

Alternative Distribution Channels Of Insurance Products

Report by: - Partner Re

An Ongoing Revolution

Financial products are sold in general through specialized networks (banks, insurance agents). Thanks to technology, the client can now choose how he will contact his financial intermediary - via the Internet, call center, telephone, letter or bank teller. Diversification and the quickening spread of new technologies are changing the market place radically. As shown here, the percentage of people who adopt a new technology

Within ten years after its introduction has increased sharply.

Insurers must react quickly to adapt their distribution networks. The last 15 years have seen already many changes (rise of mutual, banks and direct insurers), but new forces based on the use of technology may bring even more dramatic changes.

As late and relative newcomers to the insurance business, banks have nevertheless achieved a significant rate of market penetration, especially in the life market.

The banking networks share of the distribution of life insurance to individuals ranges from 10% in Switzerland to 70% in France (Italy: 55%; Spain: 50%; Belgium: 30%; and UK: 15%). In the non-life market, shares are between 3% and 10%. France ranks first overall with an average market share (life and non-life) close to 50%.

The Recognition of traditional Types of Distribution

Insurance is moving from traditional networks, selling in-house products with little technology and traditional insurance products, to a full offering of financial services with the technology component strongly integrated. This is evidenced by the wide use of call centers, the sale of online products, the development of banking-type products and an outsourcing of risk bearing to better focus on marketing functions.

We should expect a clearer separation between insurers and distributors and the risk takers, including reinsurers, to follow.

Four typical European business model breakers are demonstrating new and successful ways of offering services and insurance solutions. They might be referred to (barbarians), in that their business model poses a significant threat to the established players:

1 - The MLP concept is to offer online both life and non-life insurance products, banking and brokerage services. The organization only retains in-house the design of software and sales; the rest is outsourced. The sales force is composed of 1,500 specialists, advisors and Internet specialists (widespread from March 2000). The target clientele is management level employees and medical professionals, representing in all about 10% of the population.

2 - Banca Fideuram (BF) sells life insurance and savings products through an advisory network, brokers and banks. BF provides mainly banking and asset

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management. It has 3,700 financial advisors, 57 branches and 100 marketing offices, with a Web project for the second half of 2000. The target clientele is high net worth and affluent (with savings above €50,000).

3 - Mediolanum started in Italy and expanded into Spain. It sells savings products and life assurance through an advisory network, brokers and banks. The sales force is made up of 5,300 advisors (2,900 permanently licensed) and will start selling on the Web from February 2000. The target clientele is the mass market. Mediolanum has a private banking joint venture with Mediobanca.

4 - The April group is French in origin; it started operating in Italy in 1999 and Spain in 2000. Other projects are under way. The group specializes in personal lines insurance and insurance architecture under various distribution brands. April is basically a product designer. It delegates risk carrying to various insurers and reinsurers. The sales forces comprises 10,000 insurance agents and brokers. The group target is one million policyholders in 2000 and a 10% market share of French motor insurance by 2005.

These (barbarians) are ambitious and successful business model breakers, who bring a new vision focused on the concept of service. Still counted among the outsiders in European financial services, their flexibility and use of technology give them a significant advantage over traditional players.

The strategic importance of the financial distribution networks is increasing because of their proximity to the consumer. This is the new strategy applied by Axa, Aegon, RAS and other newcomers, but not yet quite by Allianz or Generali. Future moves will be aimed at accessing new networks.

Agency networks will have to adapt, increasing quality by adding services and products to compete with the banks and new distribution channels.

Bancassurance at Credit Agricole

Credit Agricole is the leading French banking network, with 8,000 sales outlets in France, 16 million clients and 93,000 employees. It is the leading bank for individuals (33% of French families have an account at Credit Agricole), and has a 25% share of the property loan market and a 21% share of the banking savings market.

The bank has €39.5 billion in total balance sheet assets, and €5 billion of capital. Credit Agricole is a united and decentralized multi-services group. The holding body is the CNCA Group (Caisse Nationale du Credit Agricole), which is composed of 11 specialized entities offering clients a diversified range of services through 48 regional bank networks.

Credit Agricole is a longtime bank insurer. It created Camca (a mutual for the banks own risks) in 1946, and added: ADI-CNP (a joint venture with CNP for the selling of credit life insurance for the banks property debtors) in 1955; Soravie (a joint-venture in life with Groupama) in 1972; Predica (an in-house insurance company for life) in 1986; and finally Pacifica, an in-house property and casualty (P&C) insurance company in 1990. Pacifica and Predica act with common resources drawn from the group to ensure better integration.

