

Recent Developments in the Aviation Insurance Industry

Paul Hayes^a, Triant Flouris^b, Thomas Walker^{c,*}

a Airclaims Limited, London TW6 2AS, United Kingdom

b San Jose State University, Department of Aviation & Technology, San Jose, CA 95192

c Concordia University, John Molson School of Business, Montreal, QC H3G 1M8, Canada

Abstract:

Aviation accidents have the potential to result in large property damages and losses of human life. This paper provides an overview of how the airline insurance industry works. We will take a look on how the risk is spread between insurers, how insurers treat deliberate acts of violence and, lastly, how insurers price the risk. Our paper shows that the way the aviation insurance market is structured reveals highly sophisticated risk management practices. To minimize their risk exposure, large potential liabilities are shared by means of a complicated system among several insurers. Furthermore, the paper shows that the insurance market has adjusted to the post 9-11 aviation insurance realities being reasonably ready to handle events of an even more catastrophic magnitude.

JEL Classification: D81; G22; L52; L93

Key words: Aviation Disasters; Aviation Insurance; Reinsurance

* Please address all correspondence to Thomas Walker; twalker@jmsb.concordia.ca; (514) 848-2424 ext. 2750

Introduction

Aviation accidents, although infrequent, have the potential to result in large property damages and losses of human life. While there have been a number of studies that examine how airline stocks react to accidents (see, for example, Chance and Ferris (1987), Davidson et al. (1987) and Walker et al. (2005)) there has been no study to date that examines how insurance companies, which ultimately pay the bills, are affected. Our intention in this paper is to provide an overview of how the airline insurance industry works. We will take a look on how the risk is spread between insurers, how insurers treat deliberate acts of violence and, lastly, how insurers price the risk. Our paper shows that the way the aviation insurance market is structured reveals highly sophisticated risk management practices. To minimize their risk exposure, large potential liabilities are shared by means of a complicated system among several insurers. Furthermore, the paper shows that the insurance market has adjusted to the post 9-11 aviation insurance realities being reasonably ready to handle events of an even more catastrophic magnitude.

The Aviation Insurance Market⁽¹⁾

The fundamental principle of all forms of insurance is that ‘the premiums of the many will pay the losses of the few’⁽²⁾. As the insurance businesses exist in the commercial realm, they use conventional business management principles applied in the way they operate. Insurance companies should cover the cost of running the business, expenses and commissions and, together with any investment income, provide a reasonable profit and return on the capital employed. Similarly, the insurance market works to spread the risk between a large number of insurers and re-insurers so that the amount any one insurer is exposed to is kept within acceptable limits.

A decade ago, ‘(by) the time a major airline risk (had) been fully re-insured, hundreds or even thousands of insurers and re-insurers (would) have (had) a share’⁽³⁾. But, nowadays, with continuing consolidation in the market, the number of participants has fallen significantly, although it will still probably be over a hundred. There are a number of features of aviation that set it apart from other classes of insurance. Perhaps the three most significant are the limited number of risks⁽⁴⁾ available to insure, the comparatively small size of the insurance class, and the industry’s exposure to catastrophic events.

The main characteristic of the aviation insurance segment is the relatively few risks available to insure and this is especially so if just airlines are considered. At the end of 2003 there were 765 airlines worldwide operating about 16,400 western-built jet aircraft⁽⁵⁾. This number increases to 2,207 airlines operating about 26,000 aircraft if all airlines operating jet or turboprop powered aircraft of 15 seats or more are included⁽⁶⁾. However, the actual number of individual risks is significantly less than this since there are several airline groups where insurance is purchased on behalf of all the members of the group. In addition, the exposure, in terms of fleet value (or indeed size of fleet) is dominated by a few very large airlines or groups of airlines, with the 20 largest accounting for well over 50% of the total value at risk. The 100 largest airlines probably account for 90% of the exposure as measured either by value or passengers carried.

The aviation insurance market is very small in comparison with many of the other classes of non-life insurance. Currently, it is estimated that the total gross annual premium for all aviation insurance business is about \$7.5 billion (see Table 1) and ‘(in 2001) aviation premiums represented approximately 0.1% of the worldwide insurance market’.⁽⁷⁾ This is considerably smaller than, for instance, the annual premium for automobile insurance even in small countries. Examples of comparisons between aviation and other classes of business, illustrating how insignificant aviation is in the insurance world, are often quoted – one such example often used compares aviation to the cost of insuring plate glass in New York State.⁽⁸⁾

Table 1: Aviation Direct Gross Insurance Premiums

Sector	2003(\$m) ⁽¹⁾	1994(\$m) ⁽²⁾	1994 current (\$m) ⁽³⁾	2003 increase above inflation
Airlines	\$3,000	1,750	2,100	43%
Products & Services	1,000	675	810	23%
Space	650	525	630	3%
General Aviation	2,500	1,960	2,350	6%
Hull (War) & other	<u>210</u>	<u>180</u>	<u>216</u>	-3%
	7,360	5,090	6,106	

⁽¹⁾ Estimates by ‘a leading aviation insurer’ (name withheld for confidentiality reasons) for the 2003 underwriting year.

⁽²⁾ Sigma 1/1996, Swiss Reinsurance Company, Economic Research Department.

⁽³⁾ Adjusted to 2003 \$ using US calendar year GDP inflators.

Airline Gross Premiums ⁽¹⁾

YEAR	ALL-RISK (\$m)	HULL WAR (\$m)	EXCESS TP ⁽²⁾ (\$m)	TOTAL (\$m)
1988	770	100	-	870
1989	480	80	-	560
1990	340	210	-	550
1991	660	160	-	820
1992	900	150	-	1,050
1993	1,320	180	-	1,500
1994	1,740	190	-	1,930
1995	1,950	180	-	2,130
1996	1,750	120	-	1,870
1997	1,400	50	-	1,450
1998	1,010	30	-	1,040
1999	1,020	30	-	1,050
2000	1,340	50	-	1,390
2001 ⁽³⁾	3,770	410	750	4,930
2002	3,340	300	610	4,250
2003	2,740	180	500	3,420

⁽¹⁾ Excludes premiums for hull deductible insurance. Figures are based on market estimates and are the average for the estimates in each year. Therefore, they do not exactly match the figures for ‘airlines’ given in the upper part of the table.

⁽²⁾ TP = Third Party Legal Liability.

⁽³⁾ Estimates for the 2001 airline premium prior to the events of 9/11 were \$1.6 billion for ‘all-risk’ and \$190 million for ‘hull war’, for a total of \$1.85 billion. Therefore, airlines paid an additional \$3.08 billion that year for cover.

