TERRORISM RISK:

7-Year Retrospective, 7-Year Future Perspective

RMS White Paper

Terrorism Insurers Plan for a Longer Business Cycle

On December 17, 2007, the U.S. Congress signed the Terrorism Risk Insurance Program Reauthorization Act (TRIPRA), a seven year extension to the Terrorism Risk Insurance Act (TRIA). In many ways this was good news for those involved in the management of terrorism insurance in the U.S., providing some stability to the business planning of this coverage. This in turn provides stability to the construction industry, real estate business, employers needing insurance and other major players of the economy that were disrupted by the initial insurance retreat from providing coverage after the 9/11 losses. With previous TRIA expiration dates only a couple of years into the future, and reluctant to offer continued coverage without TRIA, many insurers were unable to plan for anything more than a temporary involvement in terrorism coverage. Insurance companies can now plan over at least a seven year business cycle for their provision of terrorism coverage, the capital they want to commit to it, the insurance products they want to offer, and the shape of the portfolio they would like to build. Central to this of course is the shape of terrorism risk across the seven year horizon.

Terrorism risk models have had increasing take-up in the insurance industry, and have become a standard tool for risk management used by most of the major players in the industry. The U.S. Terrorism Model is one of the most popular RMS products. RMS model results were quoted extensively in the TRIA extension debates, being used by the Congressional Budget Office, Government Accountability Office, RAND, Wharton Risk Management and Decision Processes Center, and others in evaluating policy options. During the initial TRIA period, terrorism risk models were credited by the Congressional Budget Office with assisting with the creation of a functioning private market for terrorism insurance, in enabling "the industry to improve its ability to predict losses from terrorism and thus to put a price tag on risk more accurately."[1]

Managing Terrorism Risk

Over the past seven years, insurers have managed their terrorism risk in a number of ways. They have

- created and managed accumulation zones that diversify their risk
- monitored aggregations against 'PML' scenarios
- underwritten to match new business to their portfolio
- maximized the use of reinsurance where pricing is acceptable

These management techniques are informed by a view of the risk overall – the likely frequency, severity and location of losses faced. Models have played an important role in helping insurers understand the risks they face, and to create their risk management rules.

Central to the concept of terrorism risk is a highly localized, very severe loss scenario across multiple lines of business. The management of this has required new approaches to consolidating multi-line exposures to correlate potential losses from property, workers compensation, life, liability, fine art, specie, etc. It also requires much more accurate exposure data than has previously been managed. Address level and individual building data has become the norm: a major increase in data management and accuracy for exposure.

The selection of scenarios, the setting of accumulation zones and limits to the capital allocated to them, depend on an understanding of attack mode likelihoods, feasible magnitudes of loss, and the relative likelihoods of different cities and geographical locations. How well have the models described these? This paper sets out to examine this and to look at how risk management for terrorism may change over the next few years.

RMS takes a seven year view

Over the past few years, clients have increasingly asked RMS for a longer term view of terrorism risk—they plan business cycles over five to eight year timescales. With the TRIA extension, this has become more

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[1] CBO, Federal Terrorism Reinsurance: An Update; January 2005, the Congress of the United States, Congressional Budget Office.

important, as insurers start to plan for the seven years of stability that it provides. This year RMS tackled the more difficult job of making a longer term estimate for terrorism risk—a seven year projection to match the TRIPRA lifespan, and using the insights gained from the past seven years of RMS terrorism risk modeling experience.

RMS terrorism risk review meeting

On February 7th and 8th RMS convened its seventh annual meeting of its terrorism advisors to review and update the RMS terrorism risk model. The meeting was held in Washington D.C., home of the security and intelligence services, and convened at the Army and Navy Club, a landmark location notable for its military and security service history.

The terrorism expert elicitation meeting has been held every year since 2002, updating and improving the view of terrorism threat in the RMS model. RMS has been fortunate to retain its core advisors, providing consistency and insights year-on-year. The advisors themselves have grown in reputation and influence—Dr. Rohan Gunaratna was a prosecution expert witness in the Jose Padilla trial last year, Prof. Bruce Hoffman has become Professor of Security Studies at Georgetown University, and Dr. Jack Riley has recently been made associate director of RAND National Security Research Division.

Seventh annual review

Each year the meeting has parameterized risk for the year ahead. In the initial years of modeling, the dynamic nature of terrorism risk and the rapid evolution of modeling techniques meant that a 12 month forecast of risk was all that could be assessed with confidence.

This year's meeting reviewed the past seven years of terrorism events and looked forward seven years, to consider the terrorism risk landscape that could emerge during these years.

Figure 1: 7th Annual Review of the RMS Terrorism Model at the Army & Navy Club, Washington D.C.: Members of the RMS terrorism risk modeling team, with advisors Jack Riley, Bruce Hoffman, and Rohan Gunaratna

The evolution of terrorism threat over the past seven years

The past seven years have seen a significant increase in the information and understanding of terrorism risk, and the evolution of the shape and capabilities of the two adversaries—the jihadist terrorism movement and the counter-terrorism organizations that oppose it.

This period has witnessed the "war on terror"—the invasion of Afghanistan and the disabling of the Al Qaeda training infrastructure and leadership in that country. It has seen the invasion of Iraq and the anti-Coalition insurgency becoming appropriated by the jihadist movement. And it has seen the creation of unprecedented levels of national security infrastructure in Western countries that have relentlessly investigated and arrested many hundreds of potential plotters in their populations.

The terrorism threat has also shifted dramatically over the seven years: The centralized organization of Al Qaeda suffered setbacks from the loss of senior members and its training facilities during Operation Enduring Freedom in Afghanistan in late 2001-2002. However it has re-grouped and re-organized and is now planning and plotting and directing attacks again. During this time Al Qaeda, true to its name in Arabic— "the base" or "foundation"—has also abetted a process of global radicalization that has motivated and inspired independent cells. The hotspots of insurgency and local conflicts in Palestine, Iraq, Chechnya, Algeria, Somalia, Afghanistan, and elsewhere have been reinterpreted as jihadist struggles against the Crusader-Zionist forces, and co-opted into adopting Al Qaeda rhetoric, methodology and branding.

Most active period in terrorism history

This has resulted in the most active period in terrorism history: there have been 1,450 "macro" terrorist attacks (a car bomb or worse) in 43 different countries worldwide since 9/11. Over 25,000 people have been killed in these attacks and more than 45,000 people injured. In the past three years, over 60% of these have been in Iraq and Afghanistan.