Bancassurance was one of the main new fields for Credit Agricole in the 1990s. Insurance was considered as an opportunity to diversify and enhance the profitability of banking outlets while increasing the loyalty of banking customers. Predica issued 8 million policies in 1999 for 4.1 million insureds.

Over the years, FF421 billion has been invested, making Credit Agricole the third largest French life insurance company (after CNP and Axa).

Pacifica, an Approach Designed to Serve Regional Banks

In property insurance, the market priority for Pacifica is the individual market. Total P&C market insurance premiums for 1999 were FF198 billion, of which 61% was for private risks and 39% for commercial risks.

Lessons Learned from Bancassurance at Credit Agricole

Insurance must be core to the banking approach to be efficient and successful. The approach must be tailored to banking distribution: products must be sold through the network and be simple to understand; services and procedures must be defined in detail to allow good cooperation to ensue.

The information system has a decisive role to play. It ensures integration in the banking management system, supports and assists in complexity, improves the quality of service and administration productivity.

Insurance training is a major investment for banks: practical applications are key to sales success and administration efficiency.

Conclusion

Bancassurance at Credit Agricole is a group target, a shared success and a clearly acknowledged leadership on the French market.

UAF (Union des Assurances Federales) is part of the major French bank Credit Lyonnais and includes several entities:

- Les Assurances Federales-Vie, the life company
- Federlux, a start-up located in Luxembourg
- Afcalia, specializing in bank related products
- La Medicale de France, a traditional non-life company.

Life Bancassurance within UAF

The French life insurance market has more than doubled since 1990, achieving total premiums of FF 498 billion in 1999. The

bancassurance market share has increased from 50% to 56%.

Banking networks have a number of advantages. Banks have a close relationship with their customers, as well as good knowledge of their needs, requirements and cash position. This allows for easier selection and provides the opportunity to offer the right products, at the right time, to the right people.

The Credit Lyonnais network is very strong with about 1,900 branches in France, a sales force 6,000 strong, six million customers and 700,000 life policyholders (around 12% of bank customers have an insurance policy).

Bancassurance as a distribution channel helps limit overall cost, thanks to the marginal use of the bank distribution network. Moreover, operating costs are reduced because of an efficient IT system and a common back office. This results in an intermediary ratio (operating expenses and commissions divided by average mathematical reserves) of less than 1 %.

New Channels

UAF main development will be through the bank network. their medium term target is to sell a life policy to one quarter of the bank customers. But they are also developing new distribution channels:

- The network of La Medicale de France, with 40 agencies in France, is dedicated to non-life policies for health professionals. they are presently recruiting employees to market life products
- An international network, through Federlux (their life insurance company in Luxembourg) will market their products in the European Union. they are looking for other partnerships in Europe. their objective for 2000 was premium income of FFfr500 million
- a dedicated team is distributing specific and flexible policies through financial advisors, using an extranet communication system, with tailor-made reporting - their site uafdirect.fr allows online subscription for specific products such as Federvie (savings with flexible unitlinked policies) and Federplus (death guarantee); they are developing connections with other financial portals and sites. We expect their Internet link to become a true distribution channel within five years.

Non-Life Bancassurance

Bancassurance companies are bank subsidiaries and start-up operations. They generally have an ambitious business plan but lose money in the early years due to portfolio growth and launch costs.

These operations need reinsurance and financing support with more partnership, which means continuity and responsiveness.

Non-life bankinsurers concentrate on personal lines; products offered to the clients of the bank have small sums insured but are exposed to catastrophe events.

As the portfolio grows, the exposure to catastrophe events becomes significant: storm accumulation for householder policies and unlimited cover for motor.

There is a need for close collaboration with reinsurers for control of catastrophe accumulations and reinsurance capacity must be adapted to exposure of potential large losses.

The potential for growth is important with a captive clientele from the bank. The consequent fast growth produces negative results and a necessity to wait a few years before reaching the breakeven point.

Reinsurance Role

Thanks to light corporate structures and distribution by the bank network, acquisition costs are low, affording an ability to generate profitable business without too much pressure on prices.

Reinsurers can offer to set up a financing treaty on a sound basis, with regular control of accumulations. The treaty put in place by the reinsurer allows for planning the pay-back of the initial deficit over a period of 5 to 10 years.

The bank knowledge of the client allows a scoring approach, giving better selection than the average insurer. This approach usually provides good technical results but can also go wrong. The selection is not in line with the pricing.