Nevertheless, while aviation as a class has one of the smallest premium bases in the insurance industry, it has one of the highest exposures to potential catastrophes. ⁽⁹⁾ Some new Boeing 747s are insured for over \$250 million and many wide-bodied jets will be insured for more than \$100 million each, while for liabilities (passengers and third party liabilities) CSLs ⁽¹⁰⁾ of \$1.5 or \$2 billion will be bought.

One estimate of the total gross premium income received from airlines during the 2003 underwriting year is \$3 billion ⁽¹¹⁾ so there is potential for the single loss of a wide-bodied aircraft to account for perhaps as much as two-thirds of the total annual premium income for this class of insurance. There is, of course, always the very small chance of a collision between two such aircraft. So, how do aviation insurers plan for such possibilities?

In 1996, Lloyd’s introduced a number of Realistic Disaster Scenarios (RDS), which had been developed by their Regulatory Division. Lloyd’s Syndicates have to demonstrate their capability to meet all their commitments, which might arise from these prescribed scenarios, if they are to continue to do business at Lloyd’s. There is currently only one RDS, which specifically addresses aviation risks. This RDS, titled ‘Aviation Collision’ initially ran as follows ‘Assume a collision between 747s of the syndicate’s two highest airline exposures occurring over a major US city; Assume liability loss of US\$1 billion per airline’ ⁽¹²⁾. Amongst other changes, the assumed ‘liability loss’ has, more recently, been increased to a total of \$4 billion ⁽¹³⁾. An actual occurrence of this scenario would produce a loss equivalent to more than 130% of the 2003 gross premium income from all airline business worldwide.

With the exception of 9/11 ⁽¹⁴⁾, where the currently estimated incurred loss falling on aviation policies is some \$4.3 billion, so far there has been no aviation loss which has approached these levels. Nevertheless, in any one year, while there are relatively few total losses and/or fatal accidents, there is always the potential for a ‘catastrophe.’ In the last ten years there have been 31 losses of over \$100 million (see Table 2). On average this amounted to about three per year but, of course, these events have not been evenly distributed. Consequently, with a small premium base and occasional catastrophic losses, the airline insurance market can be very volatile.

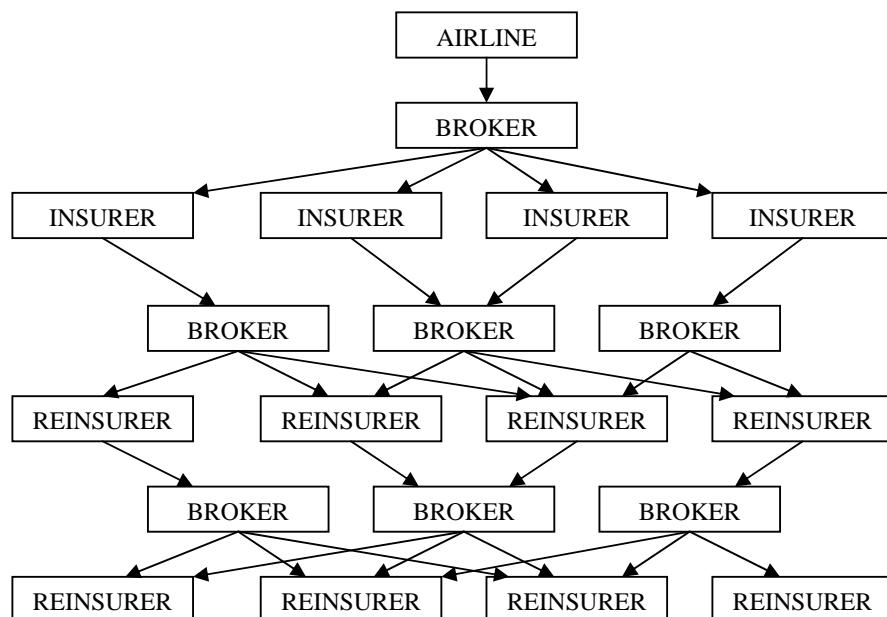
Table 2: Number of Catastrophic Losses between 1994 and 2003 (Loss > \$100 million)

> \$100 million	31
> \$200 million	18
> \$300 million	13
> \$400 million	9
> \$500 million	6

An airline's various 'aviation risks' are normally insured as a whole with one combined policy covering loss or damage to the aircraft in its fleet and its legal liability to passengers and third parties (see Figure 1). No single insurer has the financial resources to retain a risk of the size of a major airline, or even a substantial proportion of such a risk. Except at the 'local' level, which generally only applies in countries with a legal requirement to place insurance with insurers based in that country, and where insurers will retain none or very little of the risk, very many insurers/re-insurers will be participating in the risk at each step. Each step, each link in the chain, is brought together by a broker. ⁽¹⁵⁾

Figure 1: The Insurance 'Chain' for Airline Risk

**Airline → (local broker → local insurer → local re-insurer) → broker → insurer
→ broker → re-insurer → broker → retrocessionaire**



The risk will be insured by a number of co-insurers each of whom enters into a separate contract of insurance with the insured. One of the co-insurers will act as the 'leader' for the risk and will negotiate the terms and conditions for the cover provided. This lead insurer will typically also be responsible for handling any claims that may arise. The other insurers, known as the 'following market', will normally conform to these conditions, as it would be impractical to have different ones for each participant.

Once the leader has signed the slip ⁽¹⁶⁾, the broker will approach other underwriters at Lloyd's or insurance companies in London and elsewhere and invite them to take a part of the risk. Each underwriter (insurer) will then take a line (a percentage) of the risk. The insurance cover will be completed once underwriters accepting 100% of the risk have signed the slip.

Three of the largest aviation insurers, Global Aerospace, USAIG and La Reunion Aérienne, are pools, each writing business on behalf of five or six different insurance companies. A smaller insurer, Aviabel, writes business on behalf of ten insurers.

For an 'international airline risk' (i.e. non-US), the London Market dominates, with nearly 60% of the 'competitive' capacity and over 50% of the total capacity. The London capacity is split, roughly equally, between insurance companies and Lloyd's Syndicates. A long way behind London is Paris with an estimated 10% of the world's competitive capacity and 12% of the total capacity for international business.

The insurance cover for most non-US airlines is led off in London, either directly or as facultative re-insurance of a local insurer. The London insurers leading the airline business include such companies as Global, AIG and Allianz and Lloyd's Syndicates, ACE, Amlin and Wellington. In Paris, La Reunion Aérienne leads an increasing number of international airlines.