But very few attacks in Western countries

The West has suffered relatively few major terrorist attacks, but those that have succeeded—such as the attacks in London in 2005 and Madrid in 2004—have shown that Western defenses can still be vulnerable Some have suggested that terrorism risk must be exaggerated—there has, after all, been no attack in the United States since 2001. However, research shows that more than 30 attempted attack plots have been unraveled in this time, ranging from sophisticated attack plans to blow up five buildings in the financial centers of New York and Washington, to assassination plots, and cyanide attacks being prepared for the New York subway. These plots have resulted in criminal convictions, public security alerts, and trial documentation that give information about the attacks that were planned. In the United Kingdom, numerous potential plots have been tracked in their early planning stages. Of these, 16 were imminent core attack plots, mostly leading to terrorism indictments, and two plots were successful.

How well did Terrorism Models do over the Past 7 Years?

How well has the RMS modeling of terrorism risk withstood the test of seven years of terrorism experience? The RMS model embodies principles of game theory that suggest patterns of attack and targeting, reflecting the priorities of jihadist objectives. A key element of this has been the focusing of attacks in major cities.

Urban focus of risk proved to be correct

When RMS produced the first version of its model in 2002, it predicted a strong gradient of risk, apportioning a large amount of the risk in major cities like New York and minimal amounts in cities like Milwaukee, which attracted a lot of criticism. The RMS model challenged the "population-based" assessments of risk, such as those used to distribute federal funds, and contrasted with the much flatter gradient of the ISO terrorism

rating for insurance[2]. Counter-theories suggested that terrorists might concentrate their attacks in homeland United States—attacks on schools and farms that might terrorize suburban populations[3]—but RMS held that this was not in keeping with jihadist priorities for expending their resources.

Terrorism attacks worldwide over the past seven years have supported the RMS characterization of urban concentration of risk. Data on the 1,450 macro attacks worldwide in the past 7 years shows that around 38% of them have been in the premier city of the country where the attack took place. About 73% of attacks took place in the most significant 5 or so cities in that country. RMS models the expectation that 40% of attacks will take place in tier 1 cities (e.g. New York and Washington) and that 76% of attacks will take place in cities of tiers 1–3 (Figure 2). The plots that were discovered for potential terrorist attacks in the United States included 22 with specified city targets: 12 of the 22—more than half—involved New York or Washington D.C., and 18—more than three quarters—targeted cities in the top 3 tiers of RMS prioritization. At the trial of the alleged liquid-explosives plotters in June 2008, a taped discussion of target cities showed that they focused on the top 10 most popular U.S. destinations.

The heavy focus on top tier cities is demonstrably a good characterization of terrorism risk, and city risk relativity is one of the most useful guides for insurers managing a multi-city portfolio.
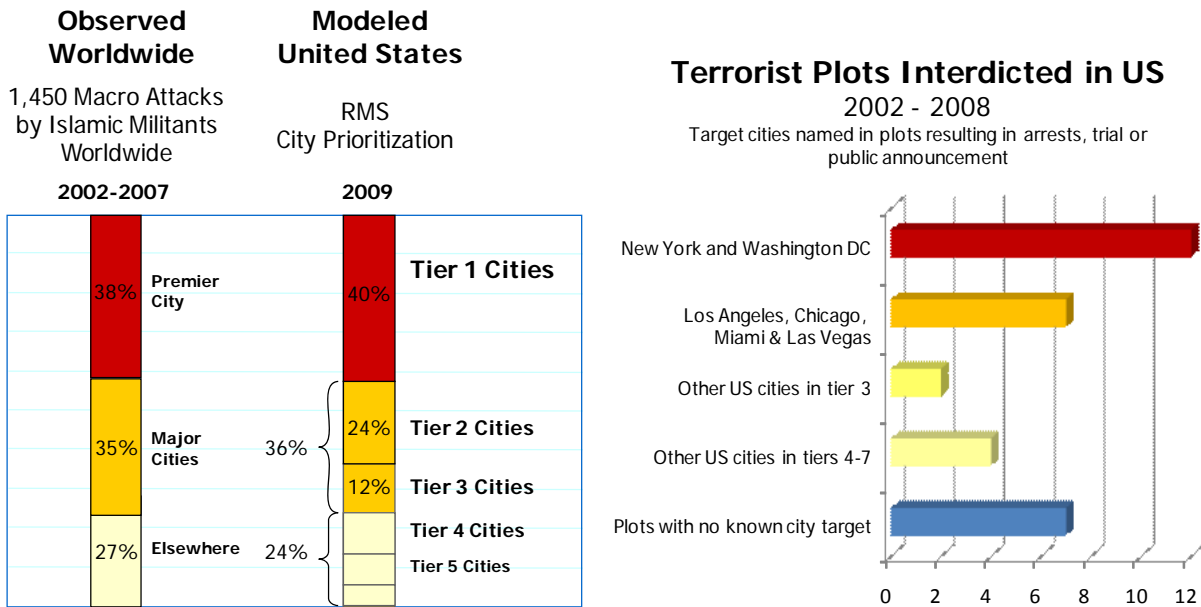

Figure 2: The RMS model was initially controversial when first released in 2002, in predicting a high focus of terrorist attacks in major cities. Experience since then has demonstrated the validity of that view.
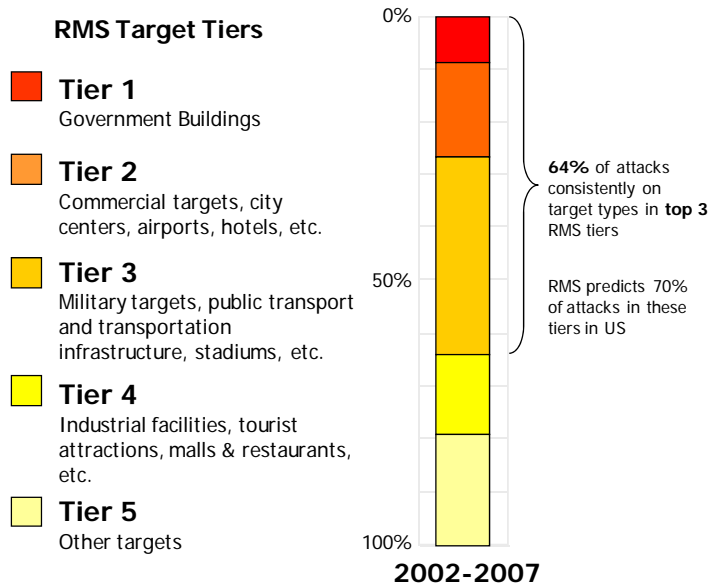
Target patterns have conformed to model prioritization

Similarly with target prioritization, RMS grades target types according to their "utility" to jihadist terrorists— the propaganda value to them in fulfilling their goals of maximizing casualties, economic disruption and

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[2] ISO technical rates, based on the terrorism modeling of Applied Insurance Research, ranged from the highest value of $0.03 per $100 of property value in the downtown city centers of New York, Washington, D.C., Chicago, and San Francisco, to the lowest rate for rural areas of $0.001 per $100—a ratio of only 30 between highest and lowest risk. CBO report, Jan 2005.