The reinsurer gives support by way of a proportional treaty in order to limit the consequences of a wrong initial scoring approach.

Affiliates of banks usually start with low capital and surplus. Starting from scratch, it takes time to build reserves and financial income is low. The need for technical profits and additional capital is high.

The capital can be protected by proportional reinsurance from the beginning in order to limit the initial deficit and monitor the follow-up of the business plan.

There are degrees of risk aversion in the banking culture. To fully protect the start-up and its capital, there are sometimes low retentions and large reinsurance coverage for the non-proportional cover.

Reinsurance Solutions

The most adequate reinsurance structure for these operations is based on balance sheet protection provided through a financial quota share.

Non-proportional and proportional covers are set up to reduce the random risk of bankinsurers and offer financial support protecting the solvency margin.

The non-proportional cover is a protection for large losses:

- motor: excess of loss with unlimited cover
- property risk and catastrophe: excess of loss with a deductible on the range of 2% of the capital and a limit adjusted to the probable maximum loss.

The proportional cover is a financial quota share, net of excess of loss, providing balance sheet protection to the company at a time of high start-up operating costs.

This protection operates as a combined quota share on motor and household.

International Cargo: The Vital Statistics

Report by: GE Frankona

The current low in the insurance cycle has created number problems for marine Insurers, not the least of, which is the application of overage additional premiums in respect of older tonnage utilized for cargo shipment. The current London market advisory scale of additional premiums, used in conjunction with the Institute Classification Clause, was issued on 21st April 1992. During the period since it was issued, marine cargo rates applied by insurers have reduced some 50% and yet the scale remains unchanged. It is now common practice for Insurers in both London and International markets to amend the application of the scale, effectively reducing the rates, but the question is - **Are They Correct In Doing So?**

This question is not a simple transaction between Insurers and cargo owners, but also brings ship owners into the equation. Whilst all essentially working in the same industry, all have their own individual commercial considerations.

Let us consider the issues surrounding the use of older shipping tonnage .

Not forgetting the human issues and safety of the crew, a considerable amount of work has been put into raising the standards of maintenance and design of vessels for carriage of cargo and passengers alike. The introduction of the International Safety Management (ISM) code in July 1998, initially in respect of passenger vessels, oils and chemical tankers, bulk carriers and cargo high speed craft, was intended to improve the quality of vessels trading in international waters. Whilst only a short time after its introduction, the sentiment is that the code is a success to date with the compliance rate for applicable vessels well ahead of target. However, as with most agreements, there are areas of the code that may be circumvented and an example of this is the temporary certificate. In this example, a newly registered ship owner is allowed six months grace before vessels must attain ISM compliance and certification.

Unfortunately, this provides a loophole that can be exploited.

The International Association of Classification Societies (**IACS**) continues to strive to ensure Classification and ISM compliance are to the fore in all shipping communities. Indeed, the (Leader L) loss highlighted particular concerns when it was revealed that some 18 days before its sinking, the vessel had passed statutory surveys. The following IACS audit showed the vessel had evidently been in poor condition for some time whilst operating under the Polish Register (PRS) & which is now removed from IACS membership.

Age of vessels used in shipment of cargo is an ever-present concern to cargo owners and insurers. Despite International Maritime Organization (IMO) and ISM safety initiatives, total losses in 1998 were running at the same levels as 1988 . However, there is some encouragement in the final 1999 close which records Total losses at approximately 50% of the previous five year average. Of these recorded Total losses in 1999, it is noted that 75% of cargo vessels lost were in excess of 20 years from date of build at time of loss . Underwriters will be interested to note that the oldest vessel lost during 1999 was the (Basari), a general cargo ship of 698 GRT, and built in 1920.

Time will tell if the trend in the world fleet has truly moved in the right direction, however, the record of bulk vessels remains under particular scrutiny having suffered an alarming number of casualties in the first half of year 2000.

IACS and IMO together with all parties in the shipping community share joint aims to introduce higher design strength and greater attention to preserving the watertight integrity in the global fleet. A high proportion of recorded bulk cargo and vessel losses are due to flooding of the hold while carrying high density cargo and accordingly, ISM compliance encourages special vigilance and maintenance of outer hulls and hatch covers, all crucial in the primary defense of the vessel as it gets older.

Dangers associated with bulk oil movement in tankers have been highlighted by the (Erika) which foundered in heavy seas off the Bay of Biscay in December 1999 and which was one of eight sister vessels all built between 1974 and 1976.

In February this year, four of these vessels, while still trading, were discovered to have suffered serious structural failure.

