

## Models for Homeland Security With Borrowings from SPC and Game Theory\*

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**Abstract.** The events of September 11, 2001, have changed dramatically the perceived and actual security of the United States of America. We have become the target of attack not by a nation state, but rather by a supranational organization of religious fanatics bent on the destruction of our country. Although they acted well outside the boundaries of acceptable Muslim behavior, the fact remains that all the 9-11 terrorists were Muslims. If America is to survive this challenge, then we need to adjust our notions of defense to deal with a threat which is quite different from those successfully dealt with during the Cold War. Just as the threat of nuclear war changed the way we handled conflicts following 1945, we need to come up with a paradigm and a set of tools to solve the new diffuse threats of al-Quaida. In this search for a new paradigm for homeland defense, we ought to learn from the lessons of the past. These include an examination of previous crises produced by Islamist threats and the ways with which they were dealt. Also, we need to profit from the example given us by Herman Kahn early in the nuclear age as to how we can develop new paradigms for dealing with the current threat. Model based simulation, which was the toolbox used by Kahn, can give us a rapid start in dealing with the new crisis.

**Inspection of Airline Passengers.** The father of Statistical Process Control, the late W. Edwards Deming, had little use for the standard acceptance rejection paradigm of quality control. Deming had noted [7] that under the risk function of expected value, the number of sampled items should be zero or the number in the total sample. The argument goes as follows:

Let  $Q$  be the total expected cost involved in sampling of a batch of  $n$

Let  $x$  be the number of items inspected

Let  $c_1$  be the cost of examining an item,

Let  $c_2$  be the cost of accepting a bad item

Let  $p$  be the probability an item is defective

$Q = c_1 x + (n-x)p c_2 = (c_1 - p c_2)x + n p c_2$ .

Then it is clear that we minimize  $Q$  by

If  $c_1 > p c_2$ , set  $x=0$ ;

If  $c_1 < p c_2$ , set  $x=n$ .

In quality control, Deming was quite right.

Unfortunately, the cost of missing a terrorist is so high that Deming's Theorem tells us to subject all passengers to a thorough inspection. If we did that, unfortunately, we would bankrupt the US airline industry. The reality is that we have to work with a constrained optimization problem:

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With  $x$  and  $n$  fixed, find the allocation of thorough samplings which minimizes  $Q$ .

Let  $n = n_1 + n_2$

Assume second population more likely to exhibit "failures":

$$Q = c_1 x_1 + (n_1 - x_1) p_1 c_2 + c_1 x_2 + (n_2 - x_2) p_2 c_2$$
$$Q = x_1 (c_1 - p_1 c_2) + n_1 p_1 c_2 + x_2 (c_1 - p_2 c_2) + n_2 p_2 c_2 .$$

Most likely,  $c_1 - p_2 c_2 < 0$ .

Consequently, since we are limited by inspections capacity to inspect a total of  $x$  items, we should follow the following rule

If  $n_2 < x$ , sample all persons from Group 2 and  $x - n_2$  persons chosen at random from Group 1.

If  $n_2 > x$ , sample  $x$  persons from Group 2. Consider delaying flight until all  $n_2$  are sampled.

Does this mean profiling? Yes. Here is a profiling strategy.

1. Let the first persons checked be the least likely (by stereotype) to be terrorists. Older persons of European origin, may be selected as frequent victims of the thorough search.
2. Select all young Islamic males for thorough checking.

Perhaps, all this is illegal. It is certainly profiling. Under the present situation, it appears unlikely that class action lawsuits would be filed. There is a certain false symmetry presented when nuns and rabbis are being checked, albeit, on the average, much less frequently than young Muslim males. It has the effect of being onerous to all groups without singling out one group and excluding others. Because the persons of stereotypical inclusion in the riskier group are in the small minority, it will almost always be the case that the middle-aged white businessmen and grandmothers outnumber young Muslim males as targets of inspection.

We note here an obvious strategy for the terrorist game master: flood flights with large numbers of persons from Group 2 so that  $n_2 > x$ . This can be done for numerous flights over time without any untoward items being on the inspected persons. This can disrupt the inspection system.

