Cat tales

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Wind damage surveys in Southwestern Ontario in 2007

By Gregory A. Kopp, Professor, University of Western Ontario

The current year has been remarkable for wind storms with two Category 5 Atlantic hurricanes making landfall in a single season (as of press time) for the first time on record and the first documented F5 tornado in Canada, in Elie, Manitoba this past June. In contrast, the year has been relatively quiet in southwestern Ontario, where we work, with only a handful of small tornadoes.

ICLR has been sponsoring our research into post-storm wind damage investigations, which we are carrying out in collaboration with Environment Canada.

This year we had the opportunity to go out for one event, which occurred near Mitchell, Ontario, in May. This event probably caused in the neighbourhood of $1 million in total damage. One house was severely damaged, and it was on it where we focused our attention.

One of the most important aspects of assessing building performance in severe winds is knowledge of the wind speed which caused the damage. Without knowledge of wind speed, we cannot assess the provisions in the building codes.

Since it is very rare to have wind speeds measured directly, we infer wind speeds based on the damage we observe. The Fujita Scale, which categorizes tornadoes, is such a scale, and is based on observed damage. Assessing wind speeds is challenging since wind loading varies with the square of the wind speed so that a 20 percent increase in wind speed leads to more than a 40 percent increase in the load the structure must withstand. In addition, there is great variability in structural strength, which further complicates such assessments.

Our work for ICLR focuses on two aspects which will increase our capacity to assess extreme wind speeds: flight distances of wind borne debris, and windthrow of trees. The May tornado in Mitchell gave us some good data which we are currently analyzing. ►

Photograph showing flight distance of a 4' x 4' sheet of plywood which originated from the house in the background. Of note is the trail of debris in the field and the nails still in the plywood.

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Using observed failures and the measured flight distances of the resulting wind borne debris, we have developed aerodynamic models for the flight of such debris. With this, we can estimate failure wind speeds. These aerodynamic models are calibrated by wind tunnel testing where the failures, the details of the structure and debris flight are measured directly, together with the wind speed. One of the aspects that has surprised us is the great distance debris can travel, an example of which is shown in the photographs. We have measured flight speeds of plywood sheathing in wind tunnel experiments which can reach 60 to 80 percent of the wind speed. One of the less surprising aspects is the common nature of many failures, one of the most common being the improper attention to detail for connections, such as nails in sheathing missing the trusses.

As we continue to learn from these damaging wind storms, our goal is to continue to ensure that our buildings, and building codes, have the level of reliability we expect from them.

Photograph showing a sheet of plywood from the same house. The figure shows how several of the nails missed the roof truss, one of which is indicated by the red circle. The truss lines can be seen as the lighter areas on the wood.

Backgrounder

Elie, Manitoba tornado—Canada's first F-5

The town of Elie (pronounced ee-lie), Manitoba, located 40 kilometres west of Winnipeg, was hit by a powerful tornado on June 22, causing severe damage along its track. No one was injured or killed by the twister. This is in stark contrast to the June 14, 2000 tornado in a Pine Lake, Alberta trailer park, which claimed 12 lives; and the Edmonton tornado of May 30, 1987, which claimed 27 lives. The Pine Lake tornado measured F-3 on the Fujita Scale of Tornado Intensity, while the Edmonton twister measured F-4.

While first reported as an F-4, Environment Canada reclassified the tornado as an F-5 on September 18 after viewing video of the event and re-evaluating damage caused by the twister. This makes it the most powerful tornado ever recorded in Canada, with wind speeds estimated to have been in the range of 420 to 510 km/h. According to the Canadian Press, winds from the tornado "sandblasted the bark from trees." The twister came close to equalling a May 2, 1999 tornado in Oklahoma, which produced peak windspeeds of 512 km/h, making it the most powerful tornado ever recorded. That twister was strong enough to scour pavement from roadways.