Following the pollution from (Erika) on the French coastline, demonstrations within the country provoked a warning from the EU of further safety rules. French authorities have already acted and introduced tough safety measures, which have been taken up by several of the oil majors as signatories to a voluntary shipping safety charter.

The charter tightens checks on tankers from 15 years old and agrees to cease using single hull vessels from 2008. French owners have committed to thorough hull inspection on 15 year plus vessels every 2 and a half years rather than the 5 year period required at present for 20 year old vessels.

Operating standards, irrespective of age of vessel clearly are a major factor within the quality and safety considerations for both cargo owner and insurer. The flag of registry will ultimately regulate vessel standards of maintenance and operation and should remain a factor in selection. Insurers in particular remain concerned at the development of the (flagging out) strategy employed by many owners in order, Amongst other considerations, to reduce operating costs made possible by registration with a Flag state that may have lower level requirements, referred to as Flags of Convenience (FOC). An increasing shift towards FOC is evidenced by comparison between 22% registration in 1988 to a staggering 66% of total registrations in the World fleet by 1998. However, this strategy is not without its problems as FOC operators will suffer additional pressure through targeting on port scrutiny and will feature strongly in the detention figures, for example, the UK Maritime & Coastguard Agency detentions in 1999 revealed some 50% of their detentions to relate to just five state flags. Factors for the cargo owner to take into account when selecting vessels for shipment. Availability of vessels continues to be a major source of headache for those cargo owners acting in best interests of the safety and quality of their cargo risk. Consider that even at an early stage of this year, 77 vessels were removed from the bulk carrier fleet. Note: 74 of these vessels were scrapped. Put this against a number of 18 new buildings in the month of February, 2000 leaving a net reduction of 59 ships with equivalent tonnage capacity of 291,000.

Market information records approximately 180 bulk vessels of twenty years plus were disposed of during the 1999 year.

The issues raised may not be all embracing but clearly show a heady mixture of factors to be taken into account by shippers,

owners and insurers. The original proposition however, raised the question of underwriters discounting overage rate levies and (are they correct to do so?) The problem of ageing cargo vessels is not new and cargo underwriters will, as mentioned earlier, avail themselves of appropriate Classification Clauses within the policy.

Insuring Conditions

These clauses will usually allow the underwriter to charge additional premium rates loaded according to vessel age, type / density of cargo and obviously fleet record of vessel owners. The operation of the clauses will usually state that policy rates apply subject to cargo being shipped on the approved vessels by nominated Classification Society, age and size. Vessels outside of these parameters are (held covered) subject to premium and on conditions to be agreed.

This hold covered provision within the Classification Clauses will only go so far in controlling the standard of vessel used and without overriding policy conditions, leaves the underwriter a call of conscience on the cargo assured to select an alternative vessel, acceptable to both sides. Understanding the problems associated with availability of vessels leaves a considerable risk management task for cargo interests in selecting suitable tonnage at viable freight and insurance rates. In view of the application of the Class Clause where non approved vessels remain held covered, and if no alternative vessel can be found, underwriters will be left to charge an appropriate premium, if such can be agreed?

The risk management proposition from underwriters must therefore be to ensure in advance that the insured cargo is carried on prescribed parameters of vessel by age, tonnage and flag which they are willing to underwrite as cargo risk. The held covered position may be overcome by using express conditions to cap use of unsatisfactory vessels, but clearly this is a risk control aspect that must be embraced and managed by the cargo assured jointly developing suitable chartering strategies.

Express conditions limiting age of vessels on which cargo is shipped are commonly used by underwriters, for example by limiting coverage to dry bulk cargo on vessels 15 years from date of build. Additionally, as another indicator of maintenance standards and to ensure as far as possible that recovery is maximized, a further express condition that the vessels used must be entered into International P & I Club for cargo liabilities will form part of the cargo policy conditions.

This feature of the booked shipping will support the general risk management sought in the cargo policy arrangements.

Given the predicted level of losses to the marine market, this is surely an area that will of necessity take a positive tack in the process of underwriting international cargo risk at a profitable and sustainable level. The answer regarding the discount of overage rates will ultimately be included within underwriters results but it is not the only factor in the apparent under funding of total marine premiums. Risk control measures will strongly underpin a sound proactive approach, going forward, and hopefully will provide ample data to answer the next question; are we doing enough?

New Institute Classification Clauses 1.1.2001

Joint Cargo Committee

On 1.1.2001 the new classification clauses has been released to replace the clauses of 1997.