On the other hand, a sophisticated security game master can then look at putative causes of these pulse floods of persons from Group 2, e.g., travel to conventions, etc., and the identities of the persons from Group 2 in the floods, and backtracking their contacts. The commonality of travel reasons provides a venue for discovering the activity of the

terrorist game master. Even if the putative travel reasons are such matters as visiting relatives, going on holiday, the security game master can seek threads of commonality amongst the travelers as a venue for discovering the activity of the terrorist game master.

At the present time, it is unlikely the linkages between al-Quaida and the mainstream American Muslim community are sufficient to provide cascades of suspicious persons to push through the system. However, continuing disaffection due to ill treatment of, say, Palestinians, might, if unchecked, lead to a situation where people who were unwilling to commit a terrorist act might nonetheless be willing to participate in discomfiting the security system. The current security system of the airlines would be seriously stressed if the mainstream Islamic community started to be so offended by US foreign policy that they, and their friends, spontaneously participated in a kind of defacilitation of the security system.

Thus, we note another grand strategy possible for the security game master: minimize, by changes in policy, the fraction of persons in the general population who are in Group 2. That might be achieved by foreign policy modifications, such as establishment of a viable Palestinian state.

**The Reginald Option.** Negative reinforcement is also a useful strategy for America. For example, there appears to be substantial evidence that Wahabi mosques in the West are established via funds from the Saudi state. Since proselytization by non-Islamic groups is strictly forbidden in Saudi Arabia (as is Christian worship), the Saudi government might be told to cease such Wahabist support forthwith. It might also be indicated that the next time an attack organized by Saudi activists took place on NATO territory, occupation of Saudi oil properties would be executed forthwith. If the al-Quaida terrorists can attack targets in the West with assurance that no targets in their lands can be attacked in their turn, they have an advantage. Presumably, al-Quaida attacked the Twin Towers in New York City and the Pentagon as what ben Laden perceived to be the symbols of America's power. The outrage in America, however, was not so much with the destruction of property, symbolic or otherwise, as with the enormous loss of life. The West does not have sacred real estate in the way that the Wahabis have Mecca. That is a Western advantage.

Twice, in 1181 and in 1183, Reginald of Chatillon-sur-Marne, the "Wolf of Kerak" launched raids into Arabia with Mecca his goal. Overwhelmingly outnumbered, Reginald was unsuccessful. (He was ultimately personally butchered by Saladin after the Christian defeat at Hattin). But the raids were, in part, a "tit-for-tat" for Saladin's declared jihad against the Crusader Kingdom of Jerusalem. The point I am making here is that those who support terrorist attacks against American lives must understand that we hold American lives sacred and will respond to massive American loss of life with any means necessary to emphasize that fact. Whether consciously intended as such, the recent American attack on Iraq was an attack and occupation of one of the holiest cities in Islam--Baghdad, where the Caliph reigned as supreme spiritual and temporal authority of Islam for 500 years. There is essentially no evidence that Saddam Hussein played any role in facilitating the 9-11 attack, and the "widespread weapons of mass destruction," at

the time of this writing have yet to be found.

Saddam had the misfortune of being an unsympathetic dictator occupying territory in which an object lesson needed to be made. There is a clear message in the Anglo-American invasion of Iraq: If Western lives are destroyed by Islamic terrorists, then the West is perfectly capable of doing a Reginald of Kerak-type retaliation. We know that after 9-11 "Osama" has become quite popular as a first name for the male children of Muslim parents. That should say something to America about the hostility it enjoys throughout the Muslim world. It is to be hoped that the hatred of America can be, over time, ameliorated. In the short term, however, it should be made clear to all that America will not tolerate the destruction of its citizens nor the idolization of the ring leaders of anti-American terror rings. The holy places of Islam are held hostage by the military technology of the West. Whatever politically correct jargon may be used by Western leaders, the facts speak for themselves and, if as yet not understood in the West, are probably beginning to be understood in the Middle East.

The "Reginald of Kerak" strategy is of course simply my speculation. In a way, it is too elegant to be the real cause of the taking of Baghdad. It may well be that the Iraq War was part of a completely different strategy. However, Muslims, who know the history of the Crusades better than most Westerners, may nonetheless profit from interpreting the War as I have suggested. One thing is fairly clear, a second attack of the magnitude of 9-11 would result in an open and blatant "Reginald." The realization of this fact is a mighty force arguing for Islamic leaders not to give aid and comfort to al-Quaida. Some have suggested that Islamist terror rings like al-Quaida do not have retaliatable real estate. Nothing could be further from the truth.

