AVIATION'S CONTINUING CRITICAL VULNERABILITIES TO VEHICLE BORNE IMPROVISED EXPLOSIVE DEVICES, INDIVIDUAL SUICIDE BOMBERS, SUITCASE EXPLOSIVE DEVICES ATTACKS AT AIRPORTS

By
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October 2010

On September 25, 2004, I made the following statement in a presentation preceding the 35th Session of the ICAO Assembly in Montreal, Canada[1]:

> "My greatest concern at the moment, however, is the simultaneous use of suicide car bombs against airport terminal buildings. The US and a number of other countries are particularly vulnerable to this type of attack. Some have addressed this vulnerability with countermeasures, but in most instances the measures do not fully address the problem."

In September 2007 I again warned of this potential lethal threat when I made a second presentation in a McGill/ICAO sponsored conference before the 36th ICAO Assembly. In the September 2010 McGill/ICAO sponsored pre-ICAO Assembly conference in Montreal, Canada I once again warned of the dire consequences of the VBIED threat. I once again stated that "it is not a question of *if* – but *when* and *where* this attack will occur."

Our adversary's interest in vehicle borne improvised explosive devices (VBIEDs[2]) is illustrated by the 24 February 2006 attack on Saudi oil facilities and the June 30, 2007 attack on the Glasgow, Scotland airport terminal building. The New York Times February 24th, 2006 edition stated that "Security forces in Saudi Arabia repelled a terrorist attack on the country's most important oil and gas facility on Friday. The attack on the gargantuan Abqaiq oil facility consisted of two cars carrying explosives that attempted to penetrate the facility's defenses." A Reuters AlertNet report (2/26/2006) estimated that each of the two cars was carrying as much as 2,200 pounds of ammonium nitrate, nitroglycerine, RDX and other substances.

The VBIED attack on the Glasgow Airport succeeded in crashing the VBIED into the façade of the terminal but failed only because of the ineptness of the two perpetrators – both medical doctors!

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[1] *Worldwide Conference on Current Challenges in International Aviation*, September, 2004, September, 2007, and September, 2010. Presented by McGill University Institute of Air & Space Law, Montreal, Canada in cooperation with the International Civil Aviation Organization in association with Airports Council International, and the International Air Transport Association and other organizations. http://www.mcgill.ca/files/iasl/McGillFlyer2LOW.pdf

[2] The TSA uses the term large vehicle borne Improvised explosive device (LVBIED) but I have chosen to use the more universal VBIED to cover all such devices.

In other venues, in both published articles and speeches, I have also stated that another pressing threat is the simultaneous attack by multiple suicide attackers using bombs[3] concealed within their baggage or on their persons during peak check-in periods in our crowded major airport terminals. The resulting horror of the hundreds of deaths and injuries from three or four suicide bombers each simultaneously detonating 20–30 pounds of C-4 plastic explosives studded with nails secreted in suitcases or similar amounts of explosives concealed on their persons in a crowded airport terminal would be beyond belief. This scenario or a VBIED at the front of a crowded airport terminal building is exactly what I believe our principle vulnerability is at the moment[4]. Moreover, other events have shown that both of these attack scenarios are attractive to our adversaries.

In my presentations at Worldwide Conferences over the past 6 years I have repeatedly stated that it is not a question of "if" a VBIED would be used against an airport terminal but rather "when and where" such an event will occur. As noted earlier, I made one of my first appeals for attention to the VBIED problem to an audience of aviation officials representing several of ICAO's 190 Contracting States on September 25, 2004 in a presentation preceding the 35th Session of the ICAO Assembly in Montreal, Canada. That is exactly what happened in 30 June 2007 when a British born Medical Doctor (MD) of Iraq ethnicity along with another MD of Indian ethnicity attempted to ram their Jeep vehicle containing an IED through the glass façade of the Glasgow International Airport Terminal building[5]. This was an attempt by two would-be radical Islamic Jihadists.

I made similar appeals about the VBIED threat to aviation to officials from numerous countries at the Saudi Arabian sponsored Aviation Security Conference in Jeddah on March 29, 2007. I did so again at the McGill Institute of Air & Space Law and the Airports of India Conference in New Delhi, India in June 2008, at the Passenger Terminal World Conference in Abu Dhabi, UAE in November 2008, and at the McGill Institute of Air & Space Law and The General Civil Aviation Authority of the UAE sponsored conference in Abu Dhabi in April 2009.

My appeals about the VBIED threat have either fallen on deaf ears or the potential consequences of a VBIED detonation are too horrific to contemplate for my audiences. Or, perhaps others simple do not agree that VBIEDs are the threat to aviation that I have postulated. If the latter viewpoint is the reason for the lack of inaction to counter this threat, and the people holding these views are correct, then we do not have anything to worry about.

Unfortunately the recent worldwide history of the use of VBIEDs does not offer any great deal of comfort. Any quick review on the Internet will reveal several sources that list the number of VBIEDs detonated over the past several years. These sources range from

[3] For the sake of expediency, I am using the term "bomb" here as meaning an improvised explosive device (IED) or a vehicle borne improvised explosive device (VBIED).

[4] For a history of the VBIED see *Buda's Wagon: A Brief History of the Car Bomb*, Mike Davis, Verso Books (2007) ISBN-13: 978-1-84467-132-8.

[5] http://en.wikipedia.org/wiki/2007_Glasgow_International_Airport_attack.

individual or business articles to the U.S. Department of Homeland Security (DHS) bulletins and advisories.

Pic. 1: BBC placed this picture on their website stating that "Thomas Conroy took this picture of the vehicle crashing into the Glasgow Airport's Terminal One building at about 15:15 BST"

Apparently physical constraints at the Glasgow Airport, or the ineptness of the driver, prevented the vehicle from actually entering the interior of the building. There was no loss of life, other than one of the two vehicle occupants, attributable to this act. If not for the ineptitude of the two would-be suicide bombers and others who helped to construct the VBIED, there could have been a considerable loss of life and damage to the Glasgow Terminal building. Will we be this fortunate in the next such attempt?

We continue to hear of threats from al Qa'ida, particularly its second-in-command, Ayman al-Zawahri, who has called former President Bush a "butcher" and threatened a new attack on the United States in a videotape aired on Arab television on January 29, 2006. The leaders of al Qa'ida have recently indicated that they have no better opinion of President Obama. The January 29, 2006, video came in the wake of a January 19, 2006, audiotape by Osama bin Laden in which he warned that al Qa'ida is preparing attacks in the United States[6]. More recent threats in mid-2010 have been forthcoming from both al-Zawahri as well as Osama bin Laden.

[6] January 31, 2006 CBS/ABC.

On 1 May 2010 31 year-old U.S. citizen Faisal Shahzad, an account analyst from Bridgeport, Connecticut drove an SUV loaded with an assortment of explosives and incendiary devices to the corner of 45th street and Seventh Avenue in Times Square, New York. He parked the vehicle and initiated the detonation process and walked to a train station to travel back to his apartment. The detonation process failed to completely ignite the combination of explosives and incendiaries – but caused a fire and smoke that was observed by a street vendor who alerted the police. Faisal Shahzad was later traced to the vehicle and its contents and arrested. Authorities revealed in late September 2010 that had the ignition process worked the resulting explosion would have had potential devastating consequence for anyone within the blast range.

