

**The Actuarial Profession**  
making financial sense of the future

The latest issues surrounding catastrophe modelling  
Dr. Gordon Woo

## Social Networks:

the key to understanding the frequency  
of catastrophe terrorism losses

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## Understanding Al Qaeda's capabilities

*'After 9/11, the UK and other western countries were faced with the fact that the terrorist threat posed by Al Qaeda was indiscriminate, global and massive.'*

*We have a better understanding of the nature and scope of Al Qaeda's capabilities but we did not have that understanding in the period immediately after 9/11'*

Jonathan Evans,  
Director-General MI5

Bristol University, October 15, 2009



## The Likelihood of Plot Interdiction

'It is with deep regret that I informed the President today that I will step down as Director of National Intelligence effective Friday, May 28<sup>th</sup>.'

Dennis C. Blair

*'Fighting terrorism is like being a goalkeeper. You can make a hundred brilliant saves but the only shot that people remember is the one that gets past you.'*

Prof. Paul Wilkinson  
Chairman, Centre for the Study of  
Terrorism and Political Violence, St. Andrews

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## IRA Campaign in Northern Ireland



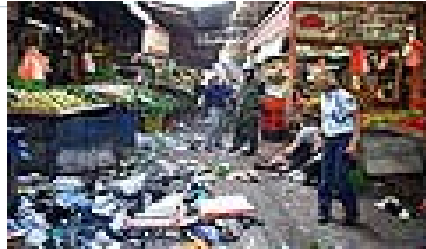
Four out of five attempted IRA attacks were interrupted by security forces.

Chief Constable of Royal Ulster Constabulary;  
confirmed by Stella Rimington, Director-General of MI5

A senior member of the provisional IRA stated that around nine out of ten operations were not carried out due to security force activities.

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## Suicide Bomb Attacks in Israel



Suicide bombing, Carmel market,  
Israel, November 1<sup>st</sup>, 2004

Security improved during the course of the Intifada.  
In 2004, about 90% of imminent suicide terrorist attacks  
were foiled by the Israeli security forces.

Data from Israel Security Agency

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### U.S. Embassy, Via Veneto, Rome:

Target of one of more than sixty attempted terrorist attacks  
against North America and Western Europe since 9/11 which  
have been prevented.

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### **Post 9/11 Western Alliance homeland major Jihadi plots evading interdiction**

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- Miami aviation: December 22, 2001
- Madrid rail: March 11, 2004
- London subway/bus: July 7, 2005
- London subway: July 21, 2005
- London nightclub - Glasgow airport: June 29 - 30, 2007
- Detroit aviation: December 25, 2009
- Times Square: May 1, 2010
- Stockholm: 11 December 2010

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### **Operation Rhyme: US & UK attacks**

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- Dhiren Barot's U.S. targets included the World Bank headquarters and the International Monetary Fund, both in Washington, the Citigroup buildings in New York and the Prudential building in Newark, New Jersey.
- Reconnaissance was also carried out on top London hotels.
- Ambitious terrorist plots capable of causing maximal loss require a significant number of operatives for surveillance, weapon development, security evasion, driving, etc..





Mohammed Naveed Bhatti, an **engineer** who researched bomb-making, provided Barot with access to his garage to store terror plans as well as false documents.



Junade Feroze, was a **driver**, who led counter-surveillance checks. He owned a garage, and could dispose of cars and obtain both tyres and gas canisters for attacks.



Zia Ul Haq had a degree in **architecture**, and provided Barot with information on how to precipitate structural collapse. He also helped in creating false identities.



Abdul Aziz Jalil, Barot's minder, rented a safe house for Barot where planning material was kept. He assisted with research into **radioactivity**.



Omar Rehman, studied information design and was tasked with **disabling fire and security systems**. At his home were plans of a security system and diagrams showing the position of security guards.



Qaisar Shaffi accompanied Barot for US **reconnaissance**. At his home the police were printed pages from the Terrorist Handbook, with references to chemicals and explosives included.