According to Insurance Bureau of Canada, the Elie tornado and seven other twisters which touched down in southern Manitoba in the third week of June triggered insurance claims of about $17.5 million. IBC said the figure is pro-rated based on numbers received from about 75 percent of the marketplace affected by the storm series.

As it moved along its 5.5 kilometre-long path, the Elie twister picked up a tractor-trailer and tossed it aside, and caused over $1 million in damage to the town's flour mill before it moved east into Elie, where it levelled four houses, flipped over vehicles and tossed others (one car landed on a roof of a house). The twister was reported to have been on the ground for close to 40 minutes. It travelled at about 6 km/h and was a reported to be 300 metres wide at its widest point.

Canada ranks second in the world for tornado occurrences after the United States. According to Environment Canada, in the summer, an average of one tornado every five days is reported in Canada. However, on August 2, 2006, eleven separate tornadoes were reported in Ontario, from Burlington/Oakville in southern Ontario, to the Peterborough and Haliburton areas. Eleven tornadoes have occurred in Manitoba so far this year. In 2006, Manitoba experienced 15 tornadoes, compared to a long term (1984-2006) average of nine.

ICLR hosting the 4th International Symposium on Flood Defence

By Slobodan Simonovic, Professor, University of Western Ontario

Brian Campbell

Floods, including flash and riverine floods, snowmelt floods, ice jams and mud flows, are naturally occurring hazards that provide essential elements to the bio-diversity and sustainability of ecosystems and many human activities. Floods are also the most taxing type of water-related natural disasters to humans, material assets, as well as to cultural and ecological resources—affecting about 520 million people and their livelihoods and claiming about 25,000 lives annually worldwide.

The annual cost to the world economy of floods and other water-related disasters exceeds $60 billion, whilst the cost of damage caused to cultural assets and natural resources is by no means quantifiable by economic scales.

The Institute for Catastrophic Loss Reduction under the chairmanship of Prof. Slobodan Simonovic, is hosting the next International Symposium on Flood Defence (ISFD4) - scheduled to take place on May 6-8, 2008 in Toronto at the Westin Harbour Castle Hotel. The theme for this important event, which marks the fourth in a series, focuses on the management of flood risk, reliability and vulnerability.

As the recent flood disasters, like hurricanes in the United States and the tsunami in Asia, made abundantly clear, all nations are susceptible to the damaging effects that major storm and flood events cause. ISFD4 provides a unique opportunity to bring the interdisciplinary group of flood experts together to share critical knowledge from regional and international perspectives.

In keeping with the previous ISFD held in Nijmegen, The Netherlands, the focus of the Toronto meeting will be a new perspective of flood risk management and assessment - one that recognizes flood risk reduction as an integral part of water resource management and which aims to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital systems.

Appropriate flood risk-mitigation investment and the redirection of resources into flood disaster prevention, offers significant economic benefits as well as reduction in loss of life and property, and improvements in welfare and social stability.

The main objectives of the 4th International Symposium on Flood Defence include:

- Addressing the various approaches and methods used to manage and assess flood risk (safety), reliability and vulnerability;
- Sharing of new, innovative developments in flood risk reduction methodologies;
- Reviewing international activities in sustainable floodplain management;
- Bridging the gaps that arise between the flood research and development communities and those flood professionals responsible for responding to and mitigating against major flood events;
- Exploring means to sustain balance between structural and non-structural approaches to floodplain management;
- Managing flood risk in large urban areas; and
- Exchanging recent experiences gained in the areas of integrated flood policy development, implementation and management.

Response to the call for abstracts has been overwhelming. Over 350 abstracts have been received from all over the world for 14 Symposium themes that include:

Meteorological Advances and Early Warnings: There are a wide array of tools and techniques available to decision-makers that aid in the provision of timely and effective flood ►

ICLR hosting the 4th International Symposium cont...

information. Various models, mapping techniques, communications systems, and sensor technologies continue to be developed at international, regional, national and local levels for detecting and monitoring potential disasters of hydro-meteorological origin.