Returning to our mathematical model for passenger inspection, we note that diminishing  $n_2$  and/or  $p_2$  by positive and/or negative reinforcement is clearly indicated to be a good thing by the model. That is the main message of the model: diminish  $n_2$  and/or  $p_2$ .

For crews, baggage handlers, etc., 100% inspection by regular random polygraphs and inspections whenever entering the work site is clearly in order.

**The Container Inspection Problem.** Cost saving technology in the transportation of goods has led to the use of large containers of standard dimensions, which can be loaded and stacked in ships and easily transferred to trucks. The size of these containers is sufficient to accommodate thermonuclear devices in the multiple-megaton range. Dirty bombs with thousands of pounds of nonfissionable nuclear material with a conventional explosive trigger are easy to construct and can be accommodated by such containers. Most of our major ports are within a few miles of population centers. Rail and truck logistics plus offloading considerations do not admit of taking cargo off in isolated ports. Even were this possible, the containers might be detonated while on rail lines or trucks. This kind of Trojan horse strategy for the terrorist game master would appear to be too tempting to resist for long.

We will require sensory enhancements of some magnitude in order to eliminate the

possibility of someone detonating a nuclear device hidden in a shipping container. These containers really need to be inspected on the high seas and done by some wholesale inspection whereby if a ship tests positive for one or more containers it is appropriately dealt with. Compared with the container inspection problem, the passenger inspection problem is relatively easy.

**Leave Policy to the Experts?** President Eisenhower warned of the military industrial complex. Now we must worry about the cozy relation between a host of federal agencies, think tanks, beltway bandits, and academia. How well would things go if we turned them over to the “experts.” Let us consider the achievements of the experts in “the War on AIDS” [4], [5]. America has spent more on the AIDS epidemic than the rest of the First World combined. What does it have to show for it? AIDS rates ten times that in the UK, eight times that in the Netherlands, six times that of Denmark, and four times that in Canada [6]. All the other First World countries have taken serious steps to shut down centers (such as gay bathhouses) of high rate homosexual contact. The United States Centers for Disease Control have recommended no such policy. Neither has the Surgeon General. And this has been the case during four different administrations of both major parties. The general benefit to the society has little influence. The special interests of those who wish the bathhouses to remain open have not so much, but more than enough. The result is that by the date of this writing more Americans have died from AIDS than the USA’s total of combat deaths during World War II. And another million or so Americans are HIV positive. A country whose public officials have little hesitation in sending its armies off to war in Iraq does not have a public health establish willing to bear the heat of a “politically incorrect” albeit epidemiologically sound decision. If the public health establishment, with a history of over one hundred years, has not the competence to deal with AIDS, is it reasonable to suppose that a freshly hatched homeland security will be infallible?

The American scientific establishment is too comfortable in its relationship with the federal establishment. The current practice when exploring new situations is for one view to become dominant and the crowd of investigators who aspire for government funding quickly to fall into line behind the dominant view. If one or more federal agencies want to show that the “Gulf War Syndrome” is purely a neurosis, they may be assured of widespread support within think tanks, universities, other federal agencies and professional scientific associations.

In the American scientific community, we are approaching a “kindler gentler” version of Lysenkoism. **Trofim Denisovitch Lysenko (1898-1976)** was Stalin’s favorite agronomist. By appropriate techniques, one could train plants to produce better, and the improved characteristics could be passed on to the seed stock. No worries about the fact that Siberia was unsuited for the growing of wheat. Wheat could be taught to grow in the permafrost. This warmed over Lemarquian idea pleased Stalin (and Kruschev) immensely. It had a kind of consistency with the Marxist paradigm in which environment trumps heredity. Botanists and agronomists who disagreed with Lysenko not only did not receive state support for their research. Frequently, they were sent to the gulag. This included Lysenko’s thesis advisor. The uniformity induced by Lysenkoist orthodoxy

greatly added to the problems of Soviet agriculture. And these problems were one of the reasons for the fall of the Soviet Union. Scientific orthodoxy is stifling at best, devastating at worst.

Here is where we statisticians can make a real contribution, by making a wide variety of recommendations and debating them openly. No establishment likes contrarians. But this is the role statisticians need to play. We remember our heritage as the custodians of the scientific method. Logical inference based on facts is our duty. We must not become part of any establishment “Amen corner” even if that is where the big bucks are most readily available.