[3] The CBO report of 2005 stated "In contrast (to the RMS model) the EQECAT model assumes that terrorists might attack low-profile targets in outlying areas to demonstrate that no place is safe."

symbolic destruction. This was originally based on published objectives and rhetoric by the Al Qaeda leadership, but has been borne out by the targets selected by their followers over the past seven years. The historical catalog of macro terrorist attacks worldwide has consistently shown that nearly two-thirds of attacks are against targets in the top 3 tiers of the RMS target database. RMS has predicted just over 70% of attacks on these three tiers (Figure 3). More significantly, 25 of the 30 known attack plots discovered and prevented in the United States in the past seven years have identified specific targets. Of these, 23 of the plots were intending to attack targets identified in the RMS target database in our top 4 tier priorities, 21 of them had targets in our top 3 tiers, and 14—more than half—had targets in our top 2 tiers. The RMS methodology can claim a reasonably good record of predicting target patterns, which is central to managing a risk portfolio within a city, and across a mix of insured property types.
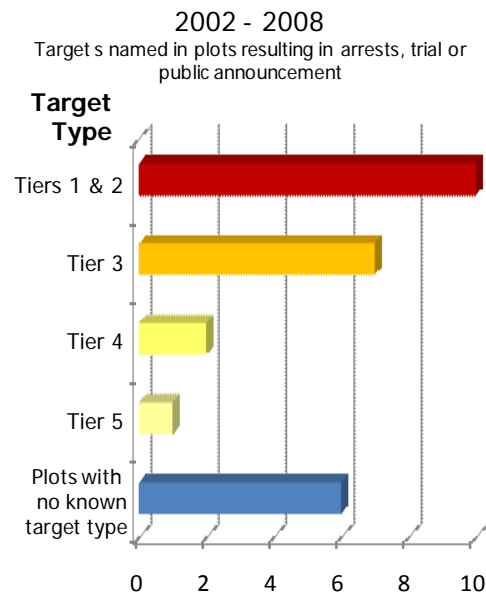

Figure 3: Targets selected in jihadist macro attacks, worldwide 2002–2007. The choice of targets picked for attack by terrorists in the past seven years has broadly followed the prioritizations of modeled preferences.

Attack modes broadly correct—with a few surprises

Attack mode preferences of the terrorists have been modeled with a close correspondence to those seen worldwide, with one or two exceptions. The original modeling of attack mode preference was drawn from historical analysis of attack patterns of groups carrying out asymmetrical warfare in the 1990s, combined with an assessment of "'logistical burden"—the tactical resources needed to mount different types of attack.

Terrorist preferences for occasional use of sabotage, conflagration attacks, attacks on and with aircraft, and use of armed attacks and standoff weapons have been approximately as expected, their frequency of use as a proportion of attacks carried out has been within a few percentage points of their modeled likelihoods. RMS modeling proposed that 60% of macro attacks in the United States would be improvised explosive devices (IEDs)—mainly vehicle bombs. In fact terrorist attacks worldwide since 2001 have shown even stronger preference than this, favoring IEDs in over 75% of all macro attacks.

Having a good understanding of the preferences of attack modes enables insurers to make better decisions on their PML scenarios, and the types of aggregation zones they want to control for.

Figure 4: Loss modeling that simulates the damage that would be caused in a terrorist attack has proven relatively accurate, but has tended to be conservative

Where were the "monster" truck bombs?

A surprise was the missing "monster" truck bombs. We expected there to be more big-yield bombs than has been the case. In terrorist attacks in the 1990s, there were several very large truck bombs, with yields equivalent to more than 3 tons of TNT, and even a bomb with a yield of 10 tons used to destroy the Khobar Towers complex in Saudi Arabia. However, in almost 1,000 vehicle bombs detonated by terrorists worldwide since 2001, the largest yield has been around 2 tons TNT-equivalent. This has occurred even where munitions are freely available, in conflict zones like Iraq, so it is not because explosives are in short supply— by refining their targeting and timing, terrorists have become more efficient, making major impacts with lesser yield bombs.

SAM use was discouraged but aircraft attempts continued

Another surprise that has run against our original expectations is the lack of successful terrorist use of surface to air missiles (SAMs) on commercial aircraft. Their relatively low cost and ease of deployment, and their ability to cripple airline business with the loss of a single passenger aircraft led to an original estimation in 2002 that we might see as many as one in every 6 or 7 attacks against the West being a SAM attack. In fact, SAM attacks have turned out to be rare: a few unsuccessful attempts were made in 2002, the most notable being the missiles fired on an El-Al plane leaving Mombasa on 28 November. A major SAM scare early in 2003 brought out the army to guard Heathrow airport. An FBI sting operation led to the conviction of a British arms dealer, Hemant Lakhani, in 2003. Other suspected SAM-related plots were unearthed in Europe, including a failed attempt by a British Jihadi, Kazi Rahman, to buy a missile. However, RMS revised its estimates of the likelihood of successful SAM attacks after sequential years of data showed that counter-terrorism defense against this attack mode had been hardened.

Al Qaeda has however maintained a strong interest in destroying civilian aircraft, but instead of shooting them down, it has continued to try to evade all the increased security and find ways to smuggle explosive devices onboard. RMS now models in-flight aircraft loss and aircraft hijacking to use in an impact attack at

around 14% of attack attempts against the U.S., consistent with the attack attempt frequency of this type of plot in the past seven years.