Flood Disaster Mitigation: Various approaches have been devised throughout the world to reduce the impact of flooding at the individual and community levels. This session will focus on proven and innovative techniques for protecting against flooding, such as the elevation of structures and wet/dry flood-proofing.

Innovations in Structural Protection: The evolution of structural flood protection measures is affected by the use of new materials, construction techniques and the change in design and construction methods. Modern technology is also offering the opportunity for near-real-time assessment and monitoring of structural integrity. Contributions to this session will address various innovations in structural flood protection and their impact on the integration of structural solutions with nonstructural protections.

Integrated Floodplain Management: Integrated flood management (IFM) calls for the joint consideration of flood damages and benefits from the use of floodplains. Factors such as socio-economic development and the level of risk that a society is willing to face characterize the IFM approach. Since both land and water resources are scarce and most arable land lies within floodplains, efficient use of IFM is necessary for maximum productivity. This session will review current floodplain management practices and raise issues for their change in order to contribute to efficient integrated flood management.

Response Planning: This session will focus on the issues associated with the planning and execution of flood response. Exactly when and where to issue an evacuation, for example, is one of the key challenges the emergency management community faces. Various plans, policies and procedures related to logistics and the emergency manager's various roles will be presented.

Relief and Recovery: This session will focus on the policies and practices that occur during the period immediately following flood events. The role that governments and NGOs play during the relief and recovery stages of a flood event varies widely.

Impacts of Climate Change: Climatic variability and global change processes are identified as a potential source of change in flood frequency, sea levels and flood and storm severity. This session will discuss issues related to global change and flooding. Contributions will offer some ideas on how to estimate the impacts of global change on flooding and identify potential flood management practices that will reduce the negative impacts of global change.

Water Quality Implications of Floods: Floods can contribute to the degradation of water quality. Conversely, they have the ability to improve conditions within highly degraded watersheds. Various issues relating floods to water quality will be discussed in this session. Lessons learned from recent floods in different regions of the world will be shared.

Community Vulnerability and Awareness: Population growth and socio-economic development increase the human vulnerability to floods. Many lives are still being lost in flood disasters around the world. In this session human flood vulnerability issues will be addressed with an expectation that new ways will be identified to increase future flood security.

Flood Protection Standards: Recent extreme events have raised concern over the sufficiency of flood standards, such as the 1 percent chance frequency, which serves as the basis for many of the flood loss reduction programs throughout the world today. Governments at many levels have come to rely upon probability-based flood standards for their floodplain ►

Brian Campbell

ICLR hosting the 4th International Symposium cont...

management programs. Recent extreme flood events, along with the threats posed by climate change, have caused many programs to turn to risk based approaches to setting standards. Papers that address the use of standards will be presented.

Flood Insurance: Flood insurance is one of the nonstructural flood management measures used with different levels of success in different countries. The United Sates has just completed a five year analysis of its experience with the National Flood Insurance Program. This session will review flood insurance practices and their efficiency in integrated flood management. Special emphasis will be placed on different forms of flood insurance, the lessons learned in the United States, and innovative ways of offering insurance in varying socio-economic settings.

Urban Flood Protection: Urban areas, due to their complex infrastructures and high concentrations of population, pose particular problems in terms of the flood risk. This session will focus on the various policies, projects and techniques unique to urban environments.

EU Directive on the Assessment and Management of Flood Risks: The European Commission has proposed a directive on the assessment and management of floods. with an aim to reduce and manage the risks that floods pose to human health, the environment, infrastructure and property. Under the proposed directive member states would first need to carry out a preliminary assessment to identify the river basins and associated coastal areas at risk of flooding, including the development of flood risk maps and flood risk management plans. Papers focused specifically on this European Union directive will be presented.