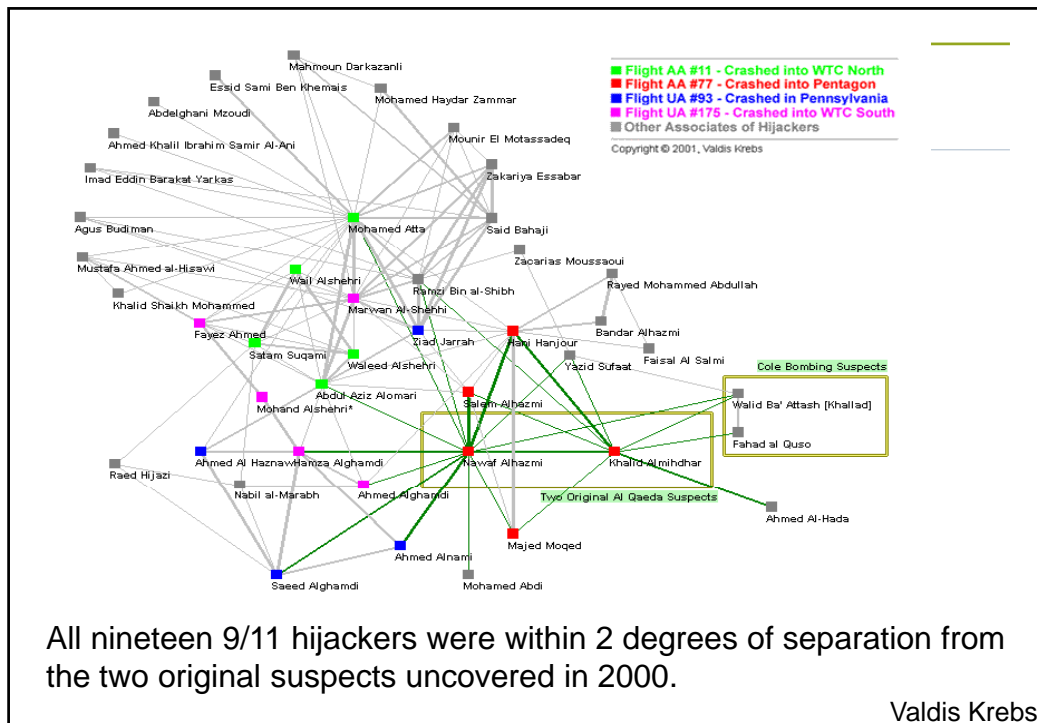
Nadim Tarmohamed undertook US **reconnaissance**. A computer account in Tarmohamed's name was used to save the plans for the attacks on the IMF, New York Stock Exchange and Prudential Buildings.

## Communications intercept

Through a National Security Agency telephone intercept, the CIA knew of a meeting in Malaysia in January 2000, involving the two Saudis: Nawaf Al Hazmi and Khalid Al Midhar

.....later to hijack Flight AA 77 on 9/11.





## Meta-data mining

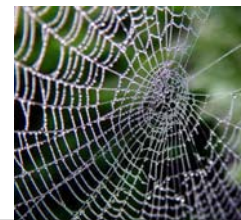
*“Analysts start with a suspect and spider-web outward, looking at everyone he contacts, and everyone those people contact, until the list includes thousands of names.”*

*“Before individuals are actually wiretapped, computers sort through flows of meta-data, information about who is contacting whom by phone or e-mail.”*