Loss modeling consistent with experience

Loss modeling of terrorist attacks can claim to have been reasonably accurate. There have—unfortunately—been many cases of large-scale terrorist attack to test model assumptions about the extent and range of damage that can be caused. RMS has reviewed its methodology to incorporate information from attacks each year. Figure 5 shows the correspondence of modeled blast damage at distance to those seen in one of the largest explosions caused by terrorists in the past seven years, the attack on the British Consulate in Istanbul in 2003 using a truck bomb with an estimated yield equivalent to 2-tons of TNT.
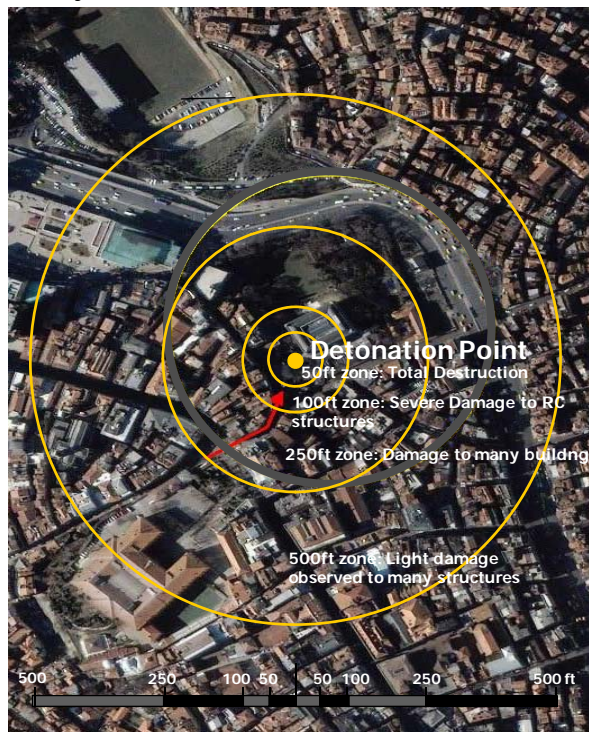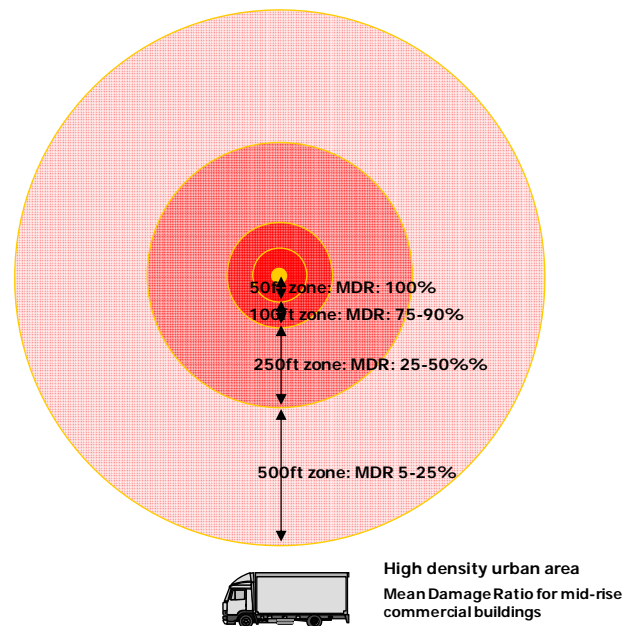

Figure 5: The larger examples of terrorist attacks have confirmed damage attenuation patterns used in RMS model footprints.

Casualty loss estimates are also consistent with observed losses. The average casualty rate from terrorist car bombs in the past seven years has been 17 dead and another 31 injured, however there has been a significant increase in more recent years as terrorists improve their techniques of causing mass casualties—average deaths per strike have increased each year, until in the past year they have reached 27 dead and 40 injured. The RMS model includes more than 16,000 scenarios of a 600 lb car bomb being detonated at a target in the U.S. Modeled casualties in these events range from 0 up to many hundreds, with a median of 13 deaths and a probability-weighted average death toll of just over 50. The modeled distribution ranges to some high numbers of fatalities in the tail, resulting from attacks on buildings with high occupancies. Most of the bomb attacks actually seen in the past seven years have not been directed at trying to cause collapse in occupied structures, but instead have been on crowds of people in market places, on public transport, or people tricked into congregating where the bomb then detonated. Some trends, however, have shown that bomb targeting has got more precise. Triggered collapses have been few, but the ones that have occurred have demonstrated that the bombers have carried out careful structural engineering analysis and combined it

with carefully accuracy in bomb placement—a potential trend that would be of concern if it were directed against targets in the U.S., as suggested by the 2004 plot against financial target buildings in New York and Washington D.C.

Accurate loss estimation is an important component of assessing risk transfer thresholds, capital allocation and risk appetite. The modeling can claim reasonable consistency with the experience data.

No attacks in the U.S.—was our frequency estimate too high?

One of the most contentious components of terrorism risk modeling is the estimation of frequency—many risk managers feel that estimating the number of major terrorist attacks in any given period of time is impossible. The criticism has been made that human actions are impossible to forecast, or even that terrorists are madmen who act randomly. RMS has taken the view that an estimate of frequency is possible, and necessary. RMS has always held that the market is encapsulating an inherent view of terrorism frequency in its pricing and management decisions, and so has sought to estimate this explicitly.

The RMS approach has been to research the underlying process of how terrorism attacks occur, the numbers of people who are sufficiently motivated to support, participate in, and carry out attacks. Every year since 2001 there have been between 3 and 7 reported attempted attack plots that have been thwarted in the United States (resulting in arrests, trial, or raising of the DHS threat level). These have been a mixture of different levels of competency and credibility, but although there is variation from one year to the next, there is no detectable trend that the frequency of attempts is diminishing. Fortunately all of these plots so far have been interdicted and no attempted attack has succeeded.

RMS has developed analyses using network theory to understand how increasing the size of a terrorist cell increases its chances of detection, which feeds into estimates of the constraints on the size and frequency of terrorist attacks. A key observational metric is the number of plots that are attempted or get to various stages of conception and detailed planning, and how many of them are detected and intercepted by the security forces. Data on the effectiveness of counter-terrorism in interdicting attack plots shows that a large proportion of all plots are foiled. The RMS model assumes an interdiction rate range typical of past major terrorist campaigns, in which 80% to 90% of attack attempts are unsuccessful. This assumption has been supported by data from Al Qaeda terrorists themselves in recent years: in the confessions of Khalid Sheikh Mohammed, released in March 2007, he claims to have been responsible for 7 successful attacks, but planned attacks against a further 32 targets that were aborted, a failure rate of 82%, five in every six.

RMS also believes that the upper limit on the number of successful terrorist attacks in a given period of time is controlled by the political response to a severe terrorist attack—the security crack-down that follows a major attack makes it unlikely that a second attack, and extremely unlikely that a third, could succeed in a short period of time. This political "control process" limits the frequency of attacks in a particular time period—terrorists are patient and space their spectacular attacks over time.

RMS has for the past seven years proposed an expected frequency of macro terrorist attack in the United States of between 0.45 and 0.65 events per year. In this time, there has been no successful attack—has this frequency assessment been a significant over-estimate? We don't believe so. For 2009 and beyond, we are continuing to recommend that insurers use a mean frequency estimate of 0.6 expected events per year. This is because we believe that the frequency estimate is a balanced view of the likely level of activity rate and interdiction effectiveness. The frequency of successful attacks is a product of two factors: the number of planned attacks, and the non-interdiction rate. Across Western Europe and North America, there have been more than sixty significant planned attacks since 9/11, and only two notable successes: the Madrid and London transport bombings. The actual interdiction rate of attempted attacks has been superior to the modeled assumption—in fact in the United States, the failure rate of attempted attacks has been 100%. There appears to be a number of reasons for this—exceptionally good intelligence, better technological methods of surveillance, communication monitoring and other tactical systems, and a high degree of informant intelligence from communities containing potential terrorist activists. And some lucky breaks. The database of attempted attacks shows that a number of suspects were identified through routine policing, infringements on unrelated issues, and accidental discoveries. Insurers should not be basing their business

decisions on a continued run of luck of this type. Assuming a 0% success rate for future attacks would not be prudent. All the evidence suggests that the activity rate for future attempted attacks will continue at about four a year. Over a multi-year time horizon, the RMS frequency estimate is likely to prove to be a prudent estimate of the rate of successful terrorist attacks.

