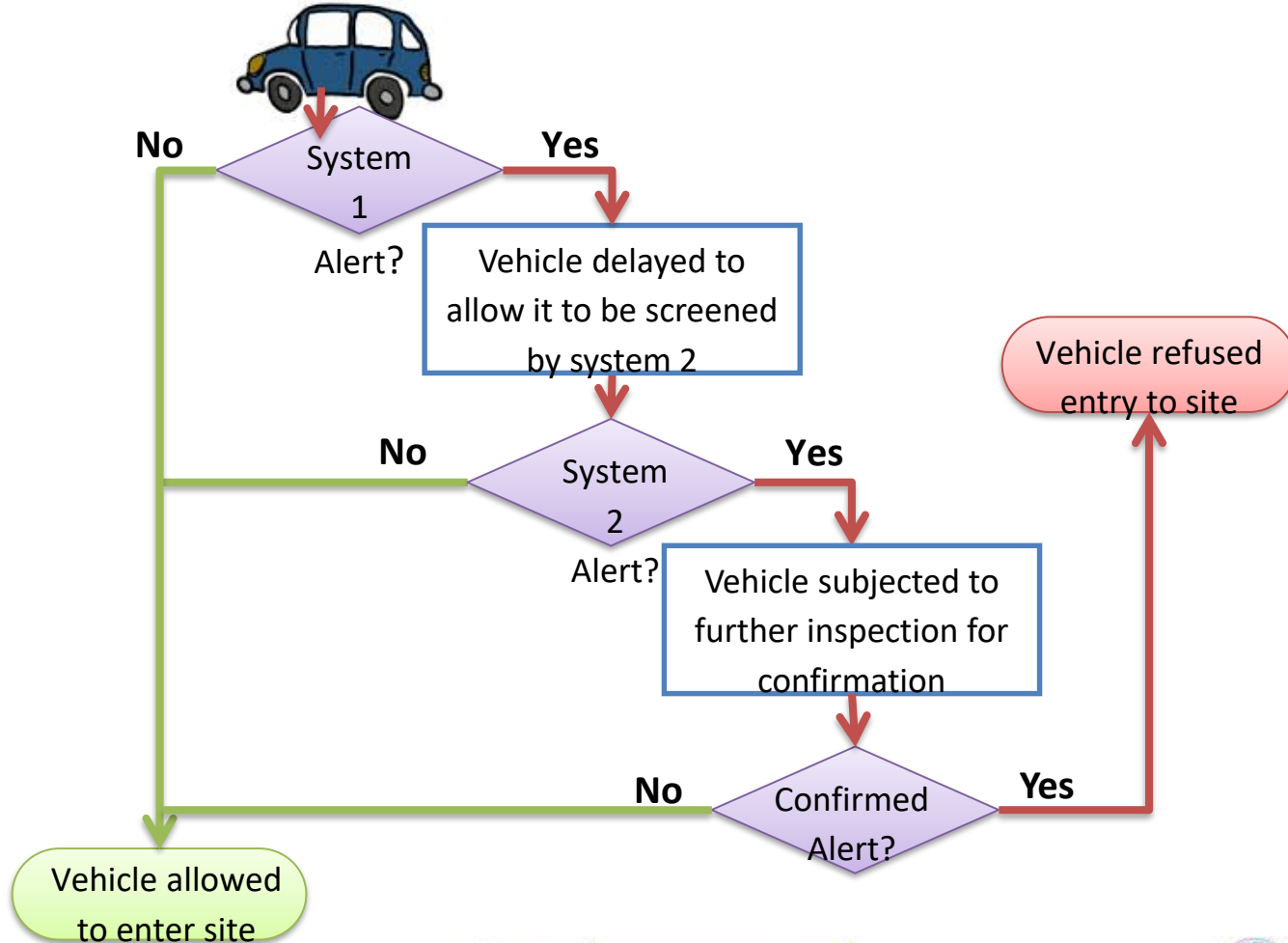Science and Technology

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Multiple Screening Elements

- May want to apply multiple screening or analysis elements
  - Simultaneously or sequentially
- Each element is likely to have different:
  - Screening time
  - Throughput rate
  - Assurance (i.e. detection rate)
  - Specificity (i.e. false alarm rate)
  - Cost
  - Training requirements

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Multiple Screening Elements- Example 1

System 1 Alert?

No → Vehicle allowed to enter site

Yes → Vehicle delayed to allow it to be screened by system 2

System 2 Alert?

No → Vehicle allowed to enter site

Yes → Vehicle subjected to further inspection for confirmation

Confirmed Alert?

No → Vehicle allowed to enter site

Yes → Vehicle refused entry to site

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Multiple Screening Elements- Example 2

1. Technique with high false alarm rate but high speed and cheap

   – Used as initial screening to select vehicles for further inspection e.g. large proportion of vehicles 'cleared'

   – Ideally automated

2. High detection rate, low false alarm rate, but slow

   – Confirmation step on small proportion e.g. whilst moving slowly or stationary

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Closing remarks

- Key challenges
  - Vehicles in motion
  - Increase throughput
  - Increase proportion of vehicles screened
  - Detection of range of threats
- Innovation needs
  - Individual technologies, techniques or processes
  - Integration of multiple screening elements
  - Tools to aid decision making

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Questions