Ex-NSA staff member

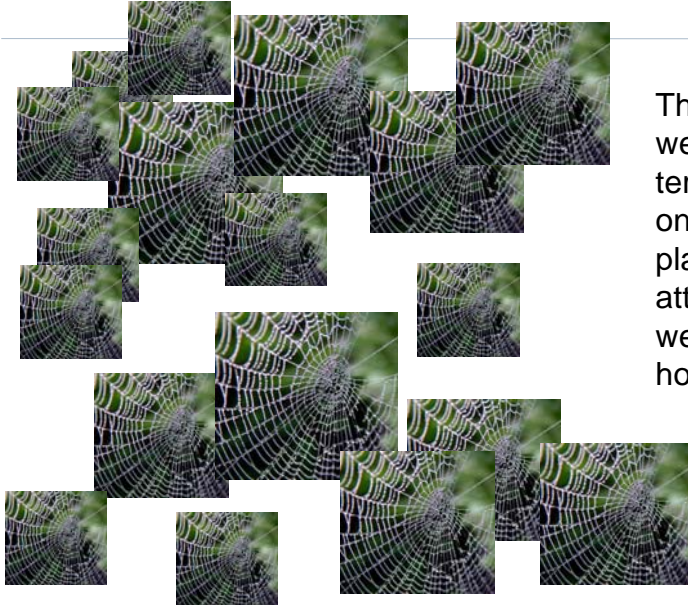


On December 15, 2005, the New York Times disclosed that the National Security Agency taps phone calls to or from USA, if one party is believed to be linked with Al Qaeda.





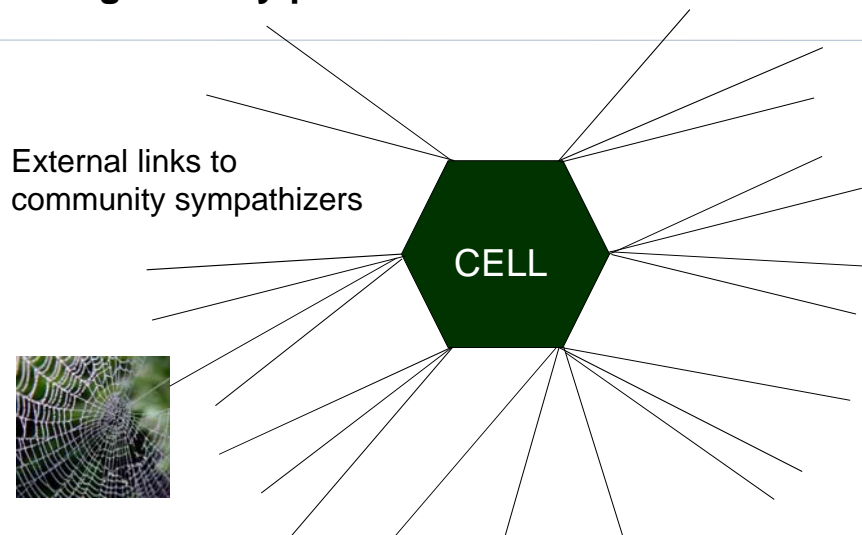
## Spanning the webs of known terrorists