Hereunder the main changes introduced with the new clauses as released by the Joint Cargo Committee (JCC): -

1. It has been decided by the JCC that it is no longer appropriate to nominate particular classification societies but, instead, to accept all societies who are full or associate member of IACS (Clause 1.1). Reference is made in a footnote to the current IACS website. Which contains a current list of member societies.
2. Where there is coastal trading (Clause 12) the ICC will also recognize classification with National Societies as defined in Clause 4.1. Should be recognized that, where felt appropriate by underwriters, a National flag Society could include governmental maritime authority vested with the power to issue trading licenses and certificates.
3. It is to be noted that vessels not classed with IACS or a national flag society (must be) promptly notified to underwriters. Both rates and conditions must be (separately) agreed
4. The ICC has decided to retain the 10-year age limit for bulkers. This being in accordance with the technical advice received and soundings in the international markets through questionnaires The ICC has decided that, in the light of technical information received Larger tankers over 10 years of age no longer call for special treatment and the age limitation before an AP is payable becomes 16 years..
5. The JCC has decided to modify the concept of liner trade routes for vessels carrying general cargo to bring it more into line with current trading patterns The ICC has also introduced in Clause 2.2, after consultation with both insurance markets and shipowners. A completely new concept excepting certain containerships, open batch gantry crane vessels and vehicle carriers from the age limits, though an upper age Limit of 30 years is still imposed
6. Cargoes carried by ships lifting within the classification requirements but outside the age limits may, as before, be insured on cover terms but at rates to be agreed.
7. Underwriters will require other vessels riot falling within the accepted classification societies to be notified promptly for rates and conditions to be agreed.

World Insurance: Top Players seek larger global stage

Report by: Financial Times

The transatlantic clash between American International Group (AIG), the world biggest insurer, and Prudential - the UK second largest life assurer - neatly illustrates how insurers are increasingly playing on a global stage.

When Prudential announced its ambitious agreed bid for American General, it clearly wanted one of the strongest US life companies partly to provide cashflow for the UK group expansion plans in Asia.

By swooping for American General with a higher offer worth Dollars 23bn, Hank Greenberg, AIG's shrewd chairman and chief executive, not only sought to bolster his group position in the US market but also to block the growth strategy of Prudential - recognized as probably the best positioned overseas insurance company in Asia after AIG, which was founded in China 80 years ago.

There is, however, another compelling reason for the attention now being focused on the relatively small number of insurers - mainly European - that have decided to operate internationally through a combination of acquisition and organic growth.

Insurance analysts at Fox-Pitt, Kelton point out: (As a group, the global insurance leaders have been the better performing insurance stocks over the last few years, and we believe this will continue to be true.)

It was the desire to access this private long-term savings market that lay behind last month Euros 23bn agreed takeover offer by Allianz, Germany largest insurer, for Dresdner Bank, Germany third-largest.

The proposed deal will also draw in Munich Re, the world biggest reinsurer. It owns 5.9 per cent of Dresdner, 5 per cent of HypoVereinsbank and a smaller stake in Deutsche Bank - each of which has stakes in Munich Re. A four-way swap of the cross-shareholdings between Allianz, Munich Re, Dresdner and HypoVereinsbank would allow Allianz to bid for the remaining shares in Dresdner it does not own.

It would also increase the stake held in HypoVereinsbank by Munich Re, cementing their partnership. This would create not one but two bancassurance groups - each offering a range of financial services.

The planned takeover of Dresdner Bank by Allianz will result in the German insurer unwinding its complex network of crossholdings in German companies.

But while the deal is largely seen as a German solution to a German issue, it also illustrates the continuing drive towards consolidation in the European insurance sector and need to secure additional distribution channels.

Shareholder value and value-based management is driving this consolidation, (says Wolfgang Rief, director of Standard & Poors in Frankfurt.) The largest insurers are looking for scale and distribution capacity.)

Bancassurance is one of the ways that UK insurers hope to meet the challenge posed to their profit margins by government-backed, low-cost (stakeholder) pensions.

CGNU, the UK largest life assurer, has formed a strategic alliance with Royal Bank of Scotland, which recently acquired National Westminster Bank.

Legal & General, which is a vocal supporter of stakeholder pensions, has linked with Barclays, while Lloyds TSB bought Scottish Widows, the Edinburgh-based pensions specialist. Copyright: The Financial Times Limited

Consolidation is set to continue as insurers realize economies of scale and gain better access to capital and human resources. National boundaries will no longer afford a protective barrier to sustain inefficient or uncompetitive players.