Probability of VBIED Detonation

The likelihood of a suicide bomber detonating a bomb at an airport in the immediate future depends on a number of factors. The logistics associated with acquiring the materials to make a bomb requires consummate skills and, like other terrorist operations have demonstrated, requires a dedication to a goal that is very difficult to accomplish. Just obtaining the explosives to build a large vehicle bomb in some countries is probably very difficult, e.g. given the overall tightening of acquisition procedures for Ammonia Nitrates in the US after the World Trade Center bombing in 1993 and the Oklahoma City bombing in 1995. Nonetheless, it is possible that it could be done provided the right "insider" or "sleeper" personnel were available to assist the terrorists. Saudi Hizbollah managed to obtain several thousand pounds of high explosives and transported them to eastern Saudi Arabia for the Khobar Towers VBIED in June 1996 without the Saudi or US military authorities detecting the effort.

Pic. 1: Khobar Towers Military Complex - Bombing Aftermath, Dhahran, Saudi Arabia – June 25, 1996[7]

[7] Illustrations courtesy of the US Department of Defense

As all US citizens will ruefully recall, our home-grown terrorists, Timothy McVeigh and Terry Nichols, wreaked havoc in Oklahoma City, Oklahoma in April 1995 with 168 deaths and over 800 injured including a number of children in a nursery/kindergarten. The blast destroyed or damaged 324 buildings in a sixteen-block radius, destroyed or burned 86 cars around the site, and shattered glass in 258 nearby buildings. Damages from the bombing totaled at least $652 million[8].

Pic. 2: Alfred P. Murrah Federal Building Bombing, Oklahoma City, Oklahoma, United States, April 19, 1995

Acquisition of Explosive Materials

Obtaining high explosives such as C-4 is probably an order of magnitude more difficult in the US than obtaining Ammonia Nitrates, but here again it is possible given the assistance of an insider – or by theft. The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), regularly reports on thefts of explosives – usually dynamite or slurries, but sometimes military grade high-explosives – around the US. However, none of these constraints may be operative in other parts of the world, particularly in war zones such as Iraq, Lebanon, Afghanistan, Pakistan, Kashmir, etc. In other parts of the world, while less controlled than the US, but not as easy to get explosives as the war zone countries, existing constraints may present less of an obstacle to the terrorist. As an example, during the scare to Singapore and Indonesia following the bombing of the restaurants in Bali, Indonesia in October 2002[9], there were reports that the Jema'ah Islamiyah terrorist group had secreted up to 5,000 pounds of Ammonia Nitrates somewhere in the region – to my knowledge no one has ever found these caches, or disproved their existence, or confirmed their use in other bombings.

[8] http://en.wikipedia.org/wiki/Oklahoma_City_bombing
[9] http://en.wikipedia.org/wiki/2005_Bali_bombings

A third method of obtaining military-grade explosives would be the illegal movement of explosives into the US or other nations through seaborne cargo. A military type of high-explosive would be the ideal choice for a terrorist group wishing to detonate suitcase bombs inside terminal buildings. In fact, a high explosive would be the only way a terrorist could hope to wreak havoc under such conditions as any low-explosive would normally be too bulky to conceal on a person or within a suitcase - particularly one using Ammonia Nitrates, as well as being quite smelly and therefore inviting suspicion. On the other hand, low-order Ammonia Nitrates/Fuel-Oil explosives may be more appropriate for use in the medium to larger sized VBIEDs because of their more destructive impact on building structures. The probability of a group of terrorists succeeding in obtaining military type high explosives is less likely than that of a terrorist obtaining access to several hundred pounds of Ammonia Nitrates, but it is nevertheless a possibility.

An alternative would be for the terrorists to make their own explosives – as they have been known to do using chemicals available on the open market. Ramzi Yousef of the 1993 World Trade Center bombing fame and his Bojinka gang were doing just that in Manila, Philippines in late 1994 when they made a mistake causing a fire. Their Bojinka plans were to bomb 12 US airliners operating in the western Pacific Ocean area. The fire department's response caused Ramzi and his team to vacate the apartment and that subsequently resulted in the police discovering their bomb factory. Ramzi Yousef's Bojinka failure notwithstanding, other groups have succeeded in making their own Triacetone Triperoxide (TATP) explosives – so it could be done, but probably not in any substantial quantity. A more recent attempt at "manufacturing your own" explosives was the interdicted August 2006 attempt by the would-be UK terrorists[10].

Al Qa'ida and other terrorist groups have a history of returning to failed operations. Ahmad Ressam, an Algerian national living in Canada, was caught trying to bring homemade explosives into the US in late 1999 through Port Angeles in Washington State. He subsequently confessed to planning to bomb Los Angeles International Airport. Ramzi Yousef and his gang in New York and New Jersey failed in their 1993 effort to bring down a World Trade Center tower in 1993. Mohammed Atta and his hijacking teams succeeded in completing the job in 2001 – will al Qa'ida persist in their planning to attack Los Angeles International Airport? What better way to do so by using a vehicle bomb – or the simultaneous detonation of multiple suitcase bombs or suicide bombers?

A Word or Two on Intelligence Gathering Systems

None of the US law enforcement agencies had any advance knowledge that these individuals were planning this disastrous act. This is a significant point as a number of individuals in the US are inclined to posit the argument that the US government should not continue spending enormous sums of money on security measures and technology to prevent acts of terrorism. Some of these individuals argue instead that we should increase our expenditures on intelligence gathering as a means to detect these acts prior to the perpetrators actually implementing their plans. We indeed should improve our

[10] http://news.bbc.co.uk/2/hi/uk_news/8242479.stm

intelligence collection efforts, especially after the damage that has been done to the US intelligence system from the late '70s onward. In light of the revelations following the 9/11 terrorist attacks on the World Trade Center and the Pentagon, we should also do more to ensure that our intelligence using organizations such as the FBI, FAA, TSA, and other DHS agencies are properly using the data from the US intelligence community[11].

As a former recipient of US high level intelligence, and a frequent interlocutor with the CIA, NSA, DIA, and the DOS I&R when I was the FAA Director of the Office of Civil Aviation Security I came to appreciate the intelligence gathering organization's products from a particular viewpoint. If, for instance, any of these collection agencies came across information of a direct and discrete nature about a specific threat to US aviation, they would immediately act on that information. I would either be immediately notified, regardless of the time of the day, by secure phone, or they might take other action to neutralize the threat. Unfortunately, or fortunately depending on an individual's viewpoint, the occasions where a specific threat was known to our US collection agencies was a rare event indeed. When this happened it usually meant that the collection source or method was critical and the source or method had to be protected at all costs. Most of the time the intelligence that I received was what was referred to in the media reports after 9/11 as "chatter".