**Thinking Outside the Box.** The Cold War was, in my opinion, a significantly more difficult problem than the current War Against Terrorism. Early on, the Americans and Russians seemed very much on the verge of thermonuclear war. The hydrogen bomb was produced by both countries in quantities sufficient for the devastation of several solar systems. Stalwarts like American General Curtis LeMay were very much of the opinion that Soviet aggression should be answered by matching and escalating aggression. Perceived weakness was only an invitation to further aggression. And there was something to this argument. It seemed as though either America would elect a president who would take the Bertrand Russell position that the West should capitulate, or there would sooner or later appear a spiral of escalation, which would lead to nuclear war.

Enter Herman Kahn. Herman Kahn (1922-1983) was for a time the world’s leading expert in Monte Carlo methods. In the late 1950s computers were quite primitive. However, they were sufficient for random walk simulations of boundary value problems relevant to nuclear physics. Kahn was quite clever in the way he gained efficiencies in such settings. However, he was also aware of the geopolitical implications of nuclear weapons. Dealing with such “soft” problems did not lend itself to ready tractability. However, Kahn noted that in the case of combat situations where the ultimate level was



nuclear war, the escalation could be discretized into an “escalation ladder.” If the two major nuclear powers would make a point of pausing at each step up the ladder, then the Curtis LeMay continuous walk to the edge could, perhaps, be avoided. Interestingly, Kahn’s paradigm was studied and tacitly accepted both by Russian and American leaders. Kahn [2], [3] had discovered a natural approach for dealing with nuclear threat without either capitulation or Armageddon.

Kahn did not live to see the end of the Cold War, but there is a good chance that without his influence the crisis continuum would have led to catastrophe. His models provided a framework for American leaders where a practical game theoretic means of dealing with strategy was natural. The Pershing II strategy

worked out by Ronald Reagan and Helmut Kohl is an example. It was a fairly open secret that the Soviet 50,000 tanks and a relatively short supply route would likely enable the Russians to win a conventional war in Europe. Only nuclear retaliation by the United States could kosh such a strategy. The nuclear missiles on German soil could not reach Moscow or Leningrad. Use of aircraft borne nuclear missiles could immediately escalate to global nuclear war. Indeed, Charles deGaulle had pulled France out of NATO and developed his independent nuclear force for just this reason. If the Soviets were to attack through the Fulde Gap, France would not intervene provided the Soviets stopped at the Rhine.



### **Herman Kahn**

The installation of the Pershing II's gave NATO a missile, which could reach Moscow and Leningrad. If a missile station commander saw that he was about to be overrun, there would be a strong temptation to use the last 15 minutes of his life to fire his missile(s). This might be strictly forbidden by remote commanders, but the Soviet leadership could count on the real chance that some of the American missile commanders would "use before losing." With one fell swoop, Reagan had rendered the 50,000 Russian tanks relatively useless. Kahn had taught (through his books, all of which Reagan had read) Reagan how to reason in the game theoretic way: "If A does this, then B does that, and then A very well may do something contrary to A's official policy due to decentralized command." The Pershing II strategy was a nail in the coffin of the Soviet Union. How quickly had Kahn brought American hardliners from the direct and dangerous approach of Curtis LeMay to an indirect and subtle strategy where America could use its economic power to rid the world of the Soviet threat.

Kahn taught us many things, which translate into our current situation. For example:

- a. It is easier to teach a scientist political science than it is to teach a historian quantitative reasoning.
- b. Poorly axiomitized models of real world geo-political situations can be dealt with by quantitative scientists..
- c. It is better to have some criterion functions about rather than just muddling through.

**Some Lessons from the Past.** There are those who hold that the War on Terrorism should be attacked de novo, that it is an entirely new situation. I disagree. Let us consider the first 9-11. On September 11, 1683, Islam reached its high water point in its attempt to subdue Europe. Using the pretext presented by some Hungarian Calvinists that they were being persecuted by the Catholic Austrian Emperor, the Turkish Sultan launched an exploratory attack into Austria, which was so successful that by September of 1683 one million Turkish troops were on the verge of the capture of Vienna. Desperate, the Austrians appealed to the Polish King John Sobieski to hasten to their aid.