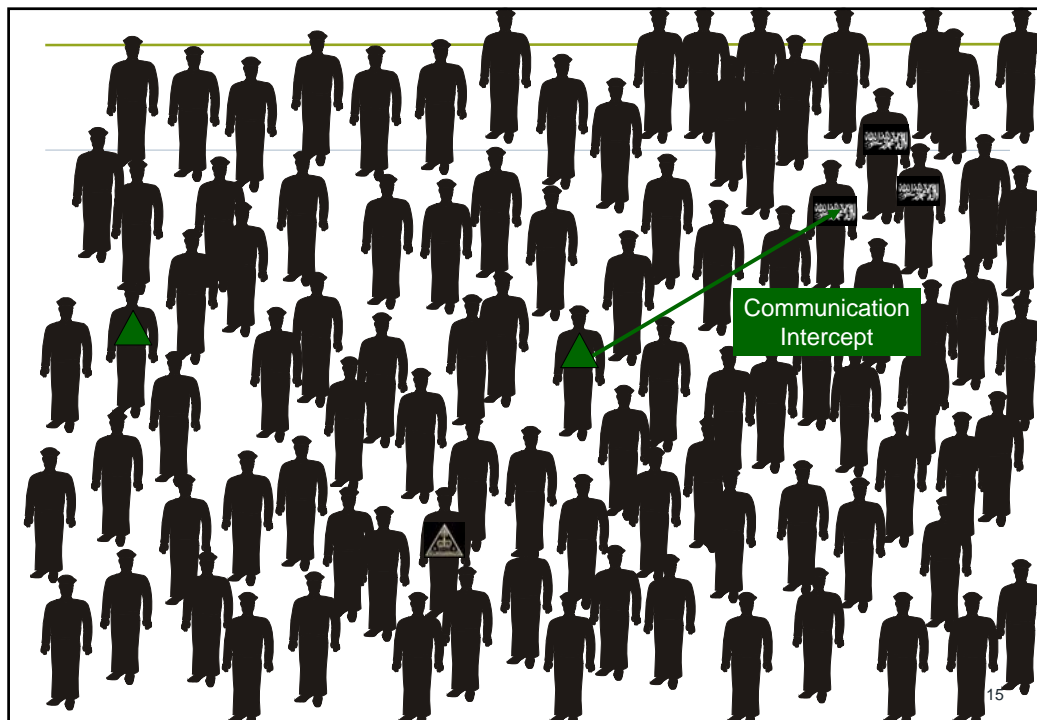
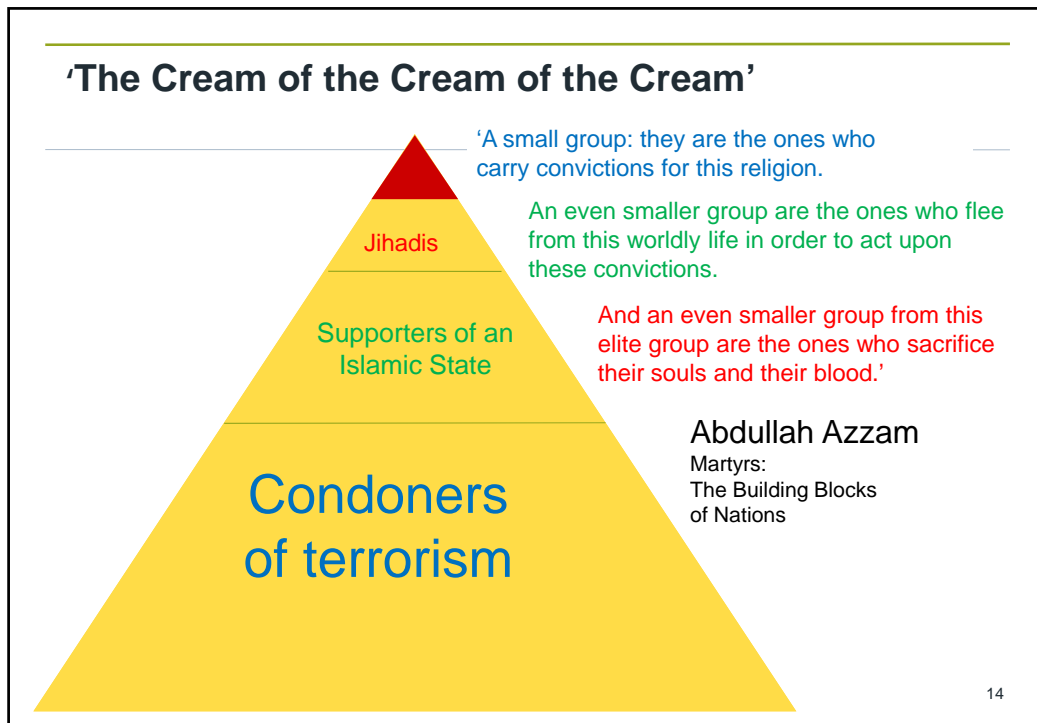
The aggregated webs of known terrorists close in on any operatives planning new attacks against western alliance homelands.

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## Gaining an entry-point into a cell



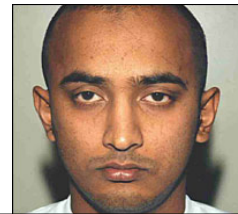
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## Meeting with the security service

- Kazi Rahman was arrested in November 2005 after trying to buy three Uzi sub-machine guns from an MI5 agent, posing as 'Mohamed'.
- This purchase was intended to be followed by others, including a Sam-7 missile and Rocket-Propelled-Grenades."
- He pleaded guilty and was jailed for nine years but details were kept secret because of his links to the 7/7 bombers, who were due to face trial later.