Intelligence chatter is amorphous and trying to determine what is happening is analogous to trying to "grab a handful of smoke". However, taken over a period of time, intelligence chatter is very useful. Comments were made post-9/11 by the US President, Secretary of State, the Administrator of the FAA and others that they did not have any "actionable intelligence" of a specific threat. This was a cop-out as the revelations in the 9/11 Commission Report revealed otherwise and that there was ample intelligence flow to have raised the US aviation protection measures to the highest level possible. I had a similar experience with "chatter" in the 1985 time period. There was enough "chatter" in the daily intelligence flow that I convened a special meeting of my key aviation security staff to discuss the situation. A couple of my own staff counseled me that "it was not specific" and that we should not overreact. I decided otherwise and immediately issued a series of Emergency Amendments[12] (EAs) over the next few months implementing additional security measures. One of those was the Rule[13] that Pan American World Airways subsequently violated in 1988 that permitted the bomb to get on-board PAA Flight 103 on December 21, 1988[14].

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[11] The 9/11 Commission Report

[12] Emergency Amendments were in fact immediate regulatory requirements demanding immediate compliance by US airlines. These Amendments changed the aviation security requirements contained in the FAA's Air Carrier Standard Security Program (ACSSP). The ACSSP was a sensitive document (TSA has reissued this doc under a different acronym) with a very limited distribution to only those with an "operational need-to-know"

[13] I dictated this EA over the phone to my secretary while I was at home in late June 1985 during the TWA 847 hijacking crisis. I did so after receiving a call from my Canadian counterpart who informed me of the way the terrorist had managed to get the bag with a bomb onboard Air India Flight 182 that killed 329 people in late June 1985

[14] See Decision of US Federal Court, Eastern District of NY, June 10, 1992.

My point, if it isn't already obvious, is that reliance on intelligence to protect US or other aviation interests is fraught with great danger. Also, those that are promoting such over-reliance on intelligence are either mis-informed, ignorant of all intelligence systems, engaging in wishful thinking, or may be ingesting hallucinatory substances. The world's intelligence systems are not as one sees in the latest Hollywood 007 and similar movies.

TSA Airport Security Design Guidelines

The Transportation Security Administration (TSA) has partially addressed the VBIED, suitcase bomb and the suicide bomber problem in their *Recommended Security Guidelines for Airport Planning, Design and Construction* (revised June 15, 2006)[15]. Architectural and engineering design firms also have a multitude of industry standards and guidelines that they must comply with in the design of any structure, and some of the guidelines may be unique to the aviation sector. However, from all public indications, the TSA has largely ignored the U.S. aviation system vulnerability to the VBIED, suitcase bomb and the suicide bomber pre-airport airline counter check-in threat at existing US airports. Some may consider this too harsh an assessment but the facts are that other than bulletins and advisories no actual public preventive standards have been specified.

The FAA/TSA has previously addressed the fear of a VBIED detonation in the front of a US airport terminal building. This effort included requirements for police or traffic control officers to ensure that no vehicle was allowed to park immediately in front of a terminal building except for the short period necessary to drop off or pick-up people. This measure is still in effect and one can usually see a tow-truck sitting in the immediate vicinity of airport terminal building access roadways in the event it is necessary to tow a vehicle. The original FAA's restrictions also required that no parking area be within 300 feet of the terminal building. This latter requirement caused so much dissention among U.S. airport officials that the pressure applied to the TSA eventually resulted in the removal of the restriction.

Given the Lethal Radius of Various Explosive Packages shown in the TSA Table on page 6 300 feet would not protect against the three greatest threats shown in the table and would be questionable if it would even protect against the fourth greatest threat in the table. The FAA/TSA measures, in essence, were and are ineffective given the data shown in the BATF table on page 7, both from a stand-off distance as well as once the vehicle is in front of the terminal building it is too late to prevent a VBIED detonation. Was the FAA's 300 foot parking standoff a case of implementing a preventive security measure that sounded good to the uninformed, or was it a case of implementing something that was achievable but impracticable?

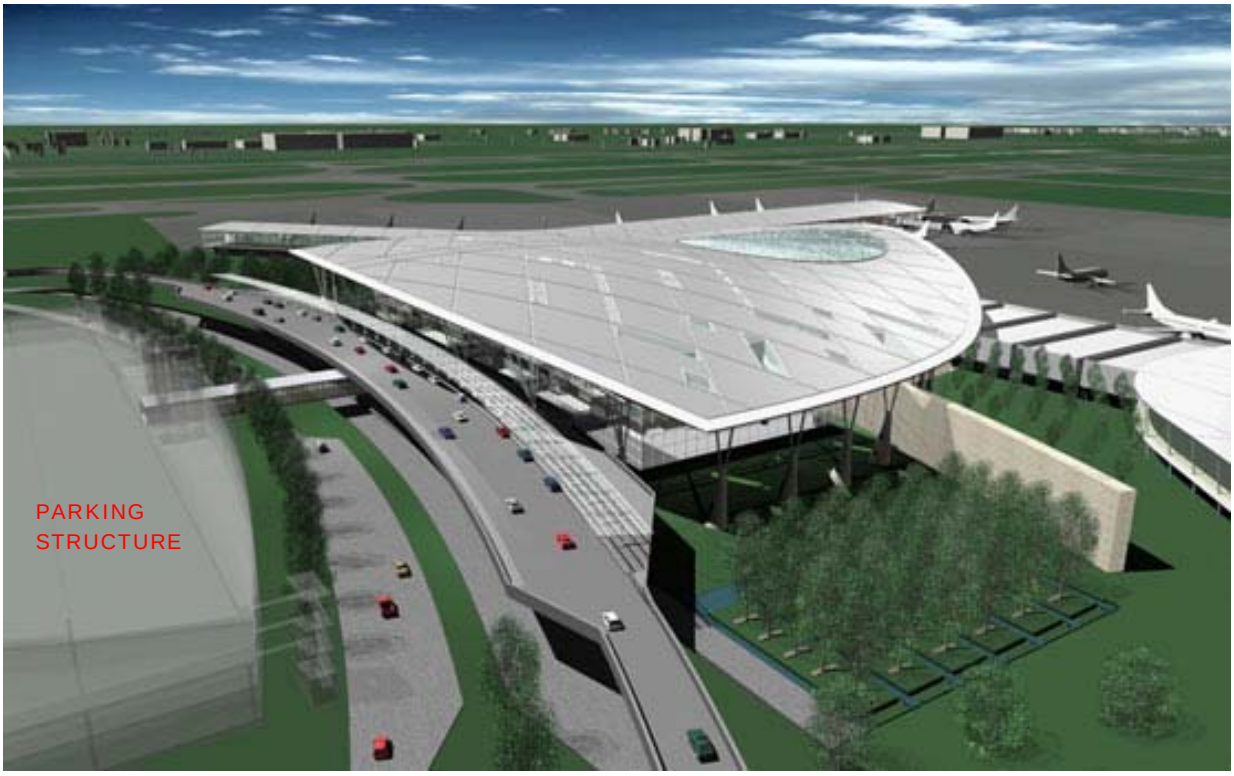
A friend and colleague of mine with years of experience in the intelligence and threat assessment disciplines, whose opinion I respect very much, has asked whether there is an