A Seven-Year Future Perspective

The current (seventh) version of the RMS terrorism risk model has been re-parameterized each year and describes the present landscape of terrorism risk demonstrably well when reviewed against the characteristics of the seven years of data and experience that now exists. In fact the surprise has been just how stable the view of terrorism risk has been over the past seven years. When we first built the model we constructed a very flexible software framework expecting to have to make significant changes to the model from one year to the next. In fact the targeting objectives and attack mode preferences have remained fairly constant: the main changes year on year have been chiefly tactical modifications and technique changes, so the overall pattern and magnitude of terrorism risk has been relatively consistent over the seven years. Figure 6 shows the modeled average annual loss for the US for the past seven years, standardized on 2007 exposure values.

Part of the reason for this stability lies in the specific definition of terrorism hazard. Hazard is not synonymous with threat, but rather is the gap between the threat posed and the degree to which social counter-measures can reduce it. In this way it is similar to flood hazard – flood hazard is not simply the height of the water but the degree to which water might overcome the flood barriers that have been built to hold it back. Terrorism hazard is not simply the jihadist threat, but the amount of the threat that might evade the security services. The record of the past seven years is one of achievement by the Western security and law enforcement services in suppressing terrorist activity, despite a rising threat level.
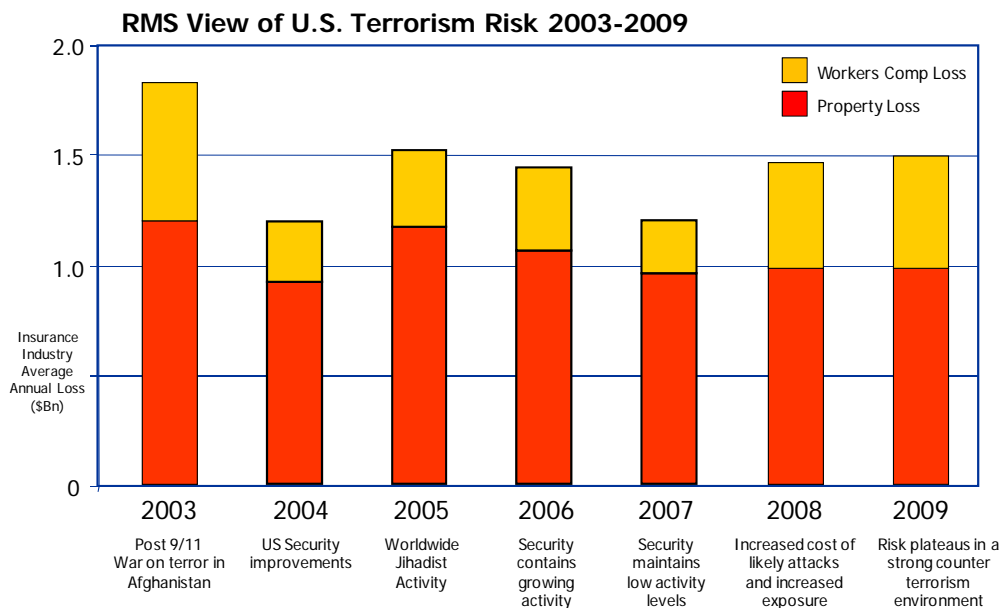
Figure 6: The recalibration of the RMS Terrorism Risk Model each year has tracked the change in risk.

We argue that terrorism risk has been relatively stable because the threat is balanced by counter-terrorism activity: as the threat changes, our security forces try to respond to contain the threat. The threat persists and cannot easily be extinguished by Western action. It is a stand-off – a dynamic equilibrium – that has lasted several years. It is likely to persist, unless the stalemate is broken in some way.

Breaking the stalemate

The challenge is to consider whether and how this stalemate might be broken over the next seven years.

The RMS advisors considered which types of events would cause a significant departure from the terrorism risk equilibrium now in effect, either breaking the stalemate to radically reduce terrorism risk, or losing the stalemate and having terrorism risk significantly escalate, over the seven year timescale.

The power blocs and their relationships

Any shift in the balance of risk will depend on geo-political developments. The Al Qaeda military strategist, Muhammad Ibrahim Makkawi, has framed Al Qaeda's strategy until 2020 in terms of the relationships between four different groups (Figure 7):

- Al Qaeda (a term that includes the broader jihadist movement)
- the Coalition nations (The U.S. and its allies, referred to as the "Crusader Coalition occupiers of Muslim lands")
- the Muslim nations
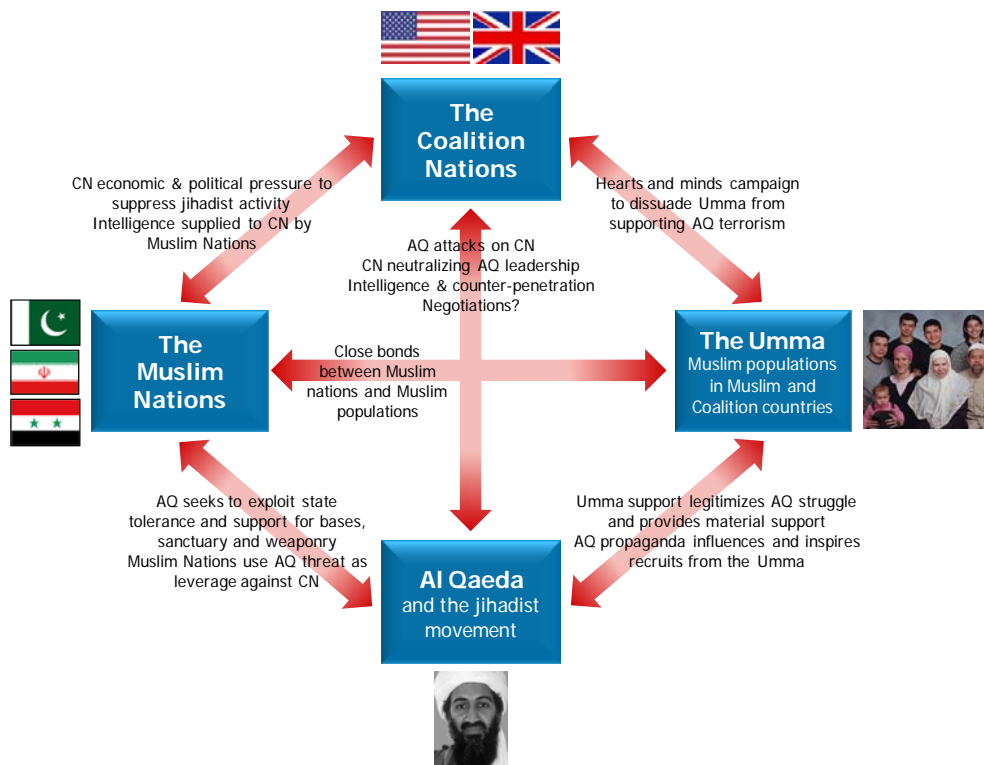- the Umma—Muslim populations worldwide