**Siege of Vienna. September 11, 1683**

The Polish king was married to a beautiful French princess and many of his court advisors were French. Their advice was unanimous: stay out of the fray. There were good reasons to heed this advice. The Poles had no large standing army, relying mostly on a national militia composed of the 15% of the population who formed the nobility. Once the mobilization had taken place, the Poles could put up to a million men into the field, but militia mobilization typically required months. The king had a private army of only 30,000, including 13,000 hussars. The Sultan was not at war with the Poles, but if the Poles attacked his forces, then he might decide to move on to Warsaw after taking

Vienna. Then there was the treachery of the Austrians to consider. Why rescue an empire, which might itself try to wrench away Polish territory?

To all these arguments, Sobieski answered simply, “I am a Christian prince and I will not sit by while Christian women are to be sold two for a dinar in Istamboul.” He marched forthwith to relieve the siege. Arriving with his spearhead of 13,000 heavy cavalry (hussars) on the evening of September 11, he attacked early in the morning of September 12 going for the command and control center of the Turks hard by the Vienna Woods. The rout of the Turks was complete. As a military force in Europe, the Muslims were thereafter in decline. Following the victory, Te Deum was ordered by the Archbishop of Vienna. The text selected from the Gospels was, “There was a man sent from God whose name was John.”



**Victory at Vienna September 12, 1683 (Jan Matejko, artist)**

As Sobieski’s advisors had warned, Austrian gratitude was of short duration. In 1772, Austria participated in the First Partition of Poland. Today, one would be hard pressed to find any evidence in Austria that Sobieski’s hussars had saved Vienna. (There is a small notice of the fact in a wine bar near the place where the Turkish command and control center stood. One feels that the plaque serves more as an advertisement for historical significance of the wine bar than from any sense of gratitude.) Sobieski would not be surprised about all this, and he still would have attacked the Muslim host had he known all the gory details up to and including the attack on Poland by the Austrian Hitler in 1939. Sobieski had this sense of history that Christendom is of one piece and should stand together against Islamic threat. Immediately after 9-11-2001, this spirit of Christian solidarity was rekindled as it had not been seen since before the Reformation. That it was

dissipated in less than a year does not speak very well for the statesmanship of the Bush administration. Given the anger engendered by 9-11, with proper consultation and leadership there is little doubt that all of Christendom would have supported almost any modality of retaliation, including the use of the “Reginald Option” against Baghdad.

**The War on Terrorism.** Many regard the current situation to be much worse for America than the Cold War. I strongly disagree. If the Oklahoma City bombing, which proceeded from Christian elements, had had significant support within the USA, our problems would be much more serious. The putative Oklahoma City terrorists looked very much like white middle America.

On 9-11, all the terrorists were Arab Muslim noncitizens of the US. According to the CUNY 2001 American Religious Identity Survey, 76.5% of Americans are Christians, 1.3 % are Jews and 0.5% are Muslims. It appears that only a tiny fraction of American Muslims have sympathies with the terrorists. Most Arab Americans are, in fact, Christians and descended from refugees of persecution by Islamic regimes. America has for some years had a casual attitude to monitoring non-Americans within its borders. That is changing and quickly.

The basic tolerance of the American people can be indicated by the fact that there were no riots against Muslims following 9-11, no murder of any Muslims in America, citizens or not. The overwhelming majority of Americans want a policy of tolerance motivated not so much by altruism as by the realization that religious strife is bad for business. It is a long standing tradition in the United States that quarrels from the old world should not be imported into America. In the case of a defensive war, persons from the old world typically side with America against their ancestral lands. The key American commanders in World War II, Eisenhower and Nimitz were both German-Americans.



**Jenin, winter of 2002, following Sharon’s “pacification”**

On the other hand, the Israeli-Palestinian conflict causes a dynamic within the American Muslim community, which is corrosive and potentially dangerous. A key to the

elimination of the Islamicist terrorist threat in America is the creation of a Palestinian state with secure internal lines of communication and water rights. Without such a resolution of the Palestinian problem, America faces a level of escalating disaffection of its Muslim minority, which can provide an unacceptable fifth column. We recall the shootings at LAX airport, the beltway snipers, and the fragging incident in Iraq. The disturbing picture of Jenin after Sharon's troops leveled it in 2002 is one that most Americans have long since forgotten. But it is unlikely that American Muslims have.

**Terrorism within the Islamic World.** Because traditional Islamic culture is very different from that of traditional Western culture, it is useful for us to examine a few terror groups, which acted as such within the Islamic world.