Four plenary sessions will address the most current topics in flood management. The first is devoted to Hurricane Katrina and perspectives of risk and reliability. The second addresses how flood risk management will be addressed from an international point of view. The third will elaborate on all international flood-related initiatives. The fourth will revisit Red River Flood of the Century – 10 years after.

We are very fortunate that both the World Meteorological Organization (WMO) and UNESCO provided funds for support of participants from developing countries. Ten participants from Pakistan, India, Bangladesh, Mongolia, Thailand, Philippines, Zimbabwe, Zambia, Sri Lanka and Republic of Uzbekistan have been selected for support.

For more information on the next International Symposium on Flood Defence (ISFD4) - scheduled to take place on May 6-8, 2008 in Toronto at the Westin Harbour Castle Hotel, contact:

Tracy Waddington at twaddington@iclr.org

See you in Toronto. In the meantime, visit us at the web www.flood2007.org

Slobodan Simonovic, Professor of Engineering, UWO, ICLR Director of Engineering Studies and Chairman of the International Symposium on Flood Defence (ISFD4)

Friday Forum schedule for the balance of the year

ICLR seeks to strengthen the insurance community's awareness of the risks associated with natural hazards. Each month we host an informal discussion of current research and industry issues related to natural hazards. Attendance is limited to ensure that participants can directly contribute to the discussion.

The cost is $75 for members ($150 for non-members) for each forum. Business casual dress.

October 19
Earthquake in Ottawa and Montreal (Gail Atkinson, University of Western Ontario)

November 16
Nov. 9, 2005 Hamilton tornado (Richard Kinchlea, City of Hamilton)

For more information, contact Tracy Waddington at (416) 364-8677 or twaddington@iclr.org

The new normal: Billion-dollar bruisers

Who would have thunk it? Earthquakes, hurricanes and floods are not the only perils causing billion-dollar mega-losses.

By Glenn McGillivray
Managing Director
Institute for Catastrophic Loss Reduction

After 2004 and 2005 brought back-to-back record years for insured losses, global claims totals in 2006 proved to be considerably more benign as only three natural catastrophe events triggered insured losses of more than USD 1 billion each. There where six such events in 2005, seven in 2004 and none in 2000.

While the three events in 2006 seem quite insignificant given the record North Atlantic hurricanes in the preceding two years, there is something worthy of mention in the metric: Of the three billion-dollar-plus events last year, two (or two-thirds) were U.S. tornadoes, something unheard of just 10 or 15 years ago.

Just over five years ago, I wrote "A new world order may be taking shape for property and casualty insurers and it could shake many an unprepared carrier to its very foundation. This new regime comes as a result of the birth and subsequent rise of billion-dollar-plus insured natural loss events that fall outside the realm of earthquake, hurricane and flood. Not all that long ago, such events were thought to be highly unlikely, if not downright impossible. But since the mid-1980s, the roll call of such losses has proven naysayers wrong."

To illustrate how natural hazards other than the traditional trio mentioned above have begun and will likely continue to trigger larger and larger insured loss totals, I began with the Munich hailstorm of July 12, 1984, which caused insured damage of USD 476 million (USD 928.9 million in 2006 dollars). The storm marked one of the first times that an event as normally low-grade as a hailstorm triggered significant insured damage, providing a hint of what was to come.

Courtesy of NOAA's National Severe Storms Laboratory

Sure enough, a few years later, on July 11, 1990, Denver, Colorado was hit with softball-sized hail which destroyed roofs, siding and cars. Insured damaged came in at USD 625 million (USD 980.1 million in 2006 dollars).

Further evidence was provided with the October 1991 Oakland, California fire, which triggered insured losses of USD 1.7 billion (USD 2.5 billion in 2006 dollars) with economic losses estimated to be twice that figure. Another urban wildfire, the October 1993 Altadena/Sierra Madre fire near Los Angeles, triggered insured losses of USD 950 million (USD 1.3 billion in 2006 dollars).