Consolidation, aided by the launch of the euro, is expected to proceed most rapidly in markets that are already transnational, such as commercial insurance and reinsurance.

In its report, A.T. Kearney questioned nine insurers and found that although 88 per cent expected to sell to common customer groups across national boundaries in future, most still handle claims at a national level.

Branding is another issue. For example, Axa has concentrated on building one global brand whereas others, such as Generali of Italy, use several brands across Europe, including Alleanza and AMB.

A.T. Kearney predicts that more global insurers will start to consolidate some European products and processes for regions such as Germany and Austria within two to four years and, within six years, outsource certain processes and develop pan-European products.

And expansion will not necessarily come through mergers. For Allianz, part of the attraction of taking over Dresdner is from distribution through its bank network. But many European insurers are looking closely at distribution strategy and linking up with banks through joint ventures such as Zurich Financial Services and Bank of Scotland in the UK.

Axa is talking to Deutsche Bank about using its distribution network and this, too, is thought to be along the lines of a partnership.

Insurers will also look at partnerships to expand into new areas such as eastern Europe, which are expanding as governments reform state-run pensions. One of the reasons why the Allianz deal gained the agreement of Munich Re was that it gives Munich access to distribution through the bank branches of HypoVereinsbank, which has a strong position in eastern Europe.

The eastern European market is growing fast. According to Swiss Re Sigma research unit, average penetration of non-life insurance products in eastern Europe is 1.7 per cent compared with 3 per cent in western Europe.

And the growth potential of eastern Europe and of European markets such as Germany mean that insurance groups like Allianz will keep on extending their scale and distribution capability.

Rainer Helfenstein of Swiss Re believes consolidation will continue and, in the long run, the European insurance market will become pan-European as the large players aim at gaining market shares in all European countries.

TOP 500 Companies in the world in 2001 - Insurance companies among the TOP 500 By :- Financial Times

Rank 2001	Rank 2000	Company	Country	Market Capital \$m	Sector
7	17	Citigroup	US	250,142.9	Bancassurance
11	19	American International Group	US	206,084.4	Insurance
23	42	Hsbc Holdings	UK	140,692.8	Bancassurance
31	59	Berkshire Hathaway	US	105,238.3	Insurance
49	56	Allianz	Ger	86,529.6	Insurance
56	86	ING	Net	77,806.1	Insurance
76	358	Royal Bank of Scotland	UK	62,865.2	Bancassurance
78	76	Lloyds TSB	UK	60,663.4	Bancassurance
79	128	Munich RE	Ger	60,532.3	Reinsurance
82	112	Axa	Fra	58,235.6	Insurance
105	119	Zurich Financial Services	Swi	50,194.1	Insurance
117	183	Generali	Ita	46,046.6	Insurance
152	202	Swiss Re	Swi	34,556.9	Reinsurance
245	244	Halifax Group	UK	21,615.2	Bancassurance
313	430	Cigna	US	17,342.5	Insurance
426		Ergo Versicherung	Ger	12,368.1	Insurance
437		AGF	Fra	12,045.9	Insurance
495		RAS	Ita	10,462.9	Insurance

The Largest 10 Sectors of the TOP 500

	Sector	No. of Companies Of the TOP 500	Market Capital \$m
1	Information technology hardware	54	2,717,719.1
2	Banks	70	2,382,243.3
3	Telecommunication services	44	2,289,330.7
4	Pharmaceuticals	24	1,837,475.4
5	Insurance	32	1,160,797.3
6	Oil & Gas	17	1,099,949.8
7	Software & computer services	29	1,026,151.4
8	Electronic & Electric Equipment	19	923,457.9
9	Speciality & other finance	21	720,244.1
10	Media & photography	26	570,319.6

Tunnels

Report by: Swiss Re

Travelling into the bowels of the earth in an underground tunnel takes one just a little closer to that fabled and feared place of fire and brimstone. And for the scores of people involved in four major tunnel fires in recent years, the experience was a lot closer to hell than they would have liked.

The earliest of the four fires took place in the Channel Tunnel, or (Chunnel) linking Britain and France. Firefighters from both countries battled a blaze that started late November 18, 1996 aboard a truck carrying polystyrene.

Though the Chunnel provides a rail-only link, drivers can load their vehicles into specially designed carriers (rakes) and enjoy the trip in the comfort of an amenity coach. At least 34 people were injured, two seriously, in the fire, which also caused Cdn. \$85 million in damage. The blaze was the first major incident since the tunnel opened in 1994.