**The Assassins.** From the diary of Marco Polo we have the description

### Hasan-i Sabbah (founder)



*The Old Man kept at his court such boys of twelve years old as seemed to him destined to become courageous men. When the Old Man sent them into the garden in groups of four, ten or twenty, he gave them hashish to drink. They slept for three days, then they were carried sleeping into the garden where he had them awakened.*

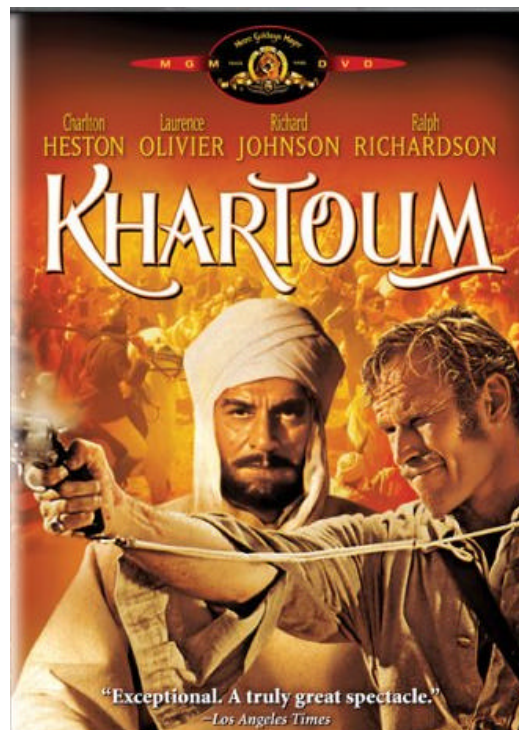
*When these young men woke, and found themselves in the garden with all these marvelous things, they truly believed themselves to be in paradise. And these damsels were always with them in songs and great entertainments; they received everything they asked for, so that they would never have left that garden of their own will.*

*And when the Old Man wished to kill someone, he would take him and say: 'Go and do this thing. I do this because I want to make you return to paradise'. And the assassins go and perform the deed willingly.*

The Assassins (Hashishin, from the drug used by the sect) were a Shiite offshoot founded around 1090. They essentially denied the revelations in the Koran and also its moral constraints. It is impossible really to find a parallel in the West. In the Manichean tradition from which Islam partly sprang, they might be described in Star Wars terms as serving the "Dark Side of the Force." They terrorized even Saladin who traveled frequently in a kind of portable fortress to protect himself against their attacks. In a few

hundred years they were mostly dispersed by the Mongols, and the survivors became the nearly respectable Ismaili sect considered to be on the periphery of Islam together with Druzes and other sects without any real parallel in Christianity. The chief of the Ismailis is called the Agha Khan. The current holder of the office owns much of the Island of Sardinia and is the offspring of the playboy Aly Khan once married to the American actress Rita Hayworth. At no time were the Assassins trying to purify Islam or “return to the traditions of the Prophet.” They were extortionists pure and simple who lived by a protection racket, which ultimately morphed into Asiatic capitalism. If today you were seeking for a person to die for Islam, you would not seek him amongst the Ismailis. The apparent parallels between al-Quaida and the Assassins are superficial.

**The Mahdists.** The Mahdi (“he who is guided aright”) is a last times figure who is supposed to bring forth the fulfillment of Islam. There are descriptions of his appearance in Islamic literature. There have been numerous pretenders to this dignity. For example, in 1881 Mohammed Ahmed ibn Seyyid Abdullah proclaimed himself Mahdi and launched a major insurrection in the Sudan. When Hollywood made the movie *Khartoum* about this conflict the actor (Laurence Olivier) playing the Mahdi was carefully made up to match the description in the texts and traditions.



We note the striking similarity in appearance of al-Quaida's putative leader Osama ben Laden.

Whether ben Laden believes himself to be the Mahdi or not, there is clear evidence that he affects the trappings. At present, it is unlikely that American Muslims, in any significant numbers, are sympathetic to ben Laden or his organization. His presence has considerable impact in most of the Muslim world, however. Traditionally, Mahdi pretenders were stopped by their own deaths and the destruction of their organizations. Therefore, the elimination of ben Laden and al-Quaida should be matters of high priority. There really is no easy way to say where American military power starts and American internal police authority ends when it comes to Homeland Security.