The US market dominates the insurance of US-based airlines. London and, indeed other international markets, may take a share of a US airline risk but they are nearly all lead off by US-based insurance operations, which will also take a significant percentage of the risk. Major US aviation insurance operations are USAIG, Global (Short Hills) and AIG (Atlanta).⁽¹⁷⁾

Currently, US-based aviation insurers generally do not write non-US airline business, although there is a notable exception in Houston Casualty Company, which will write 'difficult' risks in Africa, South America, the Commonwealth of Independent States (CIS) and elsewhere. There is a saying in the insurance market that 'there is no such thing as a bad risk only a bad rate,' i.e. everything is insurable for the right price. However, the price may be high – 20% for some African risks and, although not 'aviation', 30% for some space risks. Major airlines in Europe generally will be paying less than 1% and probably closer to 0.1%. One major UK airline is believed to have a rate of 0.088% for its hull cover and \$0.256 per 1,000 Revenue Passenger Kilometres (RPKs) for liability.

Currently, there are probably not more than about 50 insurers writing airline business worldwide and this number includes some who will only write risks based in certain countries (see comment above about certain US insurers) or are 'niche players.'

Re-insurance

Aviation and, in particular, airline insurance, because of the small number of risks, can not provide insurers with a balanced portfolio⁽¹⁸⁾ and therefore direct insurers rely on re-insurance to help smooth out the effects of random fluctuations in losses and reduce the impact of catastrophic losses.

The direct insurers on a risk will seek to limit their exposure to any loss by purchasing re-insurance. Re-insurance can be divided into two areas, proportional, which includes quota share and surplus, and non-proportional, which includes excess loss ('XL') and stop loss.

Proportional Re-insurance

Proportional re-insurance, which can be either facultative or treaty ⁽¹⁹⁾, is where the reinsured agrees to cede a certain fixed share or percentage of a risk to the re-insurers. Thus, the premiums and losses resulting from the original insurance/s are shared proportionally between the cedent (insured) and the re-insurer in accordance with the percentage – or ‘proportion’ – set out in the re-insurance contract ⁽²⁰⁾. Proportional re-insurance is, generally, in the form of either quota share re-insurance or surplus.

In quota share re-insurance, the re-insurer undertakes to re-insure an agreed percentage of all business of a specified kind written by the re-insured ⁽²¹⁾.

Surplus re-insurance is similar to quota share except that it is based on a monetary amount with the insured ceding any amount above their agreed retention subject to a minimum upper limit ⁽²²⁾. Surplus re-insurance is usually re-insured with more than one re-insurer with the proportion of the surplus accepted by the re-insurer being known as a ‘line’. A surplus treaty can be made up of many lines ⁽²³⁾.

However, it is believed that proportional re-insurance is less likely to be used by major insurers and should, perhaps, be seen as a mechanism by which an insurer with a relatively small capacity can boost their presence in a particular class of business.

The re-insurance manager of a large aviation insurer in London has confirmed that they are currently not using any proportional re-insurance, either quota share or surplus, as part of their re-insurance program. ‘(With this) you end up giving away good premium. (These) are only used by insurers who would otherwise not be able to take a large line. Brokers would (otherwise) only bother coming to them with rubbish risks where they were scraping the bottom looking for everyone to complete the risk. The good risks could be completed by just going to the big boys and the tiddlers would never be shown them’.

Non-Proportional Re-Insurance

In non-proportional re-insurance, the re-insurer insures a layer of the risk written by the re-insured or a portion thereof. The term ‘non-proportional’ refers to the fact that the premium paid to the re-insurer is not in the same proportion as the risk assumed by him. ⁽²⁴⁾

One form of non-proportional re-insurance is excess of loss (XL). Under an XL treaty the re-insurer is only liable to pay losses over a defined amount and up to a further defined limit. Any losses falling below the lower limit therefore remain with the re-insured. XL will normally be placed in layers providing cover at different levels of loss, and, again, many re-insurers may participate.

XL programs can be divided into ‘working’ and ‘catastrophe’ covers ⁽²⁵⁾. However, following 9/11, ‘working’ covers are no longer available and XL generally does not come into play until much, much higher levels of loss – catastrophes.

Prior to 9/11, cover could be bought down to \$20 or \$30 million of original loss or even lower. ‘After 9/11 all this market was killed off. You cannot get XL for levels much less than \$300 or \$400 million of original loss now. (One major re-insurer (name omitted for confidentiality)) will not provide XL below \$600 or \$700 million of original loss’ ⁽²⁶⁾.

As noted previously, XL cover is structured in layers. The width of these layers can vary from approximately \$10 million upwards. A narrow layer of \$19 million might be written 100% by a single re-insurer while a wider layer, say of \$30 or \$40 million, might be written by several re-insurers together. In any XL cover, a re-insurer may participate, to a certain extent, in each layer.

After a loss that impinges on a layer of XL cover has occurred the cover has to be reinstated in case another such loss happens. These reinstatements can either be bought up front, at the start of the re-insurance program, or following the loss which exhausted the cover. At high levels of XL cover the re-insured might pre-buy only one or perhaps two reinstatements – large catastrophes are fortunately rare.

Following the events of 9/11, where the two aircraft, which hit the World Trade Centre, can be assumed to have used up the probable one re-instatement at this catastrophic level of loss, insurers would need to have brought further reinstatements or gone bare, exposed to further catastrophes. After 9/11 reinstatements are still available but their cost has increased.

Stop Loss (SL) re-insurance, which has been described as a ‘somewhat rare form of re-insurance’ is designed to provide direct insurers with comprehensive protection against fluctuations in their annual loss experience. Under this form of cover the re-insured provides cover for any part of the total annual loss burden that exceeds the agreed deductible. This deductible is defined as either a percentage of the annual premium income or a fixed sum. The cover can be triggered if the deductible is exceeded by either one large loss or an accumulation of smaller losses.

Stop Loss insurance is not intended to relieve the direct insurer of all ‘entrepreneurial risk’. The re-insurer will normally require the re-insured to incur a technical loss (i.e. losses + costs > premiums) before the cover pays.

Re-insurers are said to have reservations about providing stop loss insurance, which is the reason it is not more widely used⁽²⁷⁾.

