

2008 saw a return to profitability for space insurers with premium income of approximately US\$750 million significantly exceeding paid and incurred claims to date of just over US\$350 million. Loss activity in early 2008, and in the wake of December 2007's claims, served to briefly arrest the orderly decline of premium rates in the last five years although the absence of any significant claims activity in the second half of 2008 has seen a continuance of the space sector's recent trend of increased capacity, 'sustainable' losses, and reduced premium rates.

## BREAKING NEWS

Two spacecraft, a commercial Iridium communications satellite and a retired Russian satellite believed to be Cosmos 2251, collided over northern Siberia on February 11. Early reports suggest that damage to both spacecraft is significant, with a large debris field. Any potential impact to other in orbit satellites and the International Space Station (ISS) is currently unknown. Iridium Satellite LLC operates a fleet of 66 satellites, together with orbital spares and is known to procure Third Party Liability insurance. At this stage it is too early to predict whether this incident will lead to a claim under this policy.

## PREMIUM INCOME AND CLAIMS

The perennial problem of launch 'slippages' has meant that original estimates of 2008 premium income of between US\$800 million to US\$875 million proved to be excessive. With only a limited number of commercially insured launches in any given year a handful of launch deferrals can have a significant impact to overall premium levels. Overall 2008 premium income was therefore approximately US\$750 million.

Although 2008's profit/loss will not be determined until expiry of the last 2008 in orbit policy in late 2009, paid and incurred claims for 2008 are currently US\$350 million. Additionally, reports in late January 2009 of a major anomaly affecting Eutelsat W2M (an EADS Astrium/ISRO Antrix manufactured satellite, and only recently launched in December 2008), suggest that this satellite may result in a significant insurance claim.

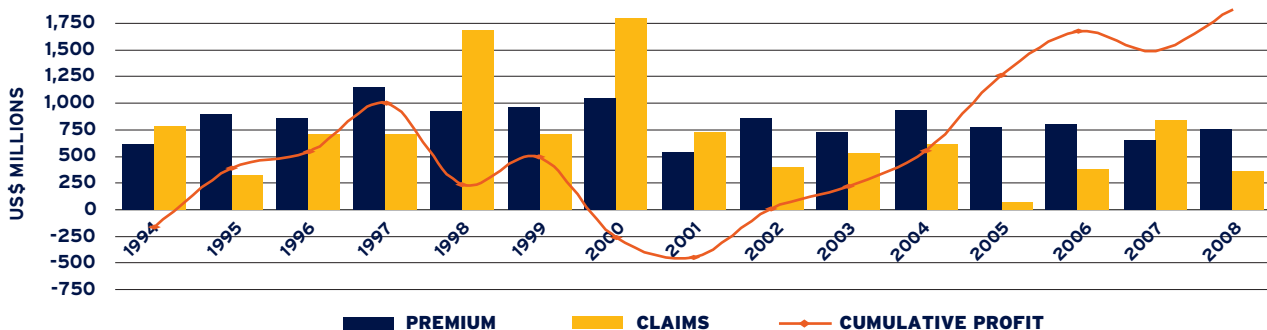
The likelihood of a claim so early in 2009 – understood to possibly account for a sizeable part of 2009's anticipated premium income – will increase pressure and focus on the success of a number of upcoming launches in Q1 2009.

## MARKET CAPACITY

Available 'working' capacity (as opposed to maximum 'theoretical' capacity) for launch risks looks set to increase again in 2009. Whilst there have been no new entrants or retractions in the space sector in the last twelve months, aggregate 'working' launch capacity for 2009 is set to exceed US\$540 million for an Ariane 5 dual launch, up from US\$465 million in 2008. Of particular note, the capacity of BRIT Space Consortium has increased from US\$30 million to US\$40 million, whilst Munich Re now have the ability to offer up to US\$80 million of aggregate capacity for an Ariane 5 dual launch. The largest launch risk of 2008 (which was placed by Willis) utilised just below US\$400 million of capacity while the largest accumulation seen in 2008 for a single risk was for an Ariane 5 dual launch with US\$458 million. Maximum 'theoretical' launch capacity has increased to US\$732 million in 2009, up from US\$622 in 2008.