[15] http://www.tsa.gov/assets/pdf/airport_security_design_guidelines.pdf - These guidelines are more appropriate to new construction but do have some limited application to renovations.

articulated VBIED threat scenario against US airports for these methods of attacks. My intuition and past experience tells me that if there is an attractive enough vulnerability in one's defenses, an adversary will exploit that vulnerability. That the DHS/TSA has identified and analyzed this potential threat is evident in the TSA's Security Guidelines[16]. The International Civil Aviation Organization (ICAO) has not specifically addressed the VBIED threat in Annex 17 Aviation Security Standards and Recommended Practices except for paragraph 3.2.6, which states:

> "Each Contracting State shall ensure that the architectural and infrastructure-related requirements necessary for the optimum implementation of civil aviation security measures are integrated into the design and construction of new facilities and alterations to existing facilities at airports."

ICAO Document 8973/7 (Restricted) includes minimal amounts of guidance regarding blast mitigation and required stand-off distances. Perhaps a recent example of a 2008 advertisement by the designers of the Indianapolis International Airport's new terminal building illustrates the *real* extent of our problem.



Pic. 3: Indianapolis International Airport's new terminal building

The parking structure on the left is located 350 feet from the new Indianapolis Airport Terminal Building to provide a safety buffer.

[16] TSA' Security Guidelines These are *Guidelines* – not *Standards,* so airports are not mandated to comply.

A designer's rendering (from avsim.com), illustrating that the parking garage was outside the blast area of the terminal also showed vehicles immediately in front of the glass façade of the new terminal building. Someone apparently woke up to this contradiction and the illustration suddenly disappeared from the media. One assumes, which admittedly is a risky assumption, that the Transportation Security Administration (TSA) was consulted on the design of this terminal from a security standpoint. Was this design an illustration of compliance with the TSA's Recommended Security Guidelines for Airport Planning, Design and Construction?

The TSA's Recommended Security Guidelines for Airport Planning, Design and Construction address the VBIED and suicide bomber problem from a *blast mitigation design* as well as a vehicle *surveillance, inspection and denial* standpoint[17]. The *guidance* provided in the TSA's document appears to be sufficient for an airport to understand the need to address blast mitigation. However, any airport authority building a new terminal or other government entity building an aviation structure deemed to need blast protection would be well advised to engage; 1) an *aviation* security consulting firm; and 2) an engineering company experienced in blast mitigation design. The extent of the VBIED problem is perhaps best illustrated in the TSA's Recommended Security Guidelines for Airport Planning, Design and Construction on page 35 with the following table:

Table 1 - Lethal Radius of Various Explosive Packages

Type of Explosive	Explosive Capacity in TNT Equivalents	Lethal Air Blast Range
Pipe Bomb	5 lbs. (2.3 kg)	
Briefcase, Backpack, or Suitcase Bomb	50 lbs. (23 kg)	
Compact Sedan (in trunk)	500 lbs. (227 kg)	100 ft. (30 m)
Full Size Sedan (in trunk)	1,000 lbs. (454 kg)	125 ft. (38 m)
Passenger or Cargo Van	4,000 lbs. (1,814 kg)	200 ft. (61 m)
Small Box Van (14th ft box)	10,000 lbs. (4,536 kg)	300 ft. (91 m)
Box Van or Water/Fuel Truck	30,000 lbs. (13,608 kg)	450 ft. (137 m)
Semi-trailer	60,000 lbs. (27,216 kg)	600 ft. (183 m)

Source: Transportation Security Working Group, Terrorist Bomb threat Standoff (Card), Government Printing Office

The Bureau of Alcohol Tobacco and Firearms provides a more detailed table of the effects of VBIED explosions. These include a *Minimum Evacuation Distance* and the *Falling Glass*

[17] TSA Recommended Security Guidelines Part III, Recommended Guidelines and Sections A, C, D and Appendix C.

Hazard. In any VBIED explosion in the vicinity of most airport terminal glass facades the problem would include deaths and injuries from flying (not falling) glass shards. The impact of flying glass shards on people was catastrophic in the August 7, 1998 bombings of the U.S. Embassies in Dar es Salaam, Tanzania and in Nairobi, Kenya. The two VBIEDs collapsed the primary targets as well as adjacent buildings. The combination of the flying debris and the outright destruction of the buildings are a nightmare illustration of what would happen if a VBIED were detonated in front of an airport terminal building.

Table 2 – BATF Explosive Standards

ATF	Vehicle Description	Maximum Explosives Capacity	Lethal Air Blast Range	Minimum Evacuation Distance	Falling Glass Hazard
	Compact Sedan	500 pounds 227 Kilos (In Trunk)	100 Feet 30 Meters	1,500 Feet 457 Meters	1,250 Feet 381 Meters
	Full Size Sedan	1,000 Pounds 455 Kilos (In Trunk)	125 Feet 38 Meters	1,750 Feet 534 Meters	1,750 Feet 534 Meters
	Passenger Van or Cargo Van	4,000 Pounds 1,818 Kilos	200 Feet 61 Meters	2,750 Feet 838 Meters	2,750 Feet 838 Meters
	Small Box Van (14 Ft. box)	10,000 Pounds 4,545 Kilos	300 Feet 91 Meters	3,750 Feet 1,143 Meters	3,750 Feet 1,143 Meters
	Box Van or Water/Fuel Truck	30,000 Pounds 13,636 Kilos	450 Feet 137 Meters	6,500 Feet 1,982 Meters	6,500 Feet 1,982 Meters
	Semi-Trailer	60,000 Pounds 27,273 Kilos	600 Feet 183 Meters	7,000 Feet 2,134 Meters	7,000 Feet 2,134 Meters

As illustrated in the picture of the new Indianapolis Terminal building, the *real* VBIED problem is vehicle access to the front of a terminal building. How can one protect the new Indianapolis Terminal building against the three largest VBIEDs illustrated in the TSA and the ATF chart? Will any blast mitigation design measures for the facility's structure be sufficient, or must one prevent vehicles from access to areas within the blast range?

To the FAA's[18] credit they imposed a 300 foot setback from any terminal building for any vehicle parking areas. In addition the FAA also required a surveillance system of vehicles accessing the roadways to the front of the terminal buildings during high-threat periods. While the effectiveness of these measures was questionable they *were recognition* of a VBIED threat. Unfortunately the TSA later largely discontinued these limited counter-

[18] Prior to the creation of the TSA on February 19, 2002 the FAA was responsible for both aviation *security* and safety.

measures as a result of the pressures brought to bear on them by U.S. airports and their lobbying organization – the AAAE. To the DHS' credit they have issued a number of bulletins and advisories concerning the threat from VBIEDs – but they have not issued any public standards other than the *recommendations* in the TSA's *Recommended Security Guidelines for Airport Planning, Design and Construct*ion[19]. The recommendations for a pre-terminal roadway surveillance, assessment, inspection facility, and associated barriers in the *Guidelines* document are rudimentary at best and are definitely not comprehensive enough to provide any realistic protection against VBIED access to the terminal building. The TSA recommended security planning *Guidelines* do, however, provide some considerable data on planning for blast protection. Unfortunately, given the devastating impact of any sizable VBIED these blast protection measures would probably be insufficient to prevent the collapse of most terminal structures and certainly would not protect individuals.