Figure 7: The relationships between the four power blocs will determine the future trajectories of terrorism risk

The battle space in the war on terror is defined by the relationships between these four protagonists, not just the direct confrontation between the Coalition nations and Al Qaeda. Six pair-wise relationships exist between these four protagonists:

Coalition—Al Qaeda

The counter-terrorism forces of the West will continue to hunt the leadership of Al Qaeda, and could inflict further losses on the terrorism forces by catching or killing key leaders. The loss of many senior leaders of Al Qaeda could result in a severe weakening of the jihadist movement, however most analysts expect that the jihadist impetus would not be significantly reduced, and the martyrdom of senior leaders could even inflame it further. Al Qaeda will continue to plan and support attacks against the Coalition, perhaps escalating the scale of attacks, or choosing different attack strategies, such as political assassination.

Al Qaeda—Muslim Nations

Where the opportunity exists, Al Qaeda is quick to take advantage of supportive or failing Muslim states, and use them as bases for recruitment, training, and weapons development. Countries such as Pakistan, Afghanistan, Iraq, Sudan, Somalia, Syria, and to some extent, Iran, all tolerate Al Qaeda bases or personnel. If tolerant states were to become more supportive, and provide weaponry, training facilities, or funding, this could significantly enhance Al Qaeda's capability. One of the key relationships is between the Pakistan government and the Al Qaeda leadership, currently hiding in the Federal Administered Tribal Areas (FATA) of Pakistan. The Pakistan government is unable or unwilling to impose military action in FATA, and is limited by its need to placate both its Coalition supporters and its own domestic constituency. The political changes in Pakistan over the next few years could see a neutral or supportive government that could provide a less beleaguered environment for Al Qaeda to re-establish training camps and weapons development operations.

Coalition—Muslim States

In Coalition diplomacy with Muslim states, there are numerous Middle East and North African flash points. Western states have considerable economic leverage but also face major political constraints. The Palestinian-Israeli conflict dominates relationships between Coalition nations and Muslim states. The resolution of the Palestinian issue could change these relationships considerably. In the Coalition battle with Al Qaeda in its geographical stronghold in the FATA, the cooperation of the Pakistani government in tracking the Al Qaeda leadership is limited by its need to play a two-level game: finding a solution acceptable not just to the Coalition, but also to its domestic constituency. How the West interacts with and co-opts the Muslim states into supporting its struggle with the extremists will dictate how the conflict plays out in future years.

Coalition—Umma

Many Western countries have sizeable Muslim populations and these have strong relationships with the Muslim populations in their homelands and in other countries around the world. This "Umma" is a significant force of mainly moderate and mainstream Muslim opinion. Opinion polls in these communities have revealed that they are at best tolerant of Al Qaeda and at worst positively supportive of terrorist action against the West. The opinion of the Muslim populations is seen as the "sea" in which the terrorist "fish" swim. Precedents such as the disarmament of the IRA suggest that historically, the mechanism that ends a cycle of terrorism is the rejection of the men of violence by those they purport to represent. Changing the public opinion of the Umma, to condemn Al Qaeda and deny it support, is beginning to be seen as a higher priority for the Coalition. Democratic reform in autocratic pro-Western Muslim states may reduce the level of Umma support for political violence against Western governments. Campaigns for winning hearts and minds may include addressing some of the grievances and alienation perceived by these communities, countering the narrative of Muslims being victims of Western oppression, and debunking the theological rhetoric of Al Qaeda. Getting Muslim leaders to speak out against radicalism, and making the Muslim community feel full stakeholders in the stability of Western society is an important aim of the Coalition.

Al Qaeda—Umma

Al Qaeda also sees mainstream Muslim opinion as a key constituency and Al Qaeda has become increasingly adept at influencing public opinion and getting its message across. Radicalization provides recruits and resources for the wider jihadist movement. It has put considerable resources into winning the battle of ideas, and the Al Qaeda leadership of Osama bin Laden and Ayman al-Zawahiri have proven to be capable publicists and influencers of Muslim opinion. Al Qaeda has created a media arm, Al Sahab, which over the past few years has increased its output so that it is now issuing videos at a rate of one every few days. The effectiveness of Al Qaeda in influencing Umma opinion will be an important element affecting terrorism risk over the coming years.

Trajectories of change

Over the next seven years, the changing positive or negative status of these six relationships will define the background landscape to terrorist operations, and will dictate the level and shape of terrorism risk faced by society and by the insurance industry. Possible future developments are tracked and explored by RMS through an "Exogenous Political Events Emulator" (EPEE). EPEE incorporates an ensemble of terrorist campaign trajectories, reflecting the political evolution of the complex six dimensional battle space. One optimistic class of trajectories would correspond to the Coalition winning over the Umma in the battle for hearts-and-minds. One pessimistic class of trajectories would correspond to Coalition foreign policy alienating the Umma, and Muslim states, leading to heightened state sponsorship of terrorism. The terrorism loss implications of each trajectory is explored, factoring in the dynamic interaction of each dimension of the battle space: negative developments in one dimension may be offset by advances in another. As an aid to risk forecasting, there is a coarse ranking of these trajectories according to plausibility.

Conclusions—Future Terrorism Risk

Models of terrorism risk are not trying to predict the next terrorist attack; they are representations of the pattern, scale, and geography of the risk of loss from terrorism averaged over time, considering the frequency and severity of attacks against likely targets. On balance, the RMS model has provided a good representation of the pattern of terrorism that has been waged and attempted against the U.S. and its Western allies. The pattern of hazard has changed only moderately during the past seven years, in keeping with the general observation that in democracies the counter-terrorism response generally stays commensurate with the threat. Despite all the investment and all of the political will expended, the threat has not significantly diminished—attempted attacks in the U.S. have persisted at a rate of 3 to 7 attempts every year since 2001. Nor have the adversaries succeeded in escalating the number of attacks or acquired any dramatically new attack capabilities. The changes we have seen have been the result of tactical shifts in uses and deployment of current resources.

