

The Association of Independent Aviation Security Professionals

Promoting the Adoption of Meaningful Aviation Security Measures

Using Dogs/ K9 to Screen for Explosives at the Passenger Screening Checkpoint is Ineffective, Impractical and Unrealistic

In a July 2011 Congressional hearing, Rep. Jason Chaffetz (R-Utah) said: "The single best way to find a bomb-making device or bomb-making materials is the canine". He then strongly objected to cost estimates for K-9, commenting: "How do you come up with hundreds of thousands of dollars. Also only costs so much, I challenge you to verify that number." As a result, AIASP has closely examined both cost and operational issues surrounding use of canine inspection at the checkpoint; we conclude that dogs, while useful for first responder situations and some highly targeted but limited searches, are quite ill-suited to the task of routine continual screening of passengers and their carry-on items at the security checkpoint.

Many canine proponents do not understand how difficult, expensive and time consuming it is to train a canine team and then keep it effective for explosives detection. Similarly, supporters are typically unaware of a K-9's narrowly focused capabilities which can augment, but not replace, evolving technology. This paper discusses these major issues involved with the use of dogs.

Any type of detection strategy needs to overcome four hurdles in order to be considered acceptable for even limited deployment: 1) detection performance/capability, (2) operational viability, (3) acceptance by the traveling public and (4) cost effectiveness. This position paper discusses each of these in turn.

1 Detection Performance

Dogs alert when they smell an odor on which they have been trained to alert (which they do typically by sitting)¹. It is often unknown (especially for low vapor pressure materials) what odor the dog is alarming on. With C4 or Semtex for example, it is likely to be the odor of the plasticizer, given the extremely low vapor pressures of both explosive materials. Obviously there is no ability for the handler to understand which particular explosive or contaminant is causing the dog to alarm. Commercially produced plastic explosives are very uniform in terms of components, so the dog may not recognize and alert on PETN or RDX that is homemade (the raw materials for PETN are paint thinner and nitric acid; for RDX, solid camping fuel can be used). The situation is even more diverse for explosives such as TATP, where the choices of raw materials and catalysts are highly variable.

By definition, dogs can perform well only on the set of materials that they are trained with. The British canine team that missed the AQAP printer-bomb in early 2011 likely did so because the homemade PETN did not smell like anything the dog had been trained to recognize. It is important to note that this was a best case scenario for canine detection: a suspect item, pre-notification of a possible bomb; an informed handler considerably more alert than during routine day-to-day screening of presumably innocent items (such as at a checkpoint), and unlimited time

¹ Generally, dogs are trained on the odors of approximately 28 standard commercial and military explosive substances found in 6-7 groups of chemical compounds. No dog can be equally proficient in identifying all 28, nor are they likely to recognize many in the vast universe of home-made compounds with highly variable components.

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available for screening in a relatively quiet and non-chaotic environment with no distractions. None of these factors would be in place during routine screening at the passenger screening checkpoint, making detection significantly less likely.

2 Operational Viability

Dogs are effective for finite tasks that take a limited amount of time and are aimed at finding a needle in the haystack if there is just one haystack, such as sweeping an arena or enclosed area. For routine screening tasks, the dog – like humans - will get bored and lose interest looking for something that isn't there. Dogs are not universally high-performing, and the handlers must be highly disciplined, since there is a constant high risk of any dog rapidly losing interest and losing detection capability. A dog has a limited attention span and can work effectively for about 30 minutes before they need a 15-20 min. break; a single dog cannot work 8-hour shifts². Dog teams do not run in continuous operational mode, they typically have several hours between tasks. To cover one security checkpoint for a 24 hour period, for example, at least 20 dogs would be needed, each with its own handler. At *one* typical major urban airport with roughly 20 lanes, a minimum of 200 dogs (and handlers, one team at each lane) would be needed for full airline schedule coverage throughout a typical 3-shift day, rotating almost constantly. Given the lack of space at the checkpoint as well as the general organized chaos in managing passenger flow, this would be unworkable. Also, dogs need additional infrastructure to feed and to answer the call of nature. Airports are not a friendly place for such purposes, especially considering that 200 dogs would require a lot of food and produce a lot of dog waste to clean up each day, which would have to be disposed of accordingly. Dogs also need to be kenneled when not in use, with added costs for transport, housing and food and require medical care³

Further, the dogs must be retrained continuously on the full range of explosives they are expected to detect; lacking that, the absence of bombs at airports will degrade their capability since the reality is that explosives are very rare at most airports. If a dog is asked to find an IED, works for hours and finds nothing, the handler then must take the dog out and give it a chance to find the item. Dogs are trained in two different ways—they are rewarded with food or with play when they succeed. That means the airport has to keep at least one, but usually several, samples of each explosive. Since the wide range and small quantities of concern are difficult to store and potentially dangerous, they must be stored in secure bunkers or lockers. To avoid cross contamination of vapors, as well as scent-saturation of dogs, which would render the samples and the dogs useless, each explosive must be stored well removed and in its own vapor-tight container to avoid all the other samples absorbing the odor of the nearest explosive with the highest vapor pressure... or worse, several competing contaminants

² This is particularly true in any public environment (i.e., airports) where there are extremely high levels of activity, distractive movement, hundreds of people, loud noises, and changing background /masking odors

³ These are not trivial matters. Rule of thumb for kennels is a 4x8 indoor pen per dog, outdoor fenced exercise run, plumbing and drainage for sanitation, year-round environment control with fresh dry air circulation well removed from all odors and noise, space for administrative and veterinarian care, etc. There are similar parallel requirements at each handler/dog residence, as well as appropriate transport vehicles.