Also noted was the May 5, 1995 Fort Worth, Texas hailstorm, which triggered insured losses of USD 1.1 billion (USD 1.4 billion in 2006 dollars) making it the most costly hailstorm in U.S. history; the January 1998 ice storm, which caused CAD 1.4 billion (CAD 1.8 billion in 2006 dollars) in insured losses in Canada alone; the April 14, 1999 Sydney, Australia hailstorm, which caused USD 982 million in insured losses (USD 1.2 billion in 2006 dollars); and the May 2, 1999 series of tornadoes which ripped through 18 U.S. states causing insured damage of USD 1.5 billion (USD 1.9 billion in 2006 dollars).

Another new normal

Since the writing of the April 2001 piece, the list has expanded (with one of the biggest events arriving as the article was on the presses), confirming my thesis.

On April 10, 2001 a powerful storm ripped across the state of Missouri, packing powerful winds, driving rain, baseball sized hail and tornadic storms. Almost 70,000 homes and business were affected and 22 TWA planes were forced out of service due, mostly, to minor damage. There was an estimated USD 700 million in insured ►

The new normal: Billion-dollar bruisers cont...

damage to north St. Louis County and parts of St. Charles County alone. The total damage figure of USD 2.5 billion (2006 dollars) easily usurped that of the May 5, 1999 Fort Worth event, making it the most costly hailstorm in U.S. history, a record which still stands.

The 'Old' and the 'Cedar' fires in California were both reported to have begun on October 25, 2003. The Old fire destroyed more than 1,000 structures as it burned in excess of 150,000 acres in the San Bernardino Mountains. The Cedar fire, which was located south of Ramona in central San Diego County, destroyed 2,820 structures as it consumed 280,278 acres. It remains as the second-largest wildfire in U.S. history. Total insured damaged from the two fires has been reported at close to USD 3 billion.

An outbreak of tornadoes in May 2003 which saw 401 twisters tallied in one week, broke a 29-year-old record of 245 in one week, set in the period March 30 to April 5, 1974. Nineteen states were hit with various combinations of rain, hail, wind and tornadoes. Swiss Re has insured loss figures pegged at USD 3.5 billion (2006 dollars).

And, as noted off the top, two of just three natural catastrophe events in 2006 which triggered billion-dollar-plus losses were U.S. tornadoes, with one outbreak occurring from April 6-8 and the other from April 13-15. The April 6-8, 2006 series began in the Great Plains and continued to South Carolina. A confirmed 74 tornadoes ripped across 13 states, with the bulk of them coming on the afternoon and evening of April 7 across the South, particularly in Tennessee. In total, 13 people were killed, 12 in Tennessee. The 'Easter Week Tornado Outbreak' a few days later marked the third major outbreak of tornadoes in April 2006. As noted by Swiss Re, the April 6-8 series caused insured damage of USD 1.3 billion, and the April 13-15 series caused insured damage of USD 1.9 billion.

Bulls eye

The fact that these types of natural loss events are now known to be able to cause, in some cases, several billions in insured damage suggests an increase in the concentration of insurable equity. Every year there are more homes, vacation properties and vehicles; more factories, warehouses and stores. Cities are getting bigger and new subdivisions are going in where wheat or corn fields recently stood. Where there was once an old clunker in the driveway, there is now a pair or trio of high-end vehicles. In short, everyday we are becoming bigger and more expensive targets.

Hand-in-hand with this is increasing development in high-risk zones. More people are living on coastlines, on or near fault lines, in chalets at the bases of snowy mountains, and in the wildland/urban interface (according to a May 29 article on wildfire in the Insurance Journal, "More than 6 million homes in the Golden State [California] stand in wildfire 'red zones' and that number is expected to grow by 20 percent in the next decade.")