The current pattern of terrorism hazard represents a relatively stable equilibrium where terrorist adversaries are kept in check by well-resourced but limited counter-terrorism operations, and the underlying geo-political relationships between the four power blocs is currently held in balance. This could continue for some time. It is possible that this equilibrium could last for most of the next seven years. In the expert elicitation held to explore the potential terrorism trajectories for the future, and in the EPEE analyses, the highest probabilities appear to favor the current regime lasting for a number more years into the future. But the further into the future the projections go, the more likely some variation on the status quo or breakthrough is to occur.

How would terrorism risk reduce substantially?

The scenarios by which the equilibrium could be destabilized to result in a new trajectory of dramatically reduced terrorism risk could include, for example:

- Solving political hotspots like Palestine, Iraq and Afghanistan to deflate these conflicts as a driver for radicalization and recruitment of extremists

- A significant reduction in support by the moderate Muslim community for the radicals, perhaps in response to a specific atrocity or more active hearts-and-minds campaigns by Western liberals

- Emergence of a Muslim Ghandi-type figure, to provide leadership for rejection of political violence along religious lines

- The death of bin Laden and a collective failure of succession and replacement of leadership within the radical organizations.

- The transformation of terrorist organizations like Al Qaeda into a legitimate political movement that eschews violence.

The consequence of a trajectory that resulted from these kinds of changes would be a much reduced frequency of attack attempts, and a higher confidence of a very high rate of interdiction. The networks that support the cells carrying out the attack would be less organized and have reduced capabilities, so the attacks themselves would be smaller scale conventional attacks, possibly focused on disruption and terror rather than destruction. They are likely to favor softer targets. Some commentators have suggested that enfeebled terrorist networks might shift their strategy away from the iconic targets in major cities to smaller scale but higher frequency attacks on schools and social activities almost anywhere in the country to try to destabilize society—a pattern of terrorism seen in Israel in the 1990s. However, higher frequency attacks are likely to require larger numbers of operatives—people who are prepared to kill and be killed—which may be one of the scarcest resources available to the terrorists in this scenario. If this shift did occur, then the losses to the insurance industry would be very significantly reduced. The current model of risk concentrates on maximizing destruction and financial loss and so provides a conservative view of the risk to the insurance industry. Almost any other pattern of terrorism results in lower risk.

The scenarios that result in lower terrorism risk mainly come about as the result of longer term changes that affect political situations and public opinion. The RMS advisors generally consider these would take extensive timescales to come about. They conclude that these scenarios have a low probability of occurring within the next seven years, but events such as a change in the U.S. administration or economic boom in Muslim communities could make some of these more likely.

Overall the likelihood of lower risk trajectories are quite small in the short term, but could be seen to increase over a longer-term horizon if efforts are consistently applied towards those ends.

How could terrorism risk rapidly escalate?

There are also a range of alternative scenarios that could provide tipping points for the current equilibrium to be transformed into a new trajectory of significantly increased terrorism risk, for example:

- U.S. or Israeli attack on Iran, causing Iran to release the senior Al Qaeda leaders currently in detention and also unleashing Hizballah, or funding other terrorist groups, to attack targets within the U.S.

- Instability in Pakistan leading to a failed state, or pro-extremist government, providing sanctuary and a homeland for jihadist groups, potentially even providing jihadist groups with nuclear weapons

- Breakthrough acquisition and use of chemical, biological, radiological, or nuclear (CBRN) weapons by a terrorist group, causing others to emulate it and changing the nature of the conflict. If CBRN weapons were unleashed, the entire nature of the conflict would escalate

- Failure to prevent escalating violence in Iraq, U.S., and allies hurriedly withdrawing, enabling insurgents to declare victory, leading to escalation of violent uprisings in many other countries in the Middle East, spreading terrorism to Europe, and on to the U.S. mainland

- Assassination of a key Western leader, influencing Western elections, provoking a major backlash and escalation of political violence in many locations

The pattern of risk that would result from these negative trajectories would be largely the consequence of an increase in the capability of the terrorist groups, beyond that which could be countered by a similar increase in counter-terrorism capability. The resulting terrorist groups would be better organized, and would benefit from a broader network of coordinated skills and experience, and could potentially have access to more destructive weaponry and greater numbers of operatives. Improved capability and greater resources might not increase the frequency of attack attempts: terrorist planning and coordination would try to avoid mounting attacks too close together in time, as the high counter-terrorism alert that follows an attack could compromise a subsequent operation mounted too soon. It is likely that more skilful terrorist tradecraft will evade detection and result in a lower interdiction rate, and the scale of attack is likely to be larger. With better skills and improved weaponry, the scale of destruction could be considerably enhanced. Higher

numbers of simultaneous multiple attacks could be achieved. Harder targets—i.e., those already identified as high priority targets in the model, but currently heavily protected—might be attempted. With more ambitious attack modes, it is more likely that the highest priority cities and targets will be attempted. This would result in an even stronger risk gradient between the key cities and lower tier cities, and a greater concentration of risk in and around the highest priority targets.

How would CBRN terrorism affect the picture?

If terrorist groups obtained and used CBRN weapons, it would obviously lead to a step-change in the magnitude of loss that they could achieve. The first successful CBRN attack to cause a large loss in a Western country would result in a massive response, politically against any state sponsor, militarily against any identifiable perpetrator, and socially with public approval of invasive surveillance and other measures proposed as necessary to prevent future attacks. Budgets and resources for counter-terrorism activities to prevent future CBRN attacks would be greatly increased. A CBRN attack, if it were a large scale weapon of mass destruction, would be likely to be deployed against a city center rather than any one specific building or asset, and unless the new weapons were plentiful, would be prioritized for the highest tier cities. Some commentators have suggested that if Al Qaeda had a weapon of mass destruction, they might deploy it on a minor city as a negotiating ploy, but this is at odds with their current political method of operating. It is likely that the risk pattern would become even more urban and with an even stronger risk gradient from major city to minor. It is possible that mass-casualty attacks could target suburbs and residential areas in preference to commercial city centers, which would change the pattern of risk from the current model.

The use of a CBRN weapon to cause mass casualties would have many ramifications that would change the nature of the consequent risk. It would probably unify the Western world and bind a new cohesion among a wide range of nations across the world. It could potentially turn moderate Muslim opinion against the Al Qaeda movement. Relations between Muslim states and the Coalition might turn a corner and improve, or under some circumstance, deteriorate and polarize into confrontation and further conflict. Internally within U.S. and Coalition countries it is likely that there would be significant changes to the insurance industry, its coverage and exposure, to underpin its continued engagement with property, casualty, and other types of insurance such as life and health. There would undoubtedly be many other consequences and changes that would play out over subsequent years.

These negative scenarios are less gradual than the positive ones. They could potentially be triggered by a sudden flashpoint of events that could occur at any time, even in the next year or so, so although also these trajectories are also remote, they may have a slightly higher likelihood of occurrence.