The lack of DHS/TSA standards for pre-terminal roadway surveillance, assessment, inspection facility, and associated barrier anti-VBIED systems, at least for our U.S. Category X and Category I airports, is unfortunate given the potential devastating impact of any sizable VBIED. The cost for designing, constructing, and operating a pre-terminal VBIED roadway surveillance, assessment, inspection facility, and associated barrier system would be considerable. The Los Angeles Airport considered a limited anti-VBIED system for their roadways but elected not to build and operate a system because of costs. Unfortunately, the costs for most U.S. Category X airports could be enormous. The converse, however, is the potential cost consequences of not doing so. The DHS/TSA would have to be able to articulate a continuing VBIED threat for them to mandate a VBIED pre-terminal roadway surveillance, assessment, inspection facility, and associated barrier system for U.S. airports of any category. It would appear that the DHS/TSA is unable to do so, are unwilling to do so.

ICAO and VBIEDs

The US and other nations are indeed vulnerable to VBIED attacks at airport terminal buildings and to suitcase bombs immediately inside our terminal buildings and at passenger check-in areas. Moreover, even an adversary's casual observation of most airport systems will have revealed these vulnerabilities. The International Civil Aviation Organization (ICAO), the world's aviation standards and recommended practices organization, has yet to address the VBIED threat. VBIED is not yet within ICAO's lexicon! This is puzzling in one sense and quite understandable in another in that ICAO operates on what its 190 Contracting States view as problems to be addressed. From an aviation security standpoint ICAO also operates from within the legal constrictions contained in the Tokyo (1963), Hague (1970), Montréal (1971), Montréal Protocol (1988), and Montréal (1991) Conventions. To my knowledge none of these, including the 1991 Montréal Convention on the Marking of Explosives, actually mentions VBIEDs as a specific threat.

On the other hand the ICAO aviation security and the safety staffs cannot be blind to the VBIED threat. Have these functionary staffs identified the VBIED threat as an area of

[19] Revised June 15, 2006, Section D Terminal Security Architecture, c Bomb/Blast Overview and Appendix C

concern to either the 2004, 2007, or 2010 ICAO tri-annual Assembly groups, and if so is ICAO developing changes to the ICAO Annex 17 Aviation Security Standards and Recommended Practices? It is noteworthy that ICAO's recently reissued five-volume 8973/7 *Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference* Document (Restricted) addresses Improvised Explosive Devices (IEDs) but the document does not specifically address the VBIED threat.

VBIED Countermeasures

Countermeasures instituted by other countries to address existing vulnerabilities to VBIED attacks include vehicle surveillance, assessment, and inspection systems on their roadways well prior to their airport terminal buildings. Three examples of countries that have taken some measure to address VBIED threats immediately come to mind: Jordan, Saudi Arabia, and Israel. Others no doubt exist. As noted in the foregoing paragraphs the TSA's Security Guidelines does provide some *recommendations* regarding vehicle surveillance and inspection measures to be taken on access roadways to terminal buildings during increased threat conditions.

As with most other security countermeasures, none of these vehicle surveillance and inspection systems will ever be 100% effective. The problem is that there are too many variables in any pre-terminal roadway access design that has as its purpose the prevention of VBIEDs from getting within blast distance of the terminal façade. Examples of these variables include: 1) vehicle surveillance effectiveness; 2) vehicle assessment effectiveness; 3) vehicle inspection effectiveness; 4) selection of security staff; 5) motivation of security staff; 6) training of security staff; 7) resourcing of security staff; 8) supervision and management of security staff; 9) selection of system technology; 10) fusion of system technology; 11) technology maintenance; 12) etcetera. Any failure, or a combination, of these variables can result in a VBIED gaining access to the terminal façade.

The foregoing factors notwithstanding, the fact that we can never have perfect performance from our security staff or technology should not deter us from adding these defenses as additional layers of our overall aviation security systems. In fact, these may be the *only* anti-VBIED measures possible in existing airports. In my presentation at the 2004 Montreal conference, I went on to comment about countering vehicle bombers:

> "Effective countermeasures are not particularly attractive in their impact or cost. As I see it, a three-stage system is necessary to have a reasonable chance of preventing successful attacks using suicide vehicle bombs against terminal buildings. Stage 1 is a surveillance and preliminary assessment of all vehicles on the approach road(s) to airport terminal buildings. Stage 2 is an inspection station for those vehicles designated by the Stage 1 surveillance team(s). Stage 3 is the installation of barriers, e.g. above and below ground, as a means of stopping relatively large vehicles if they ignore orders to stop for inspections at Stage 2. I believe it (is) imperative that we address this vulnerability immediately[20]."

[20] McGill/ICAO Montreal conference 2004.

Technology to accomplish these activities are available, e.g. in-motion weighing sensors, in-ground barriers, vehicle screening systems, baggage screening systems, people and personal article screening, etcetera. However, how effective and efficient can these systems be integrated into an anti-VBIED design and what is the impact on aviation and ancillary operations of these anti-VBIED measures? Finally, what are the costs?

Outside of the technical difficulty of building an effective VBIED detection device the most daunting aspect of building a reasonably effective anti-VBIED, anti-suitcase, and anti-suicide bomber detection and screening system would be the efficiency of the design. Any airport with a modicum of passenger traffic will generate a considerable amount of vehicle traffic to the airport. While simply stopping every vehicle for an inspection may be reasonably effective from a VBIED detection standpoint, it would consume an enormous amount of resources, cause an inordinate amount of delays, and result in almost total resistance from all persons impacted by the system. An inefficient anti-VBIED, anti-suitcase, and anti-suicide bomber screening and detection system would not only play havoc with easy access to an airport it could also bankrupt individual airport aviation transportation systems.

I am afraid that none of the answers to these questions will provide anyone with any high degree of comfort or satisfaction. The plain and simple facts are that some countries believe that their surveillance, assessment, and screening of vehicles are effective. It is not clear that they also believe them to be efficient as they spend a considerable amount on human resources and infrastructure technologies to run their security systems. One US airport has examined the cost of implementing anti-VBIED security measures and has declined to do so. On the other hand it appears that the vast majority of airports around the world have not implemented any measures to prevent VBIEDs from access to the front of their terminal buildings. Why not?