Re-insurance of Re-insurers

Re-insurers will themselves have insurance, sometimes referred to loosely as ‘retrocession’, although this term tends to have a more limited but specific meaning. The re-insurance programs of re-insurers can be quite varied depending on their perception of the risk and the structure of their ‘book of business’ but all can be expected to have some form of CAT (catastrophe) protection in place. However, at these levels, this protection is normally no longer class specific. The CAT protection will be covering the re-insurer’s whole book, not just their exposure to aviation risk.

Apart from ‘traditional’ forms of insurance, some of the risk may also be transferred directly to non-insurance entities through the use of ART (Alternative Risk Transfer) and CAT bonds. Broadly, these are financial instruments which investors may choose to include in their investment portfolio as a hedge against a downturn in the financial markets. (‘insurance risk’ was not thought to be linked to the risk of investing in the stock market but 9/11 has shown that, if the insurance loss is big enough, it can also

impact the financial markets.) However, although used, they are probably not that significant for the insurance market.

As the risk moves through the insurance chain, from (direct) insurers to re-insurers to retrocessionaires, the insurers involved at each point will be to a lesser and lesser extent ‘aviation insurers.’ However, there are always exceptions and two of the largest re-insurers, Munich Re and Swiss Re, are both understood to have separate facilities which allow them to write a certain amount of direct aviation business. Munich Re also provides part of the capacity used by Global. Some insurance entities which are perhaps best known as retrocessionaires may occasionally also write direct aviation business but this is believed to be rare.

The Cover

Although, following an airline accident, there may be a number of different covers (insurance policies) which will ultimately respond⁽²⁸⁾, in the context of this summary we will limit our review to the covers bought by airlines, specifically hull insurance, which provides cover against loss of or damage to the aircraft itself, and passenger and third party liability insurance⁽²⁹⁾. Cover for the airline’s liability will normally be arranged alongside the hull cover in a single policy with the same insurers insuring both the hull and liability risk⁽³⁰⁾.

Hull cover is affected on a so-called ‘all risk’ rather than a ‘named peril’ basis with, broadly, the policy responding to loss or damage to the aircraft as the result of any accident (a fortuitous event). Similarly, passenger/third party liability insurance will provide cover for all sums (up to the policy limit) the airline is legally liable to pay as damages arising from bodily injury (or death) or property damage to passengers or third parties caused by an occurrence and arising out of or in connection with the insured’s operations⁽³¹⁾. An occurrence is frequently defined in airline policies as ‘an accident’, which results in bodily injury. There has been considerable case law over the exact definition of ‘an accident’ and ‘bodily injury’ but it will suffice to take these words at face value.

‘War’ Exclusion

As stated above, there are no restrictions on what circumstances leading to an accident are covered – an accident need only occur. However, specific exclusion clauses are always added to aviation policies, which introduce limits to what circumstances or events they will actually respond to.

The most important of these, in the context of this review, is AVN48B⁽³²⁾, the War, Hi-Jacking and other Perils Exclusion Clause (Aviation), which should be included in every aviation policy. Very briefly, the clause states that the insurance policy does not cover claims caused by deliberate acts of violence, hi-jacking, seizure, etc.

In respect of the aircraft’s hull, part of the cover excluded by AVN48B may be regained – written back into the policy – by the incorporation of clause AVN51 Extended Coverage Endorsement (Aircraft Hulls). However, this clause is normally only used for general aviation and is never likely to be included in an airline policy. Although AVN51 does reinstate cover for damage resulting from hi-jacking or any unlawful seizure of the aircraft, it does not reinstate cover for all of the ‘war risk’

perils excluded under AVN48 and therefore does not provide airlines with the cover they need.

Cover for full 'war risks' needed by airlines can be affected under the aviation hull 'War and Allied Perils' policy (LSW555B) written in the London War market, i.e. generally by a different set of insurers. LSW555B provides cover for loss of or damage to the aircraft '...against claims excluded from the Assured's Hull 'All Risks' policy...' by AVN48B except for 'any hostile detonation of any weapon of war employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.' LSW555B also excludes losses, damages or expenses resulting from war amongst the Great Powers – United Kingdom, United States of America, France, the Russian Federation and the People's Republic of China – unless the aircraft is in the air at the outbreak of war, in which case they are covered until they have completed their first landing.

Hull 'war risk' policies usually have a fleet aggregate limit. Currently, for large international airlines, this limit lies in the vicinity of \$600 million to \$1 billion. This is equivalent to the total loss of approximately ten wide-bodied aircraft but would not cover the whole or a significant part of a large airline's fleet if it were to be caught on the ground in one place e.g. the Iraqi invasion of Kuwait. For such cases, excess aggregate war risk cover may be available. It is also understood that some war policies may provide for reinstatement at an agreed further premium but, in this case, this will not increase the policy limit for any one loss.

While 'war risk' cover for aircraft hulls may be purchased in the war market, this market will not insure liabilities. Cover for an airline's legal liability to passengers and third parties has to be obtained by 'writing it back' into the all-risk policy by incorporating Clause AVN52 'Extended Coverage Endorsement (Aviation Liabilities),' in consideration of an Additional Premium (AP). However, prior to 9/11, this liability write-back was 'given away' by all-risk insurers. Having excluded this cover by including Clause AVN48B in the policy, they then re-instated the cover in respect of liabilities free of charge or cheaply by including AVN52.

Insurers attribute the previous 'giving away' of AVN52 cover to the past 'weak' aviation market. The AP for AVN52 was typically charged at around 25% of the premium. This then 'dwindled down' to 10% and, in many cases, disappeared. It is thought that, as AVN52 was always included, the amounts originally shown as a specific AP became just an 'allocation of part of the premium'. Then, in the periodical weak market conditions that aviation (airline) insurance goes through, any allowance for AVN52 dwindled away to nothing and was lost.

Prior to 9/11, AVN52 (AVN52C) reinstated ('wrote-back') the full CSL stipulated in the policy for both passengers and third parties. But, following this catastrophic loss, the coverage afforded by this 'write-back' was limited going forward. Although it continued to re-instate the full 'all-risk' limits in respect of the aircraft's passengers, initially it was limited to just \$50 million with respect to third parties. This limit has more recently been increased to \$150 million or in some cases \$250 million but is still generally far below the coverage that airlines need (see further discussion following the section 'Changes After 9/11' below).

In summary, an airline's fleet and its legal liability to passengers and third parties in the event of an accident is covered by a combined hull and liability policy for 'all risks.' However, any loss as the result of deliberate acts of violence is excluded by the standard inclusion of Clause AVN48B. In the case of a loss resulting from an act of violence, cover for the aircraft is provided by a 'war-risk' policy (LSW555B), while liability cover for the passengers and third parties is written back into the 'all-risk' policy by the standard inclusion of Clause AVN52.