## Modes of interdiction: some recent US cases

- Communication interception
  - David Coleman Headley, 49, the Chicago-based US citizen of Pakistani origin, was a freelance reconnaissance agent for terrorist groups including Lashkar-e-Taiba, the group behind the Mumbai attacks in November 2008. British intelligence collected vital information that identified Headley, and led to his arrest.
- Informants
  - An FBI informant, Shahed Hussain, at the Masjid al-Ikhlas mosque, Newburgh, spoke of violence and jihad to other worshippers, including James Cromitie, alleged to have plotted synagogue bomb and SAM missile attacks.
- Extremist website monitoring
  - Hosam Smadi, a Jordanian, was discovered by the FBI accessing an extremist website, and was arrested in the act of detonating a bomb at the Fountain Place tower in Dallas.

## Monitoring Jihadi websites

- The National Security Agency monitors 15,000 Al Qaeda friendly web sites and chat rooms. Likewise, Israel has many Arabic-speaking agents tracking Jihadi forums.
- The secret services of seven Arab countries have a permanent presence in Jihadi forums. Some of these intelligence agents are prominent members of the forums and specialists in Shari'a. The countries intruding on Jihadi Forums are Egypt, Jordan, Syria, Morocco, Algeria, Tunisia and the Palestinian National Authority.
- Intelligence agent postings are provocatively worded to lure potential terrorists.

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## 2006 Canadian bomb plot

Canadian Mubin Shaikh was first approached by the Canadian Intelligence Service (CSIS) when a friend was arrested in relation to a major British plot.

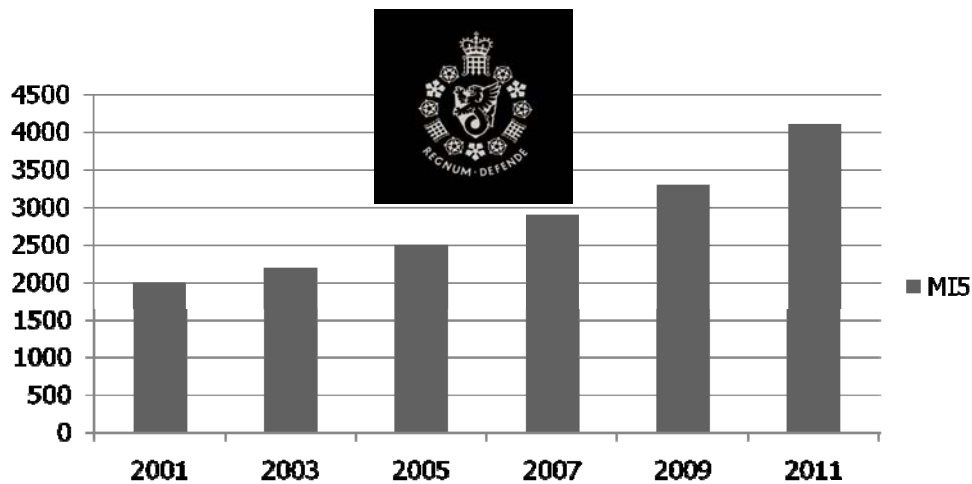


He was tasked by CSIS with befriending a group that spies had been monitoring in extremist internet chatrooms.

Zakaria Amara, one of the key figures in a conspiracy to set off three truck bombs in eastern Canada, was sentenced to life imprisonment on January 18, 2010.

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## Post 9/11 rise in MI5 staff numbers



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## MI5 surveillance of suspected plotters

- As of November 2007, MI5 were keeping under constant surveillance 2000 people directly connected to Islamist terrorist plots. According to the head, Jonathan Evans, countless more are involved in fundraising, helping people to travel to Afghanistan, Pakistan and Somalia. Sometimes they provide equipment, support and propaganda.
- The Security Service currently employs around 4,000 people, most of whom are engaged in counter-terrorism.
- There are 1350 British mosques, of which half are aligned with the conservative Deobandi sect of Islam.
- Apart from the 2000 under surveillance, another 1000 Jihadi sympathizers might be informants or intelligence agents.