The uncertainty presented by climate change only adds to the challenge. ►

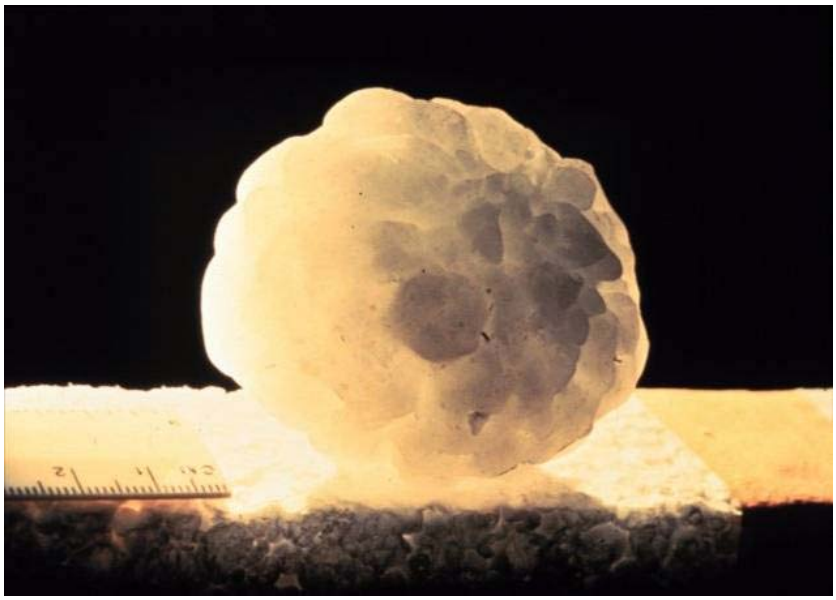
The new normal: Billion-dollar bruisers cont...

Why should insurers be concerned?

What such events may do is throw a monkey wrench into commonly held industry theories about what catastrophe reinsurance covers should be bought and why. The tornadoes, hailers, wildfires and other threat scenarios listed above are traditionally high frequency but low- to mid-severity events, and are therefore often not well covered by cat reinsurance. Many firms, particularly larger carriers, often purchase cat reinsurance for a broader range of perils than would a mid- to small-sized regional player. Larger national players who have to contend with earthquake and hurricane risks on top of tornado, hail, wildfire etc. usually purchase Cat XL covers with high attachment points, crafted for low frequency high severity events.

According to industry data, on average, insurers usually do not activate most of their CAT XL protection until the aggregate loss level approaches US$6 billion. Generally cat deductibles exceed the losses produced by tornado, hail and other non-earthquake/hurricane/flood events. Therefore most of the losses associated with such perils fall into the gap between coverage and are absorbed net by the insurer, sometimes badly hitting their bottom lines.

Because of the random, usually localized nature of tornado, hail and other such losses, the damage is not usually as widely distributed within the industry as with other natural catastrophe events. Accordingly the losses to insurers will vary. But for many insurers the annual net aggregated losses caused by tornadoes, hail etc. could possibly exceed those caused by a major hurricane or earthquake in any given year. Indeed, over the past 30 years or so (excluding the record years of 2004 and 2005), total property catastrophe losses caused by tornadoes and hailstorms (US$42 billion) has been greater than catastrophe losses associated with either hurricanes (US$34 billion) or earthquakes (US$17 billion). According to RMS, "… tornado and hail events in the United States and Canada cause an average of over US$5 billion in insured losses each year."



So if the observations noted here are indeed something to take note of, and billion-dollar-plus losses caused by natural perils outside the traditionally obvious threats of earthquake, hurricane and flood are becoming commonplace; then results for many p&c carriers in North America could become a lot more volatile in the future.

Consequently, some carriers may have to completely rethink how they protect their bottom lines with reinsurance.

This article first appeared in the July 2007 issue of Canadian Underwriter magazine.

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Mission
To reduce the loss of life and property caused by severe weather and earthquakes through the identification and support of sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters.

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