Policies of Indemnity

Both an airline's hull and liability 'all-risk' policy and its hull 'war-risk' policy are policies of indemnity, i.e., subject to any limits set out in the policies. If the claim is valid, insurers will indemnify the insured for the loss so that it is as if the loss had not occurred.

Being policies of indemnity, insurers and indeed re-insurers have the right of subrogation – 'once the insurers have indemnified the insured under the policy they step into his shoes in relation to any rights of recovery which may be available to the insured against third parties'.⁽³³⁾

Changes After 9/11

The events of 9/11 were catastrophic and, although the expected loss falling on aviation policies amounted to *only* around \$4 billion, which was less than 10% of the estimated total insured loss, in comparison with the premium generated by this class of business, it was by far the worst impacted by the event.

9/11, in which airliners were, in effect, used as weapons, resulting in a huge loss of life, also changed the industry's views on this type of risk. Aviation insurers began to realize that the impact of some forms of terrorism was unquantifiable and therefore uninsurable while their capital providers realized that the magnitude of the potential exposure they had in aviation was out of proportion to the small premium income that it generated. Capital providers ceased to see aviation simply as a small 'residual' market they could move surplus money into and out of depending upon the attractiveness of the returns in their main property/casualty business and were suddenly confronted with the realisation that aviation could hurt them.

While the events of 9/11 were shocking in the true sense of the word and it was recognized, even in the first hours, as the largest loss ever sustained by the insurance industry, there seems to have been little or no concern amongst insurers that they would not be able to meet the financial demands arising from the event.

However, the impact on the aviation insurance market was such that insurers had to act quickly to protect their business going forward and 're-inflate' the market. Insurers quickly took action to limit their exposure to this type of event in the future and to generate large amounts of additional income through the introduction of 'surcharges.' Other reactions included, for example:

- Immediately all outstanding quotes were withdrawn,
- Effective 23:59 GMT on September 17, 2001, insurers gave notice of cancellation of AVN52C,

- On October 1, 2001, special surcharges for passenger and cargo airlines and hull war cover were introduced, and
- Drafting of a new AVN48 began.

The aviation insurance market's first act after the attacks was to withdraw all outstanding airline all-risk and hull war quotes, which had not been accepted. Underwriters needed time to assess their position; this was of 'paramount importance'.⁽³⁴⁾

In the first week, meetings were held in London between representatives of the Lloyd's aviation syndicates and the insurance companies to review the cover and terms of AVN52C. According to Willis, '(they were) determined to be in a position to be able to maintain coverage for the world's airline communities, albeit on a more restricted basis.' As a result of these meetings it was decided to give notice of cancellation of the coverage afforded by AVN52C to all aviation risks, as this was the only way that insurers could give notice of a review of its coverage. Letters were sent to all insureds giving them the required seven days notice of cancellation with effect from 23:59 GMT of the date of the letter. The notice given to US domiciled insureds was extended by an additional 48 hours to allow it to be made by recorded delivery.

AVN52C was subsequently replaced by AVN52D (also, in due course, by AVN52E for non-airline risks). AVN52D was almost identical to AVN52C except, most importantly, it introduced a much lower 'sub-limit' as far as cover for an airline's legal liability to third parties was concerned – \$50 million – for any one occurrence and in the aggregate.

On October 1, 2001, special surcharges were introduced to 're-flate' (*sic*) the market. These included:

- A \$1.25 charge per passenger for each departure applicable to any airline operating any one aircraft with a seating capacity in excess of 15 passenger seats,
- A 10% surcharge on the composite hull and liability all-risks premium paid by cargo airlines, and
- For hull war, a one-year special charge of 0.05% based on the declared Average Fleet Values at risk for all airlines. This was payable pro rata up to the expiry of the then existing policies and then going forward on renewal pro rata until October 1, 2002.

The most significant of these measures was the reduction of AVN52 cover for third parties to \$50 million. This would have grounded the world's airlines since they operate subject to various contractual agreements, requirements and conditions of use, which normally stipulate considerably higher levels of cover. Fortunately, the world's governments stepped in and provided either forms of 'government sponsored insurance' or gave indemnities to allow the airlines to continue operating.

Initially, no commercial insurance cover for third party legal liabilities (TPLL) above \$50 million was available but, in due course, a number of insurers began to provide separate policies with higher limits – terms and limits differed but, generally, up to \$1

billion (i.e. \$950 million in excess of \$50 million) plus, 'where appropriate' a second layer up to \$2 billion (\$1 billion in excess of \$1 billion).

Five companies – AIG, Allianz, Axis, Berkshire Hathaway and GE Frankona – with subscribing markets following – The 'excess third party liability market', provided this excess TPLL cover.

Prior to 9/11, market estimates for the 2001 premium income for the airline business was \$1.66 billion for all-risk and \$190 million for hull war, for a total of \$1.85 billion. It is estimated that, after 9/11, the surcharges and excess TPLL cover cost the airlines an additional \$3.08 billion in the year for a total cost of \$4.93 billion – more than two and a half times what had earlier been expected.

In the three years since 2001, some changes have taken place. The \$1.25 per passenger and hull war 0.05% surcharges were 'easing by the third quarter of 2002 with a trend to blend both into the base rates... in real terms the \$1.25 reduced to \$1.00 in most cases (and less in some) and hull war was down to 0.0375%.'⁽³⁵⁾ Reductions have continued since then. Meanwhile, the commercial TPLL market was said to be 'softening their quotes'⁽³⁶⁾ and the third party liability limit in AVN52 has begun to edge up. In August 2004, Monarch Airlines' cover was renewed with an increased primary AVN52 limit of \$250 million. Willis places this risk but notes that 'there was and still is much discussion as to whether this limit will become the norm for future renewals.'⁽³⁷⁾

Underwriters have also spent time reviewing AVN48B and have produced a draft for a new version, which, once agreed, will become AVN48C and will replace the earlier exclusion clause in all aviation all-risk policies. As currently envisaged, the main difference between the clauses is the inclusion of 'new perils' including the hostile use of radioactive contamination or matter, electromagnetic pulse or chemical or biological materials for political or terrorist purposes, and the expansion of the definition of 'hi-jacking' to bring it into line with the wording of the 1970 Hague Convention for the Suppression of Unlawful Seizure of Aircraft.⁽³⁸⁾

It is thought likely that insurers will make further changes in policy wordings as the possible implications of 'modern' terrorism are more fully thought through – there is certainly a very strong belief that commercial concerns, insurers and their customers, should not bear the cost of what could be described as 'State' risks and that governments should take over responsibility for indemnifying victims of terrorist attacks. This already happens in certain circumstances in certain countries.