Perhaps what is most troubling to me is that my company has had the unusual opportunity of helping define the aviation security systems to protect several new "Greenfield Airports". These new airports offer the unusual opportunity to "do the job right – and at a minimal expense" because there are no existing physical constraints imposed by existing buildings, etc. One would expect that, with this ideal situation that this opportunity would result in the client "buying into the best protections possible". Sadly, this has not been our experience. A combination of factors contribute to this situation, not the least of which are; 1) the airport designer paradigm of "this is always the way we have designed airports; 2) the client's ignorance of the designer's paradigm; 3) we can't do that because it's never been done before; 4) not invented here; 5) we don't believe VBIEDs are a threat to us, 6) it will cost too much, 7) etcetera, etcetera.

The failure of the architectural and engineering industry to adopt new design paradigms for designing new airport terminal buildings outside blast ranges is puzzling given the fact that, according to a variety of sources, several hundred IEDs have been detonated since

January 2004[21] a number of which have been VBIEDs. Surely the architectural and engineering industry is aware of this fact? No country has committed to designing new airport terminal buildings where vehicles are prevented from direct access to the front of the terminal buildings. Who has to take the lead here – clients or the architectural and engineering industry? Will we have to suffer a disastrous VBIED attack on an airport terminal building to change our airport design paradigms?

The architectural, engineering, and construction industry have a plethora of facility design and construction guidelines. These organizations range from those recognized by the American National Standards Institute (ANSI) in the US to Europe's committees for "harmonizing" standards to improve commonality within the EU across national boundaries[22]. The US Codes and Standards making organizations include, among others, the:

a. National Fire Protection Association (NFPA), an insurance industry sponsored organization
b. International Code Council (ICC) (I-Codes)
c. Uniform Building Codes
d. Building Officials and Code Administrators (BOCA), now incorporated into ICC
e. National Building Codes - insurance sponsored
f. American National Standards Institute (ANSI)
g. United States (ASTM) standards.

Principal EU bodies are:

1. European Committee for Standardization (CEN)
2. European Committee for Electrotechnical Standardization (CENELEC)
3. European Telecommunications Standards Institute (ETSI)
4. In addition, there traditional national standard development organizations still active, for example the British Standards Institute, and some government organizations that create standards.

As one can readily discern from all of these myriad standards or guidelines, the architect and engineering firms, along with the construction firms, have a ready source of measures to guide them. The lack of standards or guidelines is obviously not the problem. The problem is one of perspective by the design and construction industry. Their paradigm is

[21] See http://www.rand.org/ise/projects/terrorismdatabase/ and http://smapp.rand.org/rwtid/terms.php and http://smapp.rand.org/rwtid and http://en.wikipedia.org/wiki/List_of_mass_car_bombings and http://www.start.umd.edu/gtd/

[22] Codes and Standards are recommended practices and guides developed by a consensus of recognized experts through a standards development process. In the US, the development process is generally under the auspices and with the approval of the American National Standards Institute (ANSI).

to build a beautiful glass structure because that is what the client wants, the passenger wants, the employees want, the general public wants, etc.

Preventive Measures and Systemic Issues

As with many problems, there is a straight-forward solution to the VBIED problem at new airports. One simply has to keep all vehicles outside of a specified blast distance. Unfortunately, as noted earlier, this solution is not what one can expect to be able to readily implement. The blast distance depends on the size of the VBIED, and, depending on the expert one wishes to believe, the minimum safe blast structural distance can vary from 183 to 400[23] meters. As shown in the BATF graphic this distance will not protect all people from death or injury, but will probably be far enough from the terminal structure to prevent catastrophic damage and subsequent collapse of the structure.

The problem of designing for protection against VBIEDs at newly designed airports is complicated because it involves people, organizations, and professional disciplines with fixed viewpoints and design paradigms, i.e. the problem is systemic. Some of the traditional stakeholders involved are the airport owner (the client), the architects and engineers (designers), the builders (construction companies), the commercial users (the airlines, the concessionaires, cargo handlers, etc.), the passengers, the public, the police, the standards and special interests organizations (DHS/TSA, ICAO, IATA, etc.), other government organizations, etc. Lastly, we have the security agencies or companies that will be responsible for protecting the airport facilities. All of these entities have, to some degree, differing perspectives regarding airport activities and their disciplines. In many instances the problem is complicated further when few of the players, including the security companies, have any real in-depth *aviation* security experience or knowledge.

Perspectives of Stakeholders

Government standard setting organizations (US DHS/TSA, ECAC, EU, EC, etc.) are constrained by rules, e.g. cost/benefit analyses, politics, individual official proclivities, special interest group influence and other issues.

The international standards organizations such as ICAO, ASTM, etc. are constrained by their member states or organizations. Most are deliberative and very conservative in their actions and, as a consequence, are usually operating behind what is usually referred to as the "power curve", i.e. events drive change as opposed to pro-action.

Special interest groups such as IATA, ALPA, IFALPA, AAAE, ACI, and others all have a stake in designs that might impact their organizations, their members, costs, efficiencies, etc.

The client wants an airport that is attractive to passengers and other commercial users, one that is pleasant to visit and use, one that is functional to the user, one that requires a minimum of cost to operate and to maintain, one that is reliable, one that provides a

[23] One non-US source has recommended as much as 400 meters.

return-on-investment, and, lastly, one that illustrates the vision, power and prestige of the owner.

Architectural and engineering groups want to design airports that are attractive to all who use or view them, particularly by other potential clients. The designers want the terminals to be pleasant and comfortable to the people using the airport because that reflects on the designer. While a return-on-investment is a consideration to the designer, it is not as important as it is to the client.

Designers and clients have traditionally selected designs for airport terminals that are open, spacious, and contain great expanses of glass. They do so because we as passengers enjoy and appreciate these open, spacious, and magnificent structures, and these structures are fashionable within the architectural community as well as among the client's peers. However, when explosives are detonated within or nearby, glass walls are deadly to people occupying these structures.

The construction companies prefer structures that they can build without too much difficulty, but complicated structures are acceptable, even though they require more effort, because they have the potential to increase construction fees, and consequently, the profits and the prestige of the construction companies.

Security designers want to see facilities with effective built-in security features in the original construction that provide full-functionality while requiring minimum security staff. Security designers want to avoid the use of secondary, or "add-on", security features because these usually result in some compromise to the security system. Finally, security designers seek to avoid designs that include large amounts of glass walls near potential blast areas that are typical of most airport terminal construction.

The functional conflicts become painfully obvious when all of these groups are brought together during design and build activities. These conflicts are further exacerbated when other variables are introduced.

Security Design Variables

Airport security design is an amalgam of three elements:

1) requirements established by international and regional standards organizations, national regulatory and other authorities;
2) determination of an acceptable level of risk to the airport/state/organization; and
3) the ability of the client to pay for security infrastructure to mitigate or reduce identified security risks.