**What Can Statisticians Do To Help?** First of all, we should try and learn from the example set for us by Herman Kahn. The historical investigations through which we have just ventured are examples of the things Kahn might well have discussed were he still with us. Kahn was not an insider. He had no office in the Pentagon. He was no slave to fashions, scientific or otherwise. He looked for and profited from historical precedents. He generally swam outside the mainstream. He was not afraid of taking unpopular positions and cheerfully entered into debate with those with whom he disagreed.

In the spirit of Kahn, we should build and bring to the table models, lots of them [8]. And when we note that the models of all the investigators are in essential agreement, we should be worried rather than comforted. When we begin to believe in our models as opposed to believing in their use as early steps to better insights, we should again be worried. We should stress our models (and those of other people) by seeing how they square with the data. And whenever we are told there actually are no data, for "we are dealing with a entirely new set of problems," we should protest as valiantly as we may. "Validation" should be for us a positive word rather than a negative. When the data becomes soft, we should not walk away from problems, for many of the most important systems present only soft data. We should have arguments about models and be careful about conformity based on the desire to please. Whatever can be done to encourage federally funded scientists to think "outside the box" should be strenuously pursued.

Some specific types of modeling tasks include:

1. We should build simulation models for bioterrorist attacks. In particular, we should look at models from the standpoint of the terrorist as a necessary first step.
2. We should build models for international dynamics between the western world and that of Islam.
3. We should build models, which take account of opportunistic attacks by powers, which are neither Muslim or Christian. The strategy of “Let’s you and him fight” is a tempting one for powers hostile to the United States.
4. We should build models, which distinguish between the desperate acts of nations resisting aggression by a technologically superior power from those of active aggressors. The Chechen fighters are not the same as those of al-Quaida. Hamas and Hezbollah are not the same. And neither is the same as al-Quaida. There have so far been no attacks on the American homeland by the Chechens, or by any of the Palestinian organizations . If we insist of lumping all these organizations as the same, then we may indeed drive them into a big al-Quaida tent.
5. We should come up with a five (six?, seven?...) player game in which the Israelis are one player, the Palestinians are another, the Americans are a third, the Europeans are a fourth, and al-Quaida is a fifth.
6. We need to model the possible economic consequences of living in a state constantly in fear of attack by terrorists. There are trade-offs between civil liberties and the cost of an intrusive and pre-emptive system of state security. What will be the effects on air travel? What the effects on trade?
7. In particular, we need realistically to model the costs of 9-11. The instantaneous costs are probably not too difficult to obtain. But what are the continuing costs? My guess would only be that---a guess. But it would not surprise me if the continuing annual costs exceeded \$40 billion for as far as the eye can see. That is real money, a real cost to the standard of living of the American people.
8. We need to develop “what if” scenarios. What if some hostile power decides to take advantage of America when its attentions are drawn to a conflict in this or that part of the world?
9. We need to develop models for the consequences, financial and otherwise, of decisions made, which feel good and sound good at the time. We cannot lurch from crisis to crisis floating on a sea of slogans. Shall America, for example, set up a Republic of Kurdistan? There are many arguments in favor of such a move. What would be costs, political and financial? There is a rich historical record available for careful scientists to use in attempts to answer such questions. Better to analyze the problem before the policy decision has to be reached.
10. We need to consider models of a fundamentally changed America. It may be that America really will be transformed from a Republic to an Empire. Almost all empires lose money. Would the Americans be willing to forego a cure of cancer, for example, in exchange for some measure of imperial glory? Frankly, at this juncture, I have no idea as to the answer to this question.

**Conclusions.** Homeland security is a matter far too important to be left to policy wonks. Muddling through will not work. We need to have reasonable answers to questions as yet

unposed. The most important step is to pose the right questions. Problem posing is usually more difficult than problem solving. And it is something statisticians have been trained to do. We must try to develop policies, which control events instead of letting events rush in, and divert us from consensus pathways of progress. One attack, 9-11, has dramatically changed our lives. Millions of Americans have lost jobs. Millions of retirees have seen their pension funds devastated. Industries, such as the airline industry, have been brought to the brink of ruin. To say simply that this all happened as the result of things over which America had no control should not be acceptable (though at present it is taken as such). It is not enough to say “never again.” We must take logical and cost effective steps to see that our country and its citizens have the security for which they have paid ample taxes and to which they are entitled.

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