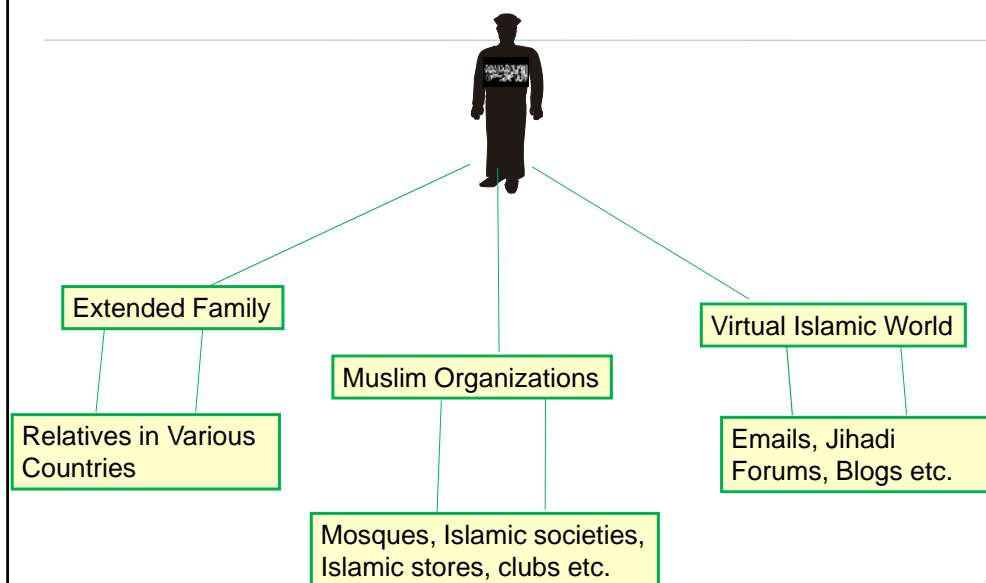
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## Surveillance statistics

- From opinion polls, the number of adult Muslims in UK, condoning terrorism, is estimated at about 60,000.
- The chance that an external contact of a terrorist is dangerous for a plot is estimated to be  $\sim (2000+1000)/60,000 = 1/20$ .
- MI5 has admitted that, prior to the July 7, 2005, bombings, they could properly track only 1/20 of the people it connected with terrorist cells. Jonathan Evans has said, *'We can only hit the crocodiles near the boat'*.

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## External links with the supportive community



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## Extremist Muslim groups in 'Londonistan'

Al-Muhajiroun, meaning 'the emigrants', was founded by the radical cleric Omar Bakri Mohammed. It was disbanded in 2004, and reformed several times.



Anjem Choudary is the current UK spokesman. In its guise, Islam4UK, the group was banned on January 12, 2010.



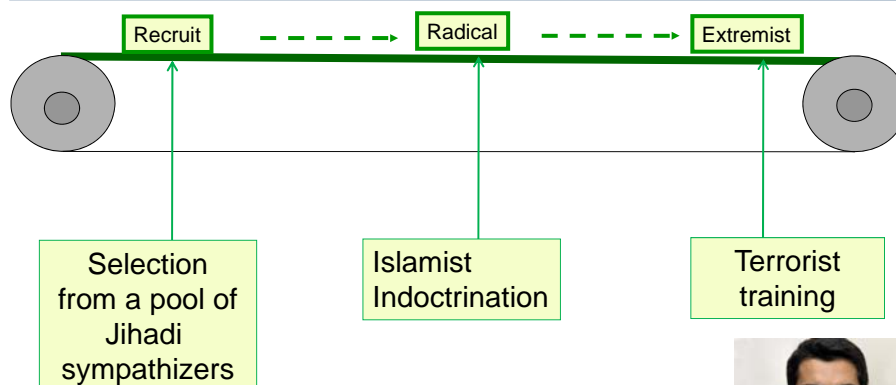
15% of those convicted in UK of terrorism-related offences were either members of, or had links with, this organization.

Centre for Social Cohesion  
June 2009

The more covert Jihadi groups dislike the security service attention given to this publicity-seeking group, which is a source of recruits.

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## MI5 conveyor belt metaphor



From 9/11 to the end of 2009, in UK there were 1,759 terrorism arrests, leading to 223 convictions.



Dr. Mohammed Asha, acquitted of involvement in the June 2007 doctors' attack on London & Glasgow.

## Plot interdiction probability

- Consider a plot involving  $N$  Jihadi operatives.
- Each operative will have a number of contacts within the supportive community. This may involve communicating with individuals by phone, email, post or meeting, or accessing Jihadi forums.
- For a cell of  $N$  operatives, the number of significant external contacts is assumed to be in the general range from  $3N$  to  $10N$ .
- Through indiscretion, each may provide an entry point into a plot network. The probability that a conspiracy is not compromised is the product of the likelihood of non-discovery by any external contact.