Prior to the establishment of the ICAO Universal Security Assessment Programme (USAP) national aviation regulatory authority was frequently deficient, ineffective or, in some instances, completely absent. In the few years since USAP began its assessments most of

these deficient ICAO Contracting States[24], have taken action to improve their national aviation regulatory authority and its effectiveness. Unfortunately risk assessment for many ICAO Contracting States is often confused with threat assessment or vulnerability assessment, and there is often nobody willing, or has the authority, to make a decision even if a true risk assessment is done. We then add to this the aesthetics issues and the existing architectural paradigms. Existing systemic paradigms are difficult to change even under the best of conditions. Often the only option for an airport authority is for the security designer to tell the airport client what they really need to do. This immediately brings into play the differing perspectives and conflicts noted earlier.

It is often presumed by the aviation client that the selected architectural and engineering (A&E) design firm can also provide effective and efficient security design. This is not a valid presumption. As a consequence of a lack of sophistication on the part of the client, the security design is frequently included in the architectural and engineering contract. Most often this is the result of a lack of sophisticated knowledge about *aviation* security by the client, and the result too often is the benign neglect of security considerations in the design process. Two major airport terminal designs underway today involving billions of dollars have the architects responsible for incorporating security design into the design of the airport[25]. One of these two new airports already under construction brought its security designer on-board only after the airport design was essentially completed and construction was well under way. The other new airport engaged a security designer, but only after the architecture and engineering design work was two-thirds completed. In these two examples, it will be most difficult or impossible to incorporate protection against VBIEDs, as well as several other security design features, at this late stage in the design and construction process.

Under these types of contracts, if there is a question regarding the amount of latitude given to the security designer, the contract money constraints will rule, i.e. security design will be constrained by the A&E firm's financial contract terms. Moreover, I have yet to meet an airport design firm that has an in-depth comprehensive understanding of aviation security design requirements. In many instances the airport design firm engages an otherwise credible security design organization but one that has minimal or zero aviation security design experience. One of the reasons for this lack of aviation security design knowledge is the arcane nature of the aviation security discipline with its restricted documents. However, many design firms mistakenly believe that they do have this capability or that security considerations are secondary to aesthetics.

These systemic design problems are not unique to any one area of the world. Heathrow Terminal 5 did not incorporate blast stand-off into its design of the roadways to the terminal building. The new Suvarnabhumi International Airport in Bangkok did not address the VBIED risk. As noted elsewhere in this paper, Indianapolis, Indiana, opened their new terminal building in 2008 and actually advertised that the parking garage was built outside the rated blast distance from the front of the terminal building, but their

[24] There are 190 ICAO Contracting States.
[25] See *Aviation Business Middle East*, Billie H. Vincent, May 2009, pg 41

illustration photo showed vehicles on roadways immediately in front of the new terminal's glass façade. Someone apparently subsequently recognized this contradiction and "pulled" the graphic.

Engagement of the Security Designer

These and other variables argue that the security designer should be engaged at the start of the overall airport master planning and initial design activities.

In addition:

1. The security design firm should always have in-depth knowledge and experience in aviation security design, not merely general security, or a non-aviation security specialty area, and

2. The security designer should always be contracted directly by the client, and

3. Primary security design should never be incorporated into the contract for the architecture and engineering design firm, and

4. A direct contract with the client allows the security designer to fully represent the needs and desires of the client.

This arrangement also allows the security designer to privately and discreetly educate the client, if that becomes necessary.

The ultimate disaster is a mix of an uninformed client, a contract with an architecture and engineering design firm that includes a security designer without actual aviation security knowledge and experience, a contract with tight money constraints, and an abundance of ignorance about the true nature of the threat to aviation, and in particular of the VBIEDs being detonated daily in selected areas of the world.

Studies on Anti-VBIED Designs for Airports

It is interesting that Los Angeles is perhaps the only US airport that is known to have seriously contemplated building a system that would prevent a vehicle bomb from reaching the front of a US airport terminal building. The Rand Corporation published a study entitled "*Implementing Security Improvement Options at Los Angeles International Airport*"[26]. In this study, RAND addresses the possibility of establishing vehicle checkpoints at the six roadway access points to the airport. They concluded that it would take from $5 to $7 million to establish these checkpoints.

The RAND study reported that Los Angeles World Airports (LAWA) "completed an in-depth study of adding and staffing permanent vehicle checkpoints. Although their infrastructure

[26] see www.rand.org.

costs were about the same as ours, they assumed much higher staffing costs."[27] The RAND study went on to state that "LAWA concluded that the congestion caused by the checkpoints was too disruptive and the staffing costs too high to provide round-the-clock inspections of every vehicle."

I personally find it disquieting that Los Angeles World Airports has shown the most initiative by a US airport authority in this regard, but still backed away from addressing the VBIED vulnerability. As noted earlier, Ahmed Ressam, the so-called Millennium Bomber, was caught attempting to enter the US with explosives in the trunk of his car with the intent to bomb the Los Angeles Airport? Have we forgotten the lesson learned from al Qa'ida's return to destroy the World Trade Towers in 2001 after failing to do so in 1993? Given that LAWA has been the most progressive US airport on this issue, and they backed away from doing anything, what can we expect from other US airports?

It is interesting that the RAND study for LAWA also concluded that "existing lines (of people) create an attractive target where a terrorist could bring a substantial bomb concealed in luggage with little risk of arousing suspicion"[28] (parenthetical insertion added by author). The problem is that one has a limited choice of countermeasures to suitcase bombs in the check-in areas in virtually all US airports. These countermeasures would seem to be restricted to:

- Establishment of checkpoints for examining baggage off-airport in safe areas where people are dispersed and bomb detonation mitigation features are built in to the check-in areas, or
- Inspect all baggage at the entrance to the airport terminal buildings (which would only partially address the suicide suitcase bomber vulnerability issue).

I observed one such countermeasures area inside a European airport in the 1980s that was processing passengers and their baggage that were enroute to Israel. The features of the facility were designed to limit deaths and injuries to small groups of people – but would not have prevented some persons from being killed or maimed.

The second option identified above would do little to reduce the number of deaths and injuries as most airport terminal entrances are constructed of glass – or have large areas of glass. One major international airport's new terminal building designed into their glass façade measures to: 1) reduce the free shards of glass from any VBIED or individual suicide bombing; and 2) constraints behind the glass to reduce the number of glass chunks that would be free flying through the passenger check-in area. While these design features have been tested in small scale tests, none have had their effectiveness proven in actual conditions. Nor would the measures implemented prevent a number of deaths and injuries – but these design features would conceivably reduce the number of these deaths and injuries.

[27] Ibid.
[28] Ibid.

I have also observed several baggage screening configurations at entrances to airport terminal buildings around the world. Some additional mitigation of deaths and injuries can be realized if the terminal entrances are of substantial steel or masonry construction and the suitcase inspections are done immediately outside the terminal building. The implementation of these countermeasures for suitcase bombs would raise havoc with the current US (as well as most of the world's international airports) checked baggage screening systems using Computed Tomography (CT) explosives detection units that are Integrated into the airport's baggage conveyor system.