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During recurrent training, which is constant and ongoing, samples need to be handled extremely carefully (that is, with forceps, not fingers) to keep them from picking up other odors, such as the handler's. It is impossible to assess whether any such types of contamination have occurred and, if so, the dogs are being trained to alert on only that one inappropriate odor, no matter how many different explosives it has contaminated. Because cross-contamination occurs even when the samples are handled carefully, the samples must be exchanged with new materials periodically, which is an expensive, rigorous procedure, especially at a public facility such as at an airport. The samples also must be controlled carefully because a lost sample is highly problematic, particularly if it is forgotten and then discovered elsewhere on an airliner, causing system-wide security alerts.

When considering homemade explosives, the difficulties and variables compound rapidly. It is somewhere between difficult to impossible to make safe homemade samples, many of which decompose quickly. Also, given the lack of quality control or consistent methods of fabrication, each single type of explosive may present different odors of differing combinations and strengths, depending on the impurities, catalysts, raw materials and processes used to make each batch.

Dogs, like their human handlers, vary substantially in their effectiveness from day-to-day and even hourly. With humans this challenge has resulted in continuous on-the-job testing and evaluation tools such as Threat Image Projection (TIP) on x-ray systems to continually evaluate effectiveness. With dogs this is clearly unrealistic; there is no way to reliably assess whether a dog is operating at peak efficiency or is somehow compromised by dozens of operational variables, including temperature, humidity, jet fuel fumes, concession cooking odors, distractions in a chaotic environment, dog age and health, as well as a dog's personality and interaction variances with its handler.

3 Public Acceptance

Many travelers are afraid of dogs and may adversely react to close-up searches. Owners traveling with pets are likely to reduce the dog's attention and potentially could be exploited deliberately to defeat the system.

4 Cost effectiveness.

At a July 13, 2011, hearing of the U.S. House National Security, Homeland Defense and Foreign Operations Subcommittee, TSA Assistant Administrator John Sammon said that canine teams do have a place in aviation security, but they require frequent breaks and are very expensive, with each team "costing hundreds of thousands of dollars." We find Mr. Sammons statement about costs completely credible.

Further, given the requirements for screening passengers and bags at the checkpoint is not merely finding explosives but also conventional weapons and a long list of hazmat and other prohibited items, dogs can only be used to supplement, not replace, many current technologies and procedural measures. This would require additional operational space and personnel (for

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both TSO/screeners and dog handlers), all of which would add substantially to the cost of operating a checkpoint.

In the US, typical dog and handler team costs are⁴:

- Initial cost: \$6,000/ dog
- Dog handler: \$100,000/ yr
- Dog trainer: \$100,000/ yr
 - Initial training requires several months initially; recurrent training is needed constantly, often daily, during operations
- Construction/maintenance of 200 dog facility
 - \$1,500,000 initial construction
 - \$25,000 annual⁵ maintenance
 - Dog facility administrative support: \$35-40,000/ yr
- Vet costs: \$300-400/ dog/ visit
- Waste management/janitorial costs: \$30-35,000/ yr
- Food depending on diet/ food restrictions: \$1200/dog/yr⁶
- Reinforced certified explosive storage facility costs:
 - Construction \$100,000
 - Explosives handler: \$50,000/ yr

Using the example of a major urban airport requiring approximately 200 such handler-K9 teams⁷, the costs break down as follows:

- Additional facility costs: \$1.6M
- Initial cost to implement and train 200 handler/ K9 teams: ~\$36M
- Annual cost of implementing routine K9 screening: ~\$37M/ year

Once again, note that these are new costs, in addition to existing security technology and procedural measures needed for all other threats.

5 Summary

A dog-handler team can be a highly effective counter-terrorism tool, but using such teams in place of machines at passenger screening checkpoints is inappropriate and highly problematic as well as cost-ineffective. It is simply the wrong tool for the task at hand. Nor can K-9 address the wide range of other challenges and threats (not merely explosives) that the checkpoint is required to find; dogs would be implemented only in addition to many of those processes currently in place.

⁴ Source: Metropolitan Washington DC area K-9 handler/trainer with 25 years' experience

⁵ Plus lost opportunity cost for airport alternate use such as cargo facility, tenant lease, etc.

⁶ Approx \$100/dog/month, 200 x \$100 x 12 = \$240,000

⁷ 20 lanes distributed over multiple checkpoints; three operating shifts, day/night peak staffing differentials, constant short duty time rotation, days off, etc. This may or may not require additional teams for non-checkpoint duty.

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Training on the wide variety of materials that pose a threat to civil aviation would be impossible, and performing the recurrent training needed to ensure ongoing effectiveness across such a broad range of threats is highly impractical, and indeed, counter-productive since dozens of additional threat training means less duty time, assuming all dogs can retain effectiveness in all threats, which is highly unlikely. Further, the operational requirements in terms of addressing attention-span challenges, housing, feeding and waste management would be hugely problematic for airports, and the acceptance by the traveling public at large is not assured. Finally, the costs required to implement such a program would be huge, initially in terms of space and facilities and then annually in terms of manpower, dog management, recurrent training and explosive materials handling/ storage.

Dog-handler teams are effective counterterrorism tools for many security applications, but for the reasons listed earlier, routine screening of bags and passengers at/ near the checkpoint is not one of them.