On March 24, 1999 a fire in the Mont Blanc tunnel in the Alps between France and Italy was sparked on a Belgian truck hauling flour and margarine. The blaze, which raged for two days before it was put out, took 42 lives. By some estimates the flames produced temperatures of up to 1,000 degrees C, hotter than the air that is directed into blast furnaces to make steel (usually about 900 degrees C).

Also in 1999, a markedly disastrous year for such events, a blaze began in Austria Tauern Tunnel that links the western portion of that country with Italy. According to firefighters, the May 29 blaze started when a truck loaded with paint plowed into the back of a car hundreds of yards inside the 6.4 kilometer long tunnel. The car exploded immediately, setting off a chain reaction of explosions and fire. At least 12 people were killed, and 50 injured. Temperatures in the tunnel reportedly soared to more than 1,800 degrees C.

And most recently, 155 people were killed on November 11, 2000 when fire tore through a funicular train climbing a slope in a tunnel in Kaprun, Austria. The train was packed with people when it became trapped in the 1.6 kilometre-long tunnel on the Kitzsteinhorn Mountain in the Austrian Alps.

As with any loss event - natural or man-made - a number of conditions linked by a precise chain of events leads to a disastrous end. In themselves the elements may be harmless. Take one out of the chain, and the event doesn't occur - or at least not to the same degree. But combine them in a certain way, and there is havoc. With the four incidents mentioned above, the mere existence of fire was not enough to trigger such carnage.

Factored into the four events were such exacerbating elements as poor emergency procedures, malfunctioning equipment, miscommunication between command and control centers, driver error and other forms of human error. Because three of the four incidents were triggered by trucks, there were also broader issues surrounding maintenance and inspection of commercial vehicles and driver training.

Aside from these ancillary matters, however, two engineering design factors played very important roles in the outcome of the incidents: tunnel configuration and ventilation system design and use.

Tunnel configuration

The issue here is straightforward. If an incident affects one tube of a two-tube tunnel, presumably people and traffic in the non-incident tube are far less likely to be impacted. The presence or absence of parallel tube passages plays a key role in the generation of casualty figures and death tolls. The Mont Blanc, Tauern and Kaprun portals are all single-bore, while the Chunnel is, in effect, a three-tube tunnel with one (running) portal leading to France, the other to the United Kingdom, and the third used for service. More than 200 people died in the three single-bore incidents, while no-one died in the Chunnel fire.

Tube configuration is also important if there are few such links in a geographic area (which is often the case in Europe) and the movement of people and goods relies greatly on the route. With facilities such as the Chunnel, if there is an incident or when routine maintenance must be conducted, traffic can be redirected from one tube to the other (the Chunnel has two undersea crossovers and two land crossovers). Also with two-tube tunnels, the non-incident tube can be used to shuttle emergency equipment and staff closer to the scene. This ability proved to be very important in the Chunnel incident because the link is almost 50 kilometers long and the incident train was 10 kilometers into the tunnel before the rail control center received its first confirmed fire alarm. Unfortunately, their very nature even basic tunnels are extremely costly to construct. Building two separate tubes increases the price tag substantially.

Hand in hand with the issue of tube configuration is the question of service-escape tunnels. In Austria, some people who survived the Kaprun blaze went down the tunnel. But others who managed to flee the train carriage went up the tunnel in the hope of escaping the flames and heat, which some estimate rapidly approached 1,000 degrees C. They tried to climb hundreds of steps in darkness but were overwhelmed by the toxic smoke driven toward them by a rush of air. About 270 meters from the train lay a ventilation shaft that might have afforded a means of escape - but no-one ascending the tunnel reached it.

Service tunnels are provided for the evacuation of passengers and crew in an emergency. The running tunnels are connected to the service tunnel at roughly 375 meter intervals by cross-passages. These have fire resistant air-lock doors on each side. Once confirmation of the fire on board train 7539 reached command and control, a tourist shuttle that was in the non-incident tunnel at the time was ordered to stop by one of these fire doors. This action proved to be crucial in the successful evacuation of 26 passengers and the engineer of 7539.

Though not usually as pricey as running tunnels, service tunnels are still costly additions to a tunnel-boring project.

Ventilation systems

According to researchers at Heriot-Watt University in Edinburgh, fires in road or rail tunnels could increase in size as a result of

current recommendations for ventilating tunnels to mitigate the effects of smoke.