Given my projections that we are vulnerable to VBIEDs, suicide bombers and suitcase bomb attacks in landside[29] areas of our airport terminals prior to any current security screening checkpoint, one might ask "why hasn't it happened yet?" From a VBIED standpoint it did happen in the 30 June 2007 attempt in the VBIED attack at the Glasgow International Airport. Only the incompetence of the two would-be suicide bombers prevented a number of deaths and the destruction of a part of the airport terminal façade. Only our adversaries can really answer why we haven't seen more of these attempts – but we know from Ahmad Ressam's intention to bomb Los Angeles International Airport at the Millennium that al Qa'ida did indeed intend to use this method of attack. It was only through the alertness of a US Customs Inspector at Port Angeles that this did not happen. What we apparently do not know is if there are any groups planning to do so now.

VBIEDs at Airports Only?

An equally valid question is: Why only airports? Why not the Grand Central Train Station in New York City, or the Union Train Station in downtown Washington? First, these facilities are not easily accessible to large vehicle bombs as there is some depth to them before one sees large concentrations of people. Even so, ramming a large vehicle bomb through the entrance doors of the Union Train Station in Washington and then detonating the explosives would wreak havoc and result in scores of deaths and injuries. Simultaneous suicide bombers with suitcases packed with explosives could penetrate to the depths of the Grand Central Station in New York or Washington's Union Station or some similar location in other countries during the peak traffic periods and kill scores of people.

So, why not the same concern for trains as I am evidencing for airports? Perhaps the same threat applies, as well as the same degree of vulnerability, and therefore the same need exists to provide some protective countermeasures. That the al Qa'ida associates consider trains a valid and desirable target is evidenced by the simultaneous bombing of the morning commuting trains in Madrid in March 11, 2004. The lesson I take from this is that al Qa'ida succeeded in bombing trains in Madrid with hundreds killed and injured. They failed in Ahmad Ressam's attempt to bomb the Los Angeles International Airport – and they have shown a tendency to return to the targets where they failed – so, is it airports or train

[29] ICAO terminology is that the "landside area" is an area prior to the airport's security screening checkpoints versus the "airside area" which is beyond the airport's security screening checkpoints and perimeter fences, etc. While the landside area may have police patrols and other security provisions it is considered less secure than the airside area.

stations? At this point it appears to be anybody's guess – unless of course government authorities have obtained information that leads them to conclude otherwise.

We have all heard the former Bush Administration and the current Obama Administration officials infer that several terrorist groups have had their planning disrupted by US law enforcement efforts, US military activities, and by foreign government's interdiction activities. We have also read extensively about alleged renditions of terrorists – and the suggested intelligence gathered from these renditions. One more story was the New York Times' revelation that President Bush had authorized the wiretapping of US citizens speaking with foreign terrorist sources. Perhaps a more accurate statement would be "eavesdropping" through intercepts of communications between questionable sources within and outside the US. What we don't know is if any of these actions have prevented additional attacks on US interests, including vehicle or suitcase bombs directed at people in the check-in areas at US airport terminal buildings.

The predicament we find ourselves in is that we have numerous vulnerabilities and we face a high threat level from a demonstrably capable adversary. The choice of attack(s), the time of the attack(s), and method(s) of attack(s) are all the choice of this adversary. We cannot afford to waste critical and scarce resources and therefore must choose our actions and countermeasures wisely. This raises the question of costs associated with the implementation of countermeasures to address threats from VBIEDs and multiple simultaneous suitcase or personally carried and concealed bombs.

Technology Solutions

I am certain that many readers are wondering at this point "why haven't we solved this problem by technology to detect VBIEDs?" The simple answer is that we have been unable to find a technology and a process to detect VBIEDs. The US Department of Defense (DOD) has spent billions of US Dollars on research to develop technology to detect VBIEDs to protect US personnel in Iraq and Afghanistan and still has not found a solution. The technology that we have to detect explosives took us from 1977 to late 1994 to develop. This technology can successful detect explosives in a closed container – albeit a suitcase sized container. It took the expenditure of several hundred millions of US Dollars over the 17 years to do so. During this same time period the US and the Europeans also successfully developed Explosive Trace Detectors (ETDs) - largely through private industry efforts and expense. The ETDs are extraordinarily effective and can detect minute amounts of explosives, provided that they are used correctly. In both of these successes one has to get very, very close to the explosive in order to have a successful detection. In other words, we do not have a stand-off method of detecting explosives. Perhaps we will develop the capability of detecting specific substances at a distance (beyond lethal blast distance?) sometime in the future – but that cannot be foreseen at this time. So, we are left to our current inadequate technology and methods of observation, guesswork (assessments) and security countermeasures, all of which are very expensive to employ.

Countermeasures Costs versus Cost Consequences

Given the US' experience with the 9/11 terrorist attacks, one cannot address countermeasures costs without also considering consequence-costs of a failure to prevent attacks. Some have calculated the cost of the 9/11 terrorist attacks to be well in excess of a trillion US Dollars to the world economy. The true cost consequences are still being felt and may continue for decades – in short, they are incalculable. We have to consider the overall cost consequences of a failure to address a known vulnerability – moreover, one that we know is an attractive target to our adversaries. How devastating is a successful attack to our airports or major train stations that results in hundreds of deaths and injuries going to be on our national will? Our sense of self worth? Our determination to prevail in the war on terrorism? Can we afford to ignore this possibility? Dare we do so? Unfortunately, any analysis on the security costing of preventative measures to counter suicide bombers and VBIEDs issues is beyond the scope of this paper and will have to be addressed elsewhere.

Can we afford the consequences of a failure to address VBIEDs, suicide bombers, and suitcase bomb threats at airports?

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GLOSSARY & ACRONYMS

AAAE	American Association of Airport Executives
ACI	Airports Council International
ACSSP	Air Carrier Standard Security Program
A&E	Architecture & Engineering
ALPA	Air Line Pilot Association
ANSI	American National Standards Institute
ASTM	American Standards for Testing and Materials
ATF	Alcohol Tobacco & Firearms
BATF	Bureau of Alcohol Tobacco and Firearms
BOCA	Building Officials and Code Administrators
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CIA	Central Intelligence Agency
CT	Computed Tomography
DHS	Department of Homeland Security
DIA	Defense Intelligence Agency
DOD	Department of Defense
DOS I&R	Department of State Intelligence & Research
DOT	Department of Transportation
EA	Emergency Amendment
ECAC	European Civil Aviation Conference
ETD	Explosive Trace Detector
ETSI	European Telecommunications Standards Institute
EU	European Union
FAA	Federal Aviation Administration
IFALPA	International Federation of Air Line Pilot' Associations
IATA	International Air Transport Association
IED	Improvised Explosive Device
ICAO	International Civil Aviation Organization'
ICC	International Code Council
LAWA	Los Angeles World Airports
LVBIED	Large Vehicle Borne Improvised Explosive Device
NFPA	National Fire Protection Association
NSA	National Security Agency
TATP	Triacetone Triperoxide
TSA	Transportation Security Administration
USAP	Universal Security Audit Programme
VBIED	Vehicle Borne Improvised Explosive Device

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