It is also possible that 'novel' attempts at solutions to counter acts of terrorism against civil aviation targets may require changes in policy wordings.

Underwriting

'The critical issue (for the Aviation Insurance Market) is to find a sustainable level of premium that is both justifiable to buyers and also sufficient to attract and retain the high quality capital providers necessary to cater for ever increasing risk exposures.'⁽³⁹⁾

There are, of course, many factors which can affect the price that an airline pays for insurance. Unfortunately, with the possible exception of its own loss experience, an airline probably has little chance of influencing many, or possibly, any of the most significant of these. There are a number of factors which are completely outside the airline's control but which can have a major impact on the cost of insurance. Factors that can impact insurance rates include:

1) Money and Insurance market factors

- The availability of capital (capacity),
- Interest rates and available rates of return on investments,
- The availability and price of re-insurance, and
- Competition within the insurance market.

2) Factors applicable to the class as a whole

- The claims experience for the class as a whole,
- The size of the risk exposure (e.g. fleet value and number of passengers carried),
- Type of aircraft operated and their age, and
- Country/region of the world where the risk is domiciled.

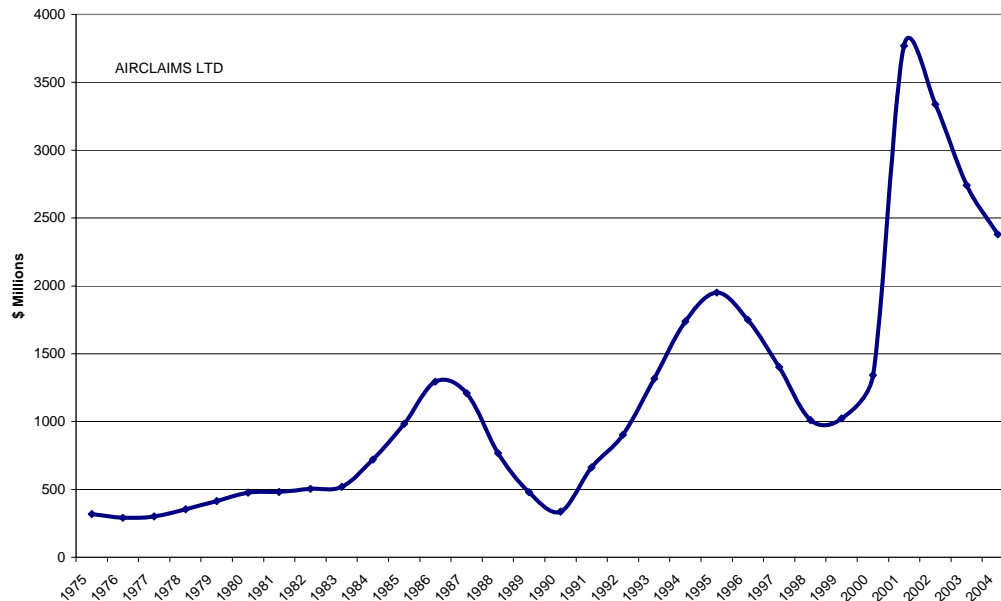
3) Factors specific to the risk itself

- Specific claims experience,
- Specific exposure profile, and
- 'Technical factors' such as crew training, maintenance, equipment, safety culture and financial health.

It should be noted that the 'technical factors' for the risk are listed last. This is because, in most cases, they probably have least impact on the airline's insurance rate. Nevertheless, underwriting probably owes more to art than science and the final rate charged depends upon the underwriter's judgement in respect of a number of 'soft' factors.

It is probable that, all else being equal, the 'money and insurance market' factors have had the largest impact on the cost of insurance over time. As can be seen from Figure 1, the aviation insurance market goes through very marked hard/soft cycles and, although the start of the move from a hard market to a soft market or vice versa may be triggered by a period of exceptionally good or bad claims experience, the reaction of the markets to this experience will exacerbate any tendency to move from one market state to another. Because aviation is such a small class of insurance, money flows, into or out of the class, which may represent only a relatively small percentage of the capital employed in, say, property/casualty insurance, can have a very marked impact in aviation, resulting in a high degree of volatility.

Figure 1: Estimated Airline Premium (All Risk & AVN52), Excluding Excess Third Party (Source: Airclaims Ltd.)



The aviation insurance cycle between hard and soft markets also modifies the degree to which underwriters may be able to reflect other factors in the price they charge for insurance. The cycle also affects the different competition strategies used in the market and this in turn further modifies or limits how underwriters do or can reflect other factors in their pricing of the risk. In a ‘hard’ market there will be less competition and therefore less need for underwriters to consider reducing their rates to win or retain business. However, in a ‘soft’ market, competition can be fierce and underwriters may feel compelled to reduce their rates to avoid being undercut. The insurance market is, after all, a market that is subject to all the usual market forces.

Whatever rate an underwriter has calculated for a risk ‘there is one other very important matter to consider. Will any other underwriter offer a lower rate, and if so is the business of such a quality that we do not wish to lose it? In other words, if there is competition, will we reduce our rates or do we feel that, regretfully, we will have to lose the business? Many underwriters will lower their rate if they believe that, despite what their limited statistics tell them, the risk in question is much better than other, similar ones. Often their intuition may be correct but in many other instances they can go very wrong.’⁽⁴⁰⁾

Brokers have and will use this competition to structure the cheapest insurance deal they can get for their clients. Depending upon market conditions, competition will tend to keep down the rate offered by the leader. But there is no need for the followers, the other underwriters on the cover, to use the same rate. Brokers will seek to complete the cover picking the lowest rates available in the market from other, acceptable, insurers. This is known as ‘verticalisation.’

Since 9/11 the market has been ‘hard’. The availability of re-insurance has reduced, so that direct underwriters are retaining more of the risk, and the re-insurance that is

available is more expensive. On top of this, capital providers, who may previously have seen aviation as a small unimportant class of business into which they could move surplus money, now realize that the class can produce huge losses. They are now treating aviation far more seriously and, if the capital used in aviation does not generate adequate returns, they will put it elsewhere. Since 9/11, a number of aviation insurers have withdrawn from the class because their capital providers did not believe that it could give them the returns they wanted. In these conditions, aviation underwriters' competition strategies are very limited.