Available 'working' in orbit capacity for the most attractive in orbit risks has remained virtually unchanged in 2009 at US\$460 million, compared to US\$470 million in 2008. This is despite the fact that LibSat's capacity has reduced from a maximum of US\$225 million per risk in 2008, to US\$75 million in 2009. A number of other major markets including Atrium Space Consortium (ASIC), BRIT, ElseCo and Satec have increased their available capacity in 2009. The largest aggregate in orbit risk in 2008 (again placed by Willis) also utilised just over US\$400 million of capacity. Similarly for what it's worth, maximum 'theoretical' in orbit capacity for 2009 is approximately US\$675 million, compared to US\$717 million in 2008.

## PREMIUM AND CLAIMS HISTORY



## PREMIUM RATES

Loss activity at the end of 2007 and 1st Quarter 2008 saw attempts by insurers to increase premium rates for launch policies in the first half of 2008. Whilst it is difficult to provide a 'like for like' comparison of 2007 versus 2008 launch policies due to the unique characteristics of each risk (i.e. satellite/launch vehicle combination, hardware heritage and sum insured), nett premium rates of less than 12% were achievable in 2007 for Launch and one year in-orbit policies. In the wake of a number of failures, premium rates for some Russian launch vehicles were significantly higher at 15%+. Premium rates established in the second half of 2008, with the most attractive launch placements achieving rates of around 12% for launch plus one year in orbit. Premium rates for launch vehicles/satellites with little or no heritage continue to be significantly higher.

Premium rates for in orbit policies continued to fall throughout 2008, although the pace has now slowed to an annual average reduction of 5% - 7.5% compared to reductions of 12.5% or greater in previous years. Annual premium rates for three axis satellites are now close to 1.50% with some of the most attractive risks having recently broken this 'psychological barrier'. For the limited number of spin stabilised satellites that are insured, premium rates have now approached the 1% rating level.

## LOOKING FORWARD

Continued overcapacity, and a return to profitability for the sector in 2008 leads to the anticipation that premium rates for both launch and in-orbit risks should continue to improve in 2009. Premium rating differentiation will however continue to exist and possibly expand between those launch vehicles and satellites with and without proven heritage. Premium income for 2009 is again expected to be in the range of US\$750 - US\$850 million depending upon

the actual number of launches that occur. The first quarter of 2009 is scheduled to see a number of key launches with aggregate sums insured in excess of US\$1.25 billion; with the potential for the recent Eutelsat W2M anomaly to result in a significant insurance claim. The success of all of these will be a key determinant to the profile and philosophy of the space market for the rest of the year.

## 2008 PAID & INCURRED SPACE CLAIMS

SATELLITE	LAUNCH VEHICLE	SATELLITE TYPE	LAUNCH DATE	LOSS DATE	TYPE OF LOSS	INCURRED AMOUNT (USD)	COMMENT
Nigcomsat 1	Long March 3B	DFH-4	05/13/2007	Q1 2008	In orbit	70,000,000	Loss of solar array drive mechanism - Partial Loss
AMC-14 (Americom 14)	Proton Breeze M	LM- A2100AX	03/14/2008	14/03/2008	Launch	182,000,000	Launch undershoot - Insurance Total Loss (100%)
Express-AM2	Proton KDM	NPO PM	03/29/2005	Various	In orbit	40,000,000	Solar Array Drive Assembly (SADA) anomaly - Partial Loss
Kazsat 1	Proton KDM	Khrunichev	06/18/2006	08/06/2008	In orbit	58,890,000	Control system/on board digital computer failure. Claim amount TBA
<b>TOTAL</b>						<b>350,890,000</b>	

## MARKET NEWS

**Mike Jillings** joined the Watkins Syndicate as the Deputy Space Underwriter on February 18, working with **Brian Branch** and **Brian Nicholas**. Mr. Jillings had been at Satec Venice Ltd. since February 2006 and prior to that was a senior broker at Marsh Space Projects. This move continues the most recent 'space underwriter merry-go-round.' Following **Eric Allenspach's** internal move within Swiss Re in early 2008, **Sven Karnagel** joined Swiss Re from Inter Hannover in the autumn of 2008. **Tim Slade**, formerly of Watkins Syndicate, was subsequently appointed as Mr. Karnagel's successor at Inter Hannover. An announcement from Satec regarding Mr. Jilling's replacement is expected imminently.

Each quarter this publication will look to give independent opinions and will therefore include guest articles from:

- **Key industry figures, providing their views on current areas of interest.**
- **Space insurers, giving their perspective on the benefits and challenges of satellite and launch vehicle insurance.**
- **Technical experts, commenting on the developments that will shape the insurance coverages required today and tomorrow.**

## A TIME OF CHANGE

**David Wade**, Space Underwriter at Atrium Space Insurance Consortium

Three failures of the Proton launcher within a twenty-four month period marred the record of a vehicle which has flown almost 350 times since it debuted in 1965. Despite an impressive track record, these failures showed the volatility associated with launching a satellite and the sensitivity of these vehicles to change. Changes to the design, manufacturing processes and testing of a launcher can all affect the reliability, but it's not only technical changes that are important. Changes to a workforce can also hamper reliability whilst training and experience are gained. This aspect of change is not one that Russia is facing alone. Over the coming years the aerospace sector, which saw its most rapid expansion in the 1950's and 1960's, will face wholesale retirements. How the aerospace sector deals with this transition will be a factor of utmost importance for space insurers in the coming years.

## THE BEST AND THE BRIGHTEST?

Two reports conducted for Aviation Week and Space Technology magazine highlighted the issue of an aging workforce in the U.S. aerospace and defence sector. By the end of 2008, one in four U.S. aerospace workers reached retirement age. In addition, the lay-offs in the sector in the 1990's due to the consolidation of U.S. companies left the aerospace sector short of middle-aged talent.

A plethora of the 'best-and-brightest' were attracted to a booming space industry in the 1960's, drawn by the industry that would define the future of mankind. In achieving their goal of putting a man on the Moon in 1969, this same workforce was faced with a massive scaling back of space exploration that the government space sector is only now starting to re-address. The reduction in space exploration budgets that prevailed throughout the 1970's and 1980's meant that the younger generation of workers entering the industry saw fewer opportunities to learn their trade than their brethren who started a decade or two earlier. Combined with this is the fact that the space industry has lost its kudos over the years. Science and engineering graduates often first look elsewhere for their choice of career nowadays, where political whim and government funding have a lesser impact. Attracting the best-and-the-brightest is not as easy a task for space managers as it used to be.

## A WATCHFUL EYE

If this problem is being faced by the worldwide space industry, how is it being addressed? Many people are being encouraged to work beyond their nominal retirement age which is a simple, but short-term, solution. Longer-term solutions also need to be implemented. Thorough training, good design margins, robust manufacturing processes and a strong emphasis on quality control are needed to ensure the implications of change are minimized. How the space industry faces these aspects during this time of transition will be a key factor in the decision-making process for the space insurance community in the years to come.

## BEWARE THE NUMBERS

**Mark Williamson**, Technical Advisor to Willis Inspace

It is said that there are 'lies, damned lies...and statistics.' Although the quote is widely attributed to the 19th century politician Benjamin Disraeli, it is as true today as it was then, and can readily be applied to the space insurance industry. Not the lies, of course, but certainly the issue with statistics.

As anyone who's tried to calculate the failure probability of a given launch vehicle variant or satellite platform knows only too well, it's a difficult problem. Not the maths aspect of it so much, but the analysis. After all, if a given launcher has failed in one out of ten launches, you'd expect it to have a failure probability of 0.1, or 10%. But does this really mean much? Is the result statistically significant?

The problem is that there are only a couple of dozen commercial launches a year, so the statistical population is small. Imagine, by comparison, that there were only two dozen commercial aircraft flights per year and one aircraft crashed: would the industry consider that to be a good statistical basis for a reliable rating system? Probably not.

A similar issue occurs with satellite in-orbit life. Though the typical launch policy includes the first year of life (to incorporate the relatively high-risk phases of orbital transfer, array and antenna deployments, and early operations including the first eclipse season), the number of annual renewal policies is small compared with other fields. Commercial geostationary satellites are generally specified for 15-year lifetimes, so even if an exceptional 50 spacecraft of the same type are launched, this provides a theoretical maximum of only 750 satellite-years of in-orbit experience. Of course, in year three or four, the statistics are sparse and the statistical significance of any failure is open to question. It could simply be an unpredictable 'random' failure.

It's a bit like statistics in medicine. According to the dictionary, statistical significance is a statement of the probability that an observation represents a true causal relationship and not a chance occurrence. Say you administer a flu vaccine to 10 people and none of them catch flu; how do you know whether the vaccine worked in all cases, or whether they were already immune to the virus? A sample of 10 people is simply not statistically significant for medical trials; theoretically, the next 990 people you try the vaccine on could all catch flu, which would imply that it was ineffective.

So, how do we deal with the lack of a statistical sample in the space insurance industry? A number of techniques and strategies can be employed, but they all boil down to experience – and, luckily, Willis Inspace has plenty of that. In part, it's about understanding the risk reduction techniques employed by the various satellite manufacturers: providing redundancies, improving reliability, limiting the significance of single point failures, and so on. It's also about understanding the heritage of manufacturers, not only the prime contractors of course, but also the subcontractors and their suppliers.

Fundamentally, the satellite industry is a 'bespoke sector': unless spacecraft are deployed in a multi-satellite constellation (like GPS or Globalstar), they are essentially unique. The philosophy of the production line is pretty much non-existent. The uniqueness of each client and each risk is what makes satellite insurance both fascinating and challenging. The numbers, or lack of them, can be frustrating, but space is a quality rather than quantity-driven business.



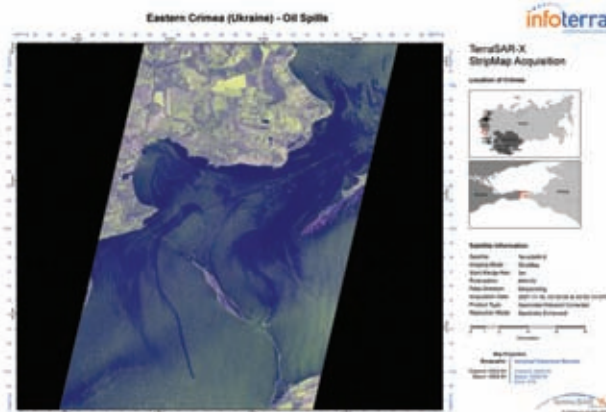
## A GLOBAL VIEW

**Philippe Cotelle**, Head of EADS ASTRIUM  
Insurance Risk Management

Globalisation of the information network in the 1990s, clearly supported by development of Space technology, has enabled the Globalisation of the economy. A consequence of this change is an evolution of the mindset of the population, increasing the feeling of interdependency and mutual social and environmental responsibility for the future of the world, and therefore the increased need for information about the Earth's environment.

The observations of the Earth's environment and the predictions that they facilitate are now essential to many components of society, including national defence, industry, policy-making bodies and the people that manage natural resources, as well as to the comfort, health and safety of the public. It is estimated that as much as 40% of the 10 trillion US Dollar economy is affected by weather and climate annually. In Africa alone, 500 million hectares of arable land have been degraded by poor management and the lack of fertiliser – this represents a loss of 30 billion Euros per year.

Particularly at this critical moment of economic distress, it is recognised that a 'green economy' is an essential factor for sustainable economic growth. The current financial crisis reminds us that in addition to energy price vulnerability and climate damage, the risks of excessive energy dependency include lower long-term economic growth. In California, known for its pioneering role in climate policy, the economic benefits of energy efficiency innovation have a compounding effect. The first 1.4% of annual efficiency gain produced about 181,000 additional jobs, while an additional 1% yielded 222,000 more.



Since satellites can observe the entire Earth at relatively low cost, they play an essential role in contributing to the global database which describes the Earth system. Advances in remote sensing technology and research have put the dream of an Earth Information System within reach during the next few decades. This system would make available valuable quantitative digital data about the complete Earth system to a myriad of users.

Satellites will provide many, though not all, of the future observations required to describe Earth completely. According to experts, more than 150 Earth Observation satellites are forecast to be launched in the next 10 years, more than twice that in the previous decade. EADS Astrium is strongly involved in this sector, being the European leader in the manufacturing of Earth Observation Satellites, and its subsidiaries, Infoterra and Spot Image, are world leaders in the provision of imaging services (both optical and radar). The trend for increased usage of Earth Observation satellites is an essential part of our future strategy.

While the 1990s saw the booming of the telecommunication sector, we believe that in the next decade, there will be a significant development in the Earth Observation and Environmental sectors. This is justified not only by the necessity for governments to better manage the Earth resources, but also for corporate companies, at the moment of financial downturn, to benefit from the contribution these sectors can make to sustainable economic growth.

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