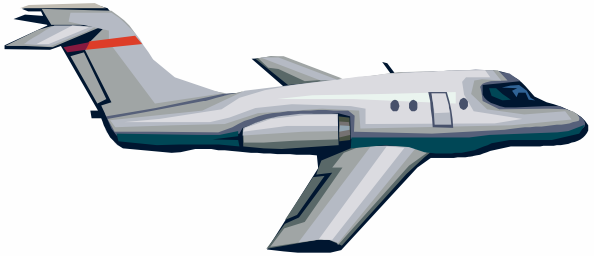


AVIATION INSURANCE

Presented by: **Mindy Steichen, FCAS, MAAA**

Casualty Loss Reserve Seminar

September 18, 2008

Presentation Overview

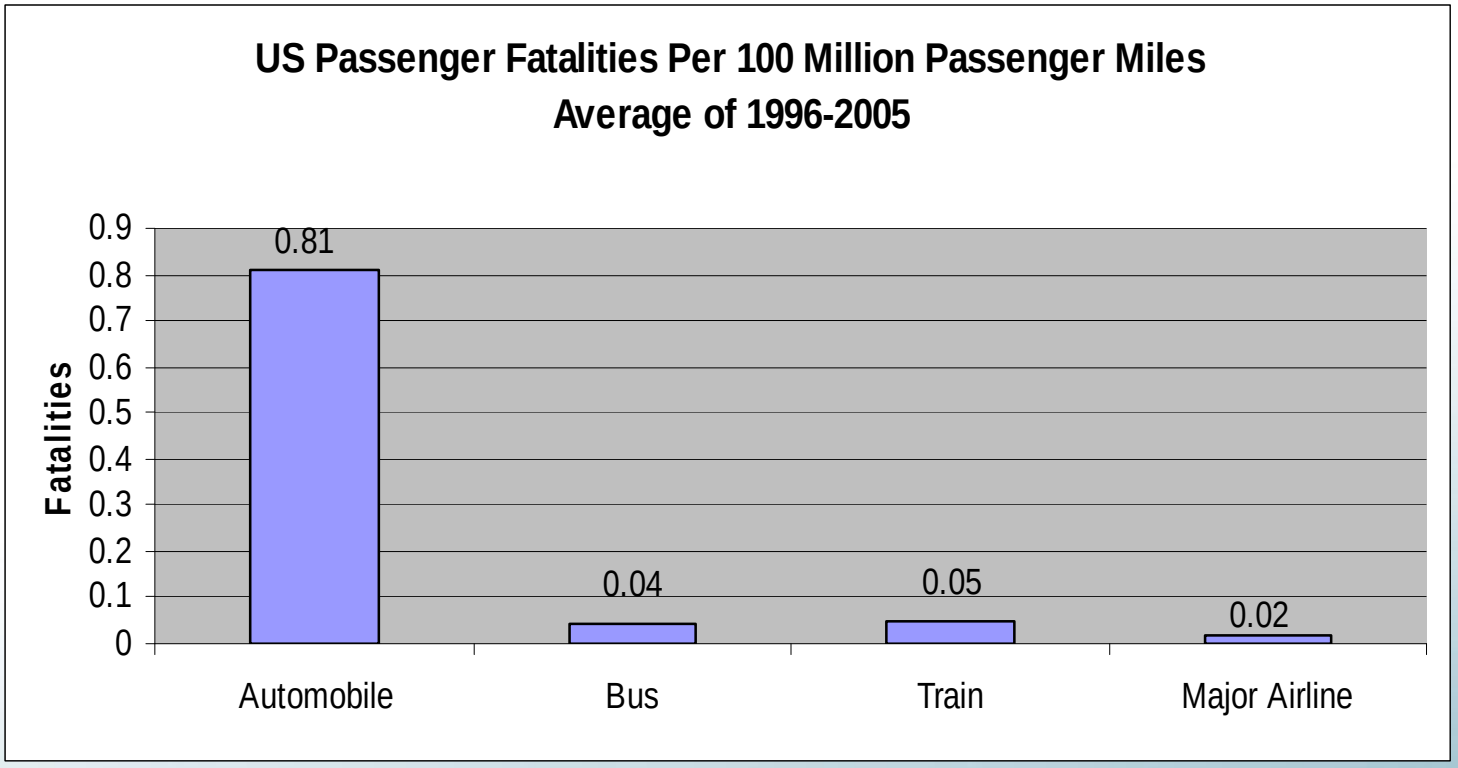
- Aviation Industry Statistics
- Aviation Insurance: Coverages and Exposures
- Actuarial Considerations
- Current Trends
- Closing Thoughts

Aviation Industry Statistics

Aviation Industry Statistics