Apart from its effect on the market cycle, trends in the overall claims experience for the class will also impact the price individual airlines have to pay for insurance. Underwriters will determine the total amount of premium needed to meet average expected claims levels and then add an allowance for future catastrophes, commissions and expenses, and profit (return on capital employed). This total then needs to be shared between the different risks. Depending upon other factors, insurers will differentiate between risks, but, if, for instance, the recent claims experience has been bad, everyone will pay more than they would have otherwise done.

As noted above, other generic factors, which may be significant, include the size of the airline, as measured by the number of aircraft operated, the number of passengers carried, the country or, more generally, the region in which is the airline domiciled and the class of aircraft operated. The past loss experience, 'burning rate' or loss rate, will be calculated for each of these generic groups and then used as part of the input when calculating the rate to be paid by the airline. Note that this is independent of the airline's own experience.

These generic groups are quite broad. Airlines may be divided between, say, four or five size groups – smaller airlines, as a group, historically have had a worse experience than larger ones. Similarly, the world may be divided into five or six regions – airlines domiciled in Latin America or, in particular, Africa, again, as a group, have historically had a worse experience than airlines from, say, Europe. And turboprop airliners, so-called 'eastern-built' aircraft and old, first or second generation 'western-built' jets, again, as a group, have tended to have a worse record than newer 'western-built' jet airliners.

Airline size, as measured by its fleet value and either annual number of passengers carried or RPKs, will also affect the price paid for insurance, in that the rate charged does not increase linearly with the exposure. All else being equal, an airline with a higher fleet value and/or more passenger traffic will be given a lower insurance rate. For instance, in the Marsh August/September 2004 aviation newsletter it was noted that 'the average hull rate reduction for September currently stands at minus 18% (but) this is indicative of the substantial growth in exposure not a weakening in the market.'

Aircraft age can also have a 'technical' impact on the hull insurance rate since older aircraft are normally worth less than new ones but any repairs will cost much the same. Therefore, for the same damage, the cost of repairs for an older aircraft will represent a larger percentage of its 'agreed' (i.e. insurance) value than for a newer aircraft. Underwriters may choose to factor this in when working out the hull rate. This is traditionally done using the so-called '70/30 formula' to increase the rate for

the older aircraft (although known as the '70/30 formula, the actual ratio can be anything depending upon the insurer's own experience, based on his underwriting statistics).

Turning now to factors, which are specific to the risk being insured, perhaps the most significant is the airline's loss ratio for 'attritional losses', excluding any major losses unless there has been more than one in the period under review. This is then factored into the calculation of the final rate. It would seem that, except for this loss experience, underwriters make the assumption that a risk will perform no better and no worse than its broad peer group.

Although major losses may be excluded in this calculation because they 'distort the figures', underwriters certainly will take any major losses into account when setting the rate. As common wisdom in the insurance industry goes: 'If you've had a big loss you're not going to get a reduction.' However, although the rate may increase in the year following a 'disaster' and remain higher in the following years, underwriters will not be seeking to recover the full amount paid out through increasing the premium. After all, what would be the point of buying insurance if that was the case?

The next consideration, which, although specific to the individual risk, is still generic in nature, is an airline's exposure profile (as opposed to risk profile), particularly in respect of its exposure to the different legal liability regimes. For instance, an airline which carries a relatively higher percentage of US citizens, will tend to be charged more since compensating for the death or injury of a US citizen will cost more than for some other nationalities.

Lastly, as far as 'technical factors' are concerned, it would seem that once underwriters have differentiated between the different risks using such generic short cuts as size, domicile, etc., there is an expectation that all airlines in a specific grouping are essentially the same.

Nevertheless, it is felt that underwriters must still differentiate to some extent between different risks within a 'peer group' and the airline, which better addresses safety, will have this taken into account during rate negotiations. But it is not possible to quantify what effect any particular safety initiative may have on the cost of insurance other than to say that it is probably minimal.

An airline, which fits a new device or introduces a new procedure, which is intended to reduce a particular risk, may, indeed, reduce this risk but it is probably not eliminated entirely, and, as new risks may be introduced, it is still only part of the total risk run by the airline. One underwriter commented that 'all these goodies will not affect the rate but the proof of the pudding is in the eating – if these improve safety then it will be reflected in their loss experience.'

Although it would seem that small, incremental improvements in safety may not actually be directly reflected in the insurance rate charged, this does not mean that the opposite is also true and it is likely that it is not. Within a given 'peer group' underwriters expect all the airlines to have the same general safety culture – 'they've all got those (EGPWS, TCAS, etc.) now' – and might seek to charge a slightly higher

rate if an airline stood out from its peers through not meeting the expected standard of safety.

These comments probably hold true for ‘normal’ situations. Underwriters are certainly more inclined to significantly penalize (or reward) airlines in more hazardous times. Following the recent destruction of two Russian aircraft, apparently as the result of two suicide bombers boarding the aircraft at Domodedovo Airport, Moscow, it is understood that underwriters now consider Russian airlines, operating from airports in CIS countries, are at much greater risk and are said to be considering increasing the AP (Additional Premium) charged for AVN52, writing back legal liability cover initially excluded by AVN48B. This particular sub-set of airlines would be penalized for the apparently perceived lack of security at CIS airports. However, if any of these airlines were able to demonstrate to underwriters that their security was good, then they would not be charged the higher AP – in effect they would be rewarded for having better security.

Conclusion

In this study we gave an overview of how the airline insurance industry works. We examined how the risk is spread between insurers, how insurers treat deliberate acts of violence and, lastly, how insurers price the risk. The main finding of our study was the fact that the way the aviation insurance market is structured reveals highly sophisticated risk management practices. To minimize their risk exposure, large potential liabilities are shared by means of a complicated system among several insurers. Furthermore, we found that the insurance market has adjusted to the post 9-11 aviation insurance realities being reasonably ready to handle events of an even more catastrophic magnitude.