According to the research engineers, a construction feature used in many tunnels throughout the world can actually be quite dangerous - the use of forced longitudinal ventilation. When a fire starts in a tunnel equipped with longitudinal ventilation, the system is switched on in order to blow smoke down the tunnel away from the blaze, allowing the passengers from the vehicles to escape in the opposite direction and giving a route for the fire crews to use in tackling the fire. But according to Heriot-Watts Dr. Alan Beard:

(This, of course, could fan the flames, spreading the fire to more vehicles or coaches further down the tunnel. This may be what happened in the Mont Blanc fire.)¹ Beard hopes that his findings, taken in conjunction with other research, will help to indicate rates of airflow that could be used to provide the ventilation needed while preventing the fire from spreading significantly. According to a report released July 8, 1999 by French and Italian investigators as cited by Reuters, a ventilation duct switched to the wrong position fed the deadly fire in the Mont Blanc tunnel. An Italian tunnel worker saw cars suddenly turning back and passengers getting out of cars and decided to switch equipment to send oxygen into the tunnel instead of filtering out smoke. Duct equipment operated by the French was reversed to (extraction mode) minutes after the fire broke out. But as for the duct system operated by the Italians, their officials apparently waited for 21 minutes before trying to switch the flow of air. Even worse, they initially put the air flow at the maximum level, as investigator Michel Marec told the Associated Press. When they tried to switch the duct mechanism to the correct position through an automatic system, it apparently didn't work. An attempt to switch the equipment manually also failed. An interim report by French experts released earlier in 1999 also pointed out the ventilation error, and concluded that there was a lack of co-ordination between the French and Italian companies running the tunnel.

The Chunnel has a sophisticated ventilation system to extract smoke from the running tunnels and to provide good quality air in the service tunnel should it be needed for evacuation. However, during the 1996 fire the system was confounded by three major problems - two were caused by equipment failures and the third was probably a procedural issue or a human error.

First, due to a lack of reliability in the opening/closing mechanism, the heavy steel doors used to close off the tunnel crossovers were left in the open position.

Second, while piston relief dampers used for ventilation were ordered closed once the fire became known, one remained open. These two problems caused a great deal of acrid smoke to migrate from the incident tunnel to the non-incident tunnel. Regarding the third issue, variable pitch fans used in the system were left at zero pitch, rendering them useless for several minutes. Once they were stepped up, they began to remove smoke at a fairly rapid pace.

Canada transit fires

Canada has several rail and highway links that cut through the Rocky Mountains, as well as rail portals that link Canada & the United States via the St. Clair River at Sarnia and the St. Lawrence Seaway. There are also light rapid transit tunnels, such as Montreal five kilometer long Mount Royal tunnel. Of course, there are also subway tunnels in Montreal and Toronto, and it is with the latter that probably the most fire experience has been gained.

There have been three incidents in Toronto between Transit Commission subway tunnels in recent years. Courtesy On August 11, 1995, three riders were killed and hundreds were injured when one subway plowed into another that was stopped between stations. Almost two years later to the very day - August 6, 1997 - at least 33 people were taken to hospital after dense smoke filled the Don-lands subway station. The fire started in a pile of rubber pads used to cushion railway tracks. and most recently, a converted subway car used to haul trash burst into flames at Old Mill Station, early morning December 8, 2000.

While not belittling their importance, these urban subway accidents only mildly resemble the four European tunnel incidents cited above. Urban subway accidents can be nasty; there is no doubt. However, the distance between stations is seldom great. There are often escape routes located between stations. Intense 1,000 or 1,800 degree C fire is rare, and dangerous cargo rarer. Subterranean links, on the other hand, often span great distances, either snaking through large mountains or below bodies of water. If they have escape routes, they are often few and far between. And it can take rescue crews a fair amount of time to reach the scene. What is more, such tunnels often contain burning vehicles, which themselves contain fuel and give off toxic smoke from burning rubber and plastic. The vehicles may also be hauling dangerous substances: styrene plastic as in the Chunnel incident; paint in the Tauern fire. The ensuing heat often causes great damage and makes it very difficult for firefighters to get in close to the source. As critical transportation links, they are down for many weeks or months following the incident. The U.K.-bound Chunnel was not reopened to passenger traffic until almost a month after the blaze.

In recent years, a great deal has been learned about tunnel fires. Unfortunately, it has taken, several incidents with great loss of life and millions in damages to make the lessons meaningful.

Authorities responsible for the safe movement of people and goods in Canada must ensure that the lessons learned by others in the world - usually the hard way - are made meaningful here and that everyone who enters a Canadian tunnel gets to see the light at the other end.

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