More of the same, with some potential for major escalation

A pragmatic view of terrorism risk is that for the next seven years, we are most likely to see a continuation of the pattern of terrorism risk that we have seen for the last seven years, reflecting a dynamic equilibrium between terrorist plotting and active counter-terrorism response. The chance of a major negative shift to a higher risk trajectory is small but significant, but this has the potential to occur earlier in the 7-year window than many of the positive ones.

The chance of a major change to a positive trajectory is similarly small, but is gradual in nature and may become more likely over a much longer period of time. The resolution of terrorism cycles has through history been a long term process, with several examples lasting for a number of decades. Some commentators have described the conflict with jihadism as likely to be "generational" in duration. The cycles of terrorism in the past have tended to go through periods of general activity, flare ups of increased threat, and then a gradual resolution of conflict through breakthrough arrangements. Following this pattern, it could be expected that this current conflict may still have periods of increased risk before it is resolved, so we should be prepared for a sudden shift to a higher risk trajectory.

Figure 8 shows a notional illustration of how the likelihoods of changing from the status quo to a dramatically different type of terrorism risk regime may change over the next seven years.
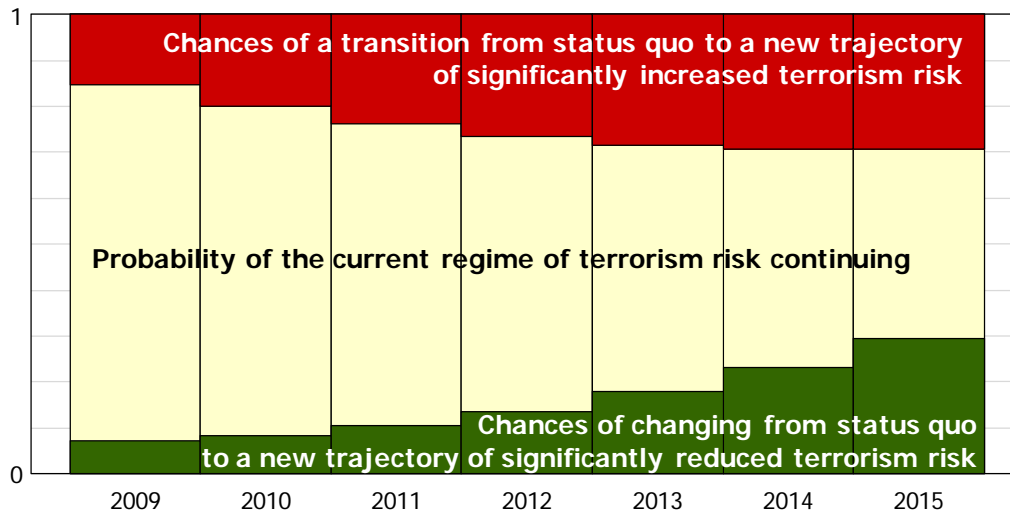
Figure 8: Notional illustration of the likelihood of switching to different trajectories of terrorism risk regimes

Insurers planning their business cycles for their provision of terrorism coverage can take the current picture of risk as the most likely pattern to endure through the seven year timescale, and be assured that current models form a reasonably conservative view of that risk. However they should also allow for the possibility of a major change in the regime of terrorism during this time period. If it dramatically changes to a new trajectory of lower risk, then insurers will be well positioned. However, if the status quo undergoes a significant change, it may well be for the worse. Insurers need to allow for a small chance of significantly increased terrorism risk during the next seven year period. Just like many other perils in fact.

Managing future terrorism risk

Over the past seven years, terrorism models have helped insurers manage their terrorism risk in a number of ways. Most insurers have concentrated on managing their accumulations from terrorism. The use of realistic scenarios and specific event footprints have helped insurers monitor their exposure across multiple lines of business, using a consistent specification of an event to correlate losses from property, workers compensation, life, liability, fine art, specie, and any other line they write. Terrorism models have helped insurers identify their highest concentrations of potential losses and help them instigate controls to ensure that losses are within specified aggregation limits. Insurers have tended to add very significant safety margins to their loss scenarios, because of the uncertainties about the nature of terrorism risk.

As insurers become more confident with increasing experience and data about the types of events and scale of terrorist event footprints, these aggregation scenarios and the limits set by them will become more realistic. PMLs will reflect realistic loss scenarios, take into account the performance of the insured building stock and reflect observed patterns of terrorism risk, attack modes, targeting, and multiplicity of attacks. The use of capital to support terrorism risk will become more efficient and more in line with capital controls placed on other natural catastrophe perils. Terrorism risk modeling will help insurers derive comparable benchmarks to ensure that capital allocation is efficient and allocated more equally across the range of perils covered by an insurer. Aggregation controls at present are most diligently enforced in Manhattan and a small number of other U.S. cities: aggregation controls are likely to be rigorously analyzed and enforced in a lot more cities and countries worldwide as international coverage grows, geocoding in major cities improves, and the global threat drives corporate demand. Insurers will use international views of modeled risk in each specific territory for support in their risk management.

Underwriters will select the risks that best suit their portfolio, and models will continue to help with risk selection. Insurers and reinsurers will run new accounts through various checks, visualization of the local risk context using aerial imagery, risk scoring systems, and analytical models to assess compatibility with the existing portfolio, and for pricing and acceptability criteria.

Models will also continue to provide a foundation for risk transfer decision making. Portfolios of exposure will be analyzed and the diversification benefits of larger and widespread exposure will be quantified. Reinsurance, swaps, and pools will continue to be provided creatively. At some point, alternative risk transfer instruments will be used to package and transfer terrorism risk from insurers to the capital markets, overcoming the objections of rating agencies who currently remain agnostic on terrorism modeling.

Insurers should continue to aggressively manage their terrorism risk using the tools they have developed and the models that are available to them. Over the next seven years these tools are likely to become more sophisticated and more in line with those used for managing the risk of other natural catastrophe perils.

This paper has argued that the overall risk from terrorism is likely to remain broadly constant, with moderate changes arising from shifts in tactical practices by terrorist groups and intelligence services. Major shifts in risk are of low probability but can still occur, and insurers will be advised to retain flexibility in responding to a major increase (or decrease) in terrorism risk.

The modeling of terrorism will continue to provide support to insurers in managing their risk over the next seven years. As terrorism risk shifts, the modeling will continue to incorporate new views of that risk, as it has done fairly successfully over the past seven years. If a major new trajectory of terrorism risk begins to emerge, RMS modeling will adapt to this. Being aware of how the terrorism risk can shift provides the foundation for providing new views of it when evidence of a new trajectory emerges. RMS remains committed to providing clients with decision-support tools to manage their risk throughout the next seven years and beyond.