References

- Burrows, R. A. P. (1992). *Aviation Insurance, Study Course P60*. The Chartered Insurance Institute, Distance Learning Division, Sevenoaks, Kent, UK.
- Chance, D., and S. Ferris, (1987). "The Effect of Aviation Disasters on the Air Transport Industry: A Financial Market Perspective". *Journal of Transport Economics and Policy* 21, 151-165.
- CII Study Course 780*. Chartered Insurance Institute, Sevenoaks, Kent, UK.
- Davidson, W., P. Chandy, and M. Cross, (1987). "Large Losses, Risk Management and Stock Returns in the Airline Industry". *Journal of Risk and Insurance* 54, 162-172.
- Margo, R. D. (2000). *Aviation Insurance, 3rd Edition*. Butterworths, a division of Reed Elsevier (UK) Ltd., London, UK.
- Sigma 1/1996 Swiss Re. A Report Series Published by Swiss Reinsurance Company – Economic Research Department, Zurich, Switzerland.
- Swiss Re (2002) *An Introduction to Reinsurance, 7th Edition*. Swiss Reinsurance Company, Zurich, Switzerland.
- Viccars, P. J. (2001). *Aviation Insurance – A PlaneMan's Guide*, 1st Edition. Witherby & Co. Ltd, London, UK.
- Walker, T., D. Thiengtham, and Y. Lin, (2005). "On the Performance of Airlines and Airplane Manufacturers Following Aviation Disasters". *Canadian Journal of Administrative Sciences* 22, 21-34.

Endnotes

- (1) The term 'Aviation Insurance Market' is used to refer to a group of insurers operating in a particular branch or class of insurance.
- (2) Viccars (2001), Page xiii.
- (3) Bannister (1996), Page 18.
- (4) The word risk is used in this context to mean something which is insured, e.g. an airline fleet. This is common usage in the insurance market but, of course, it can lead to confusion with the more conventional use of the word.
- (5) Jet Operator Statistics (2004), Issue One. Airclaims Ltd.
- (6) Turbine Airliner Fleet Survey (Spring 2004). Airclaims Ltd.
- (7) La Reunion Aerienne (2002), Page 1.
- (8) See Viccars (2001) who notes that 'It was said that the annual premiums for the (aviation) class were less than the annual plate glass insurance premium for the State of New York'.
- (9) Viccars (2001), Page xvi.
- (10) CSL: Combined Single Limit (see also endnote 32).
- (11) See Table 1. This figure comprises all risk premiums including the AVN52 per passenger surcharge, where still charged as such, but excludes premiums for hull war and excess third party covers.
- (12) Lloyd's of London, Regulatory Bulletin Annex 1 (February 1997).
- (13) Lloyd's Realistic Disaster Scenarios (April 2004).
- (14) The hijacking of four aircraft and their subsequent deliberate crashing into the World Trade Center and the Pentagon, as well as the crash in rural Pennsylvania on September 11, 2001, is in short often referred to as '9/11'.
- (15) The insurance broker is the intermediary who acts as the agent of the insured or policyholder and is frequently remunerated by way of a commission deducted from the premium. See Viccars (2001), Page 117.
- (16) A 'Slip' is a document, prepared by a broker, which sets out, in abbreviated form, a proposal to an underwriter (insurer) for insurance. See Margo (2000), Page 6.11.
- (17) Global is based in London but mainly writes US airline risks through its US operation while AIG, which is a US insurer writes international, i.e. non-US business in London and only US business in the USA.
- (18) The basis of insurance is the 'law of large numbers', first described around 1700 by Jakob Bernoulli. For any individual risk it is impossible to predict the exact moment when fate will strike or the extent of the loss that will be incurred. But if insurers are covering very many similar risks then statistical methods may be used to predict future trends. The fate of any individual risk is still not known but it is known how many losses of a certain type may occur over a given time in a large population of risks. A large motor insurer providing cover for several hundred thousand cars would be considered to have a 'balanced portfolio'. 'Examples of portfolios with extremely poor balance are, above all, nuclear power and aviation ... here, a huge exposure arises from a relatively small number of objects insured ...'. Swiss Re (2002).
- (19) Facultative reinsurance is where a *risk* is reinsured individually, separate from any others. Treaty reinsurance is where a number of *risks*, perhaps an insurer's whole book of aviation business, is reinsured as a whole without the re-insurer necessarily knowing which specific *risks* are being covered. See Viccars (2001).
- (20) Margo (2000), Page 27.07
- (21) Margo (2000), Page 27.44 'For example, the direct underwriter may wish to write a maximum line for themselves of 3% on airline business. If they were to affect a quota-share treaty re-insurance for 40% of the line, that would enable them to write a maximum lien of 5% of which 2% (40% of 5%) would be ceded to the quota share treaty, and the remaining 3% would be retained by the direct underwriter. Chartered Institute of Insurance (CII) Study Course 780, Page F2.

- (22) Chartered Institute of Insurance (CII) Study Course 780, Page F2.
- (23) Burrows (1992), Page E.
- (24) Margo (2000), Page 27.08.
- (25) Margo (2000), Page 27.60. ‘*Working* covers are intended to provide cover in respect of the ordinary day to day losses which might arise and may, therefore, be used as a substitute for proportional re-insurance. *Catastrophe* covers are intended to protect the re-insured against exceptional losses.’
- (26) Comments by the re-insurance manager of a major London aviation insurer.
- (27) Swiss Re (2002), Page 28.
- (28) Other covers, which may ultimately respond, particularly in any accident involving death or serious injury, are liability covers for products manufacturers (e.g. aircraft manufacturers, subcontractors etc.) and service providers (e.g. air traffic management providers or air traffic control).
- (29) Although, in some instances, an airline liability policy may contain separate clauses providing cover for passengers and third parties, it is now generally the case that a single comprehensive clause will include both. The majority of airline liability covers are placed on a Combined Single Limit (CSL) basis providing one limit for all passenger and third party liability claims arising out of an accident. Typically, for an airline operating wide-bodied aircraft, this will be \$1.5 or \$2 billion.
- (30) Viccars (2001), Page 22.
- (31) Margo (2000), Page 12.01.
- (32) The current version of this clause is AVN48B. These are aviation insurance standard clauses originally defined in London by the Lloyd’s Aviation Underwriters Association (LAUA) in association with its ‘company market’ counterpart, Aviation Insurance Officers Association (AIOA). This activity is now carried out by a market working party (still in London), the Aviation Insurance Clauses Group (AICG, see http://www.aicg.co.uk/aicg_public/default.asp). At the time of writing, the AICG was working on an updated version of AVN48B, AVN48C.
- (33) Margo (2000), Page 23.61.
- (34) Willis Global Aviation Bulletin, No. 48, (September 19, 2001).
- (35) The Heath Lambert Report on Airline Insurance, Issue 13, (October 2002).
- (36) Ibid.
- (37) Willis Global Aviation Bulletin, No. 99, (August 10, 2004).
- (38) Lloyds Aviation Underwriters Association (LAUA) Letter (May 2004).
- (39) Andre Clerc, Willis – Aviation Law Association of Australia and New Zealand, 23rd Annual Conference, Sydney 2004.
- (40) Burrows (1992), Page 60.