Cell Size	1	2	3	4	5	6	7	8	9	10
Plot Interdiction Probability	0.26	0.46	0.60	0.70	0.78	0.84	0.88	0.91	0.93	0.95

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## UK doctor's plot, June 29 & 30, 2007

Bilal Abdulla and Kafeel Ahmed formed a small two-man cell. They had links with the Islamist organization: Hizb-ut-Tahrir.

But, when studying in Belfast, Ahmed knew Abbas Boutrab, who was arrested in Northern Ireland in 2003, and later convicted of terrorism charges. So Ahmed might have been under watch by MI5.



Glasgow airport:  
Saturday June 30, 2007

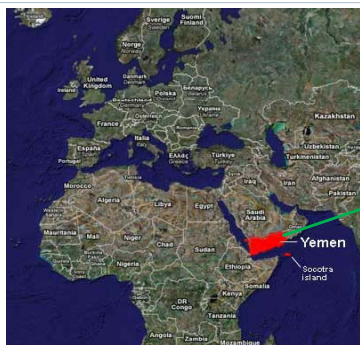


Haymarket night-club, London:  
Friday June 29, 2007





## Christmas Day 2009 aviation plot



Umar Farouk  
Abdulmutallab

An aviation explosives plot requires fewer operatives than taking control of a plane and flying it into a building.



## Relative frequency of vehicle bomb sizes

Bomb Size		Rel. Freq.	Cell Size
Bomb - 600 lb.		100%	Two
Bomb - 1 Ton		30%	Six
Bomb - 2 Ton		14%	Eight
Bomb - 5 Ton		8%	Nine
Bomb -10 Ton		4%	Ten

Based on  
Logistical Burden

Bomb Size		Rel. Freq.	Cell Size
Bomb - 600 lb.		100%	Two
Bomb - 1 Ton		9%	Six
Bomb - 2 Ton		2%	Eight
Bomb - 5 Ton		1%	Nine
Bomb -10 Ton		0.4%	Ten

Including Interdiction,  
this is close to global  
vehicle bomb experience:  
4% for 1 ton bombs  
2% for 2 ton bombs

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## Too many terrorists spoil the plots

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### The Small-World Network Problem

- An excessive number of operatives involved in attack planning, increases the chance that an external link may compromise the operation, and lead to it being interdicted.
- In the past few years, the only successful Jihadi terrorist attacks in countries with high security have involved a modest number of operatives. Large plots involving many operatives have been interdicted.
- Similarly, a proliferation of plots makes it easier for the intelligence services to find an entry point to stop them.

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## Rapid tracking of the Time Square bomber

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FBI agents turned up a telephone number, *but no name*, in connection with Faisal Shahzad's purchase of a Nissan Pathfinder.

Agents searched databases containing the telephone numbers called by or to that disposable cell phone.

They found a number given by Shahzad to Customs and Border Protection, when he was screened on US entry in February 3rd.

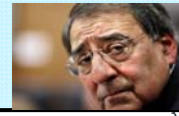


## Basic modelling principles

- For natural perils, hazard events are subject to the universal Laws of Physics.
- For terrorism in countries with effective intelligence services, hazard events are subject to the universal law of social networks, which apply as much to terrorists as to other groups in society.

*'The biggest threat is not so much that we face an attack like 9/11. It is that Al Qaeda is adapting its methods in ways that often make it difficult to detect. It's the lone-wolf strategy that I think we have to pay attention to as the main threat to this country'*

Leon Panetta, Director CIA      February 2, 2010



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## Failure of the Thames Barrier

Special effects were used to predict how London could look if the Thames barrier was overwhelmed by a surge of water.



Keith Weston

Ex-Head  
of the  
Police  
International  
Counter  
Terrorism Unit

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## Thames Barrier flood protection for London



Completed in October 1982, the Thames Barrier has been closed 119 times (up to March 2010) to protect London from flooding.

- an average of about 4¼ per year.

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