Space Insurance:
Experience and Outlook

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A wise person once said...

Good judgement comes from experience.
Experience comes from bad judgement.
USAIG’s Space Insurance Activity

• United States Aircraft Insurance Group (USAIG) was formed in 1928 to insure aviation risks
  » USAIG is a pool of insurance companies
  » USAIG has insured space risks since 1965

• U.S. Aviation Underwriters, Inc. (USAU) manages the USAIG pool
  » Leader in worldwide aviation/space insurance market
  » Subsidiary of General Re/Berkshire Hathaway
What Is Space Insurance?

- Loss due to the failure of, or physical damage to, satellites, launch vehicles and other space payloads
- Coverages
  » Launch, initial operations, in-orbit
- Geostationary commercial communications satellites are the core business segment
  » 40% of launches, 90% of in-orbit satellites, 85% of premium
- Clients
  » Launch vehicle and satellite manufacturers, operators and users
- Characteristics
  » Volatility (low frequency / high severity)
  » Constantly changing technology
  » Each risk is unique
The Insurance Cycle

High Profits → Increased Capacity
Profits Rise → Seek Market Share
Rates Increase → Relaxed Underwriting
Flight to Quality → “Hard” Market
Capacity Decrease → “Soft” Market
Insolvencies/Withdrawals → Inadequate Rates

Mounting Losses → Inadequate Reserves

USAIG
Warren Buffett said...

"Nothing sedates rationality like large doses of effortless money."
Insurance Implications of 9/11/01

- A combination of coverages and losses never seen before — property, bodily injury, aviation, workers’ compensation, life and accident and health
  » Largest insured loss ever ($50 billion ±)
  » Largest aviation insurance loss ever
  » Largest workers compensation insurance loss ever
  » Largest property insurance loss ever
  » Largest life insurance loss ever

- Effects far beyond WTC, Pentagon and PA
# Largest Insurance Losses

<table>
<thead>
<tr>
<th>Date</th>
<th>Loss</th>
<th>Claim ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 2001</td>
<td>Terrorist attacks (US)</td>
<td>50</td>
</tr>
<tr>
<td>Aug 1992</td>
<td>Hurricane Andrew (US)</td>
<td>20</td>
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<tr>
<td>Jan 1994</td>
<td>Northridge earthquake (US)</td>
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<td>Sep 1991</td>
<td>Typhoon Mireille (Japan)</td>
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<tr>
<td>Jan 1990</td>
<td>Winter storm Daria (Europe)</td>
<td>6</td>
</tr>
<tr>
<td>Dec 1999</td>
<td>Winter storm Lothar (Europe)</td>
<td>6</td>
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<tr>
<td>Sep 1989</td>
<td>Hurricane Hugo (US)</td>
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<tr>
<td>Oct 1987</td>
<td>Storm and floods (Europe)</td>
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<tr>
<td>Feb 1990</td>
<td>Winter storm Vivian (Europe)</td>
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<tr>
<td>Sep 1999</td>
<td>Typhoon Bart (Japan)</td>
<td>4</td>
</tr>
<tr>
<td>Nov 2001</td>
<td>Enron bankruptcy (US)</td>
<td>4</td>
</tr>
</tbody>
</table>

... and don’t forget ...

Asbestos liability  
Environmental liability (pollution)  

Source: Swiss Re/sigma, Tillinghast, Morgan Stanley
Results of 9/11/01 - Underwriting

- Expected loss costs have increased
- Definition of risk has changed
- Technical risk has increased
- Uncertainty has increased
- Correlations have increased
- Terrorism peril has increased
- Prices have increased
- Policy conditions have become more restrictive
- Terrorism exclusions have been implemented
Results of 9/11/01 - Financial

- Required capital has increased
- Cost of capital has increased
- Liquidity requirements have increased
- Required underwriting margins have increased
- Capacity has decreased
- Insolvencies and withdrawals have increased
- Scrutiny has increased
  » Investors and owners
  » Financial markets
  » Rating agencies
  » Regulators and politicians
Space Insurance Market 2001 In Review

- Satellite launches decreased
  » 46 satellites launched in 2001, 77 in 2000, 93 in 1999

- Insured values decreased
  » Average value of GEO satellites launched was $193 million in 2001, $235 million in 2000, $212 million in 1999

- Market space insurance premium decreased
  » $0.5 billion in 2001, $1 billion in 2000, $1 billion in 1999

- Satellite anomalies increased
  » “Generic” anomalies on certain classes of satellites

- Market annual loss ratio increased
  » 251% in 2001, 107% in 2000, 91% in 1999, 156% in 1998
2002 So Far

- So far this year, three insured satellites have been declared total losses, and a fourth may have suffered an anomaly that could lead to a total loss
- Based on these (potential) losses, incurred claims in first three months of 2002 exceed full year 2001 premium
- Loss ratio so far in 2002 is 720%
- Market net loss $1.8 billion over past four years
Insured Launch History

- LEO & other satellites
- GEO satellites
- Launches


Values: 0, 20, 40, 60, 80, 100, 120, 140
New Launch Vehicles in 2002

- Ariane 5 ESC-A
- Atlas 3B
- Atlas 5
- Delta 4
- Proton-M / Breeze-M
- Sea Launch 6000

... All of these new launch vehicles have committed insured payloads assigned to them

... Rule of thumb – two failures in first ten flights
Insured Launch Claims

<table>
<thead>
<tr>
<th>Year</th>
<th>Failure</th>
<th>Success</th>
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<tr>
<td>1994</td>
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<td>2000</td>
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<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>3</td>
<td>3</td>
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</tbody>
</table>
Insured Satellites In-Orbit

Total insured value
$24 billion

Total insured value
$11 billion
In-Orbit Failure Statistics

- Average 140 insured satellites in orbit at any point in time over the last five years
  - Average 10 satellites (7% of population) suffer a claim each year
- Of 119 “Western” commercial communications satellites reporting anomalies over the last five years...
  - 225 communications payload failures (TWTA, SSPA, receiver...)
    - 10% of these resulted in loss of capability (i.e., no redundancy)
  - 189 electrical power subsystem failures (solar array, battery...)
    - Many of these satellites suffered reduction of life
    - 11 total losses
  - 54 propulsion subsystem failures (thruster...)
- Anomaly reporting issues
  - Late/no reporting
  - Variation in reporting depth
Insured Satellite Claims

- 1997: 7
- 1998: 5
- 1999: 7
- 2000: 3
- 2001: 7
- 2002: 7

Legend:
- Partial Losses
- Total Losses
What We Have Experienced

- Increase in introduction of new technologies
- Schedule and cost pressures
- Shortfalls in ground testing

= Unprecedented level of losses
What You Can Expect

- Reduced capacity *(especially for new technologies)*
- Increased pricing *(100-200% increases typical)*
- Shorter coverage periods *(1 year vs. 5 years)*
- More exclusions *(generic faults, terrorism)*
- Higher loss thresholds *(CTL @ 75% vs. 50%)*
- Higher deductibles and margins *(10-15% ded.)*
- Risk differentiation *(mature vs. new technology)*
Final Thoughts

- The insurance market is battered but fundamentally sound
- The aerospace, communications and information markets are weak but will recover
- We have all suffered the consequences of bad judgement
- Let's hope that we will learn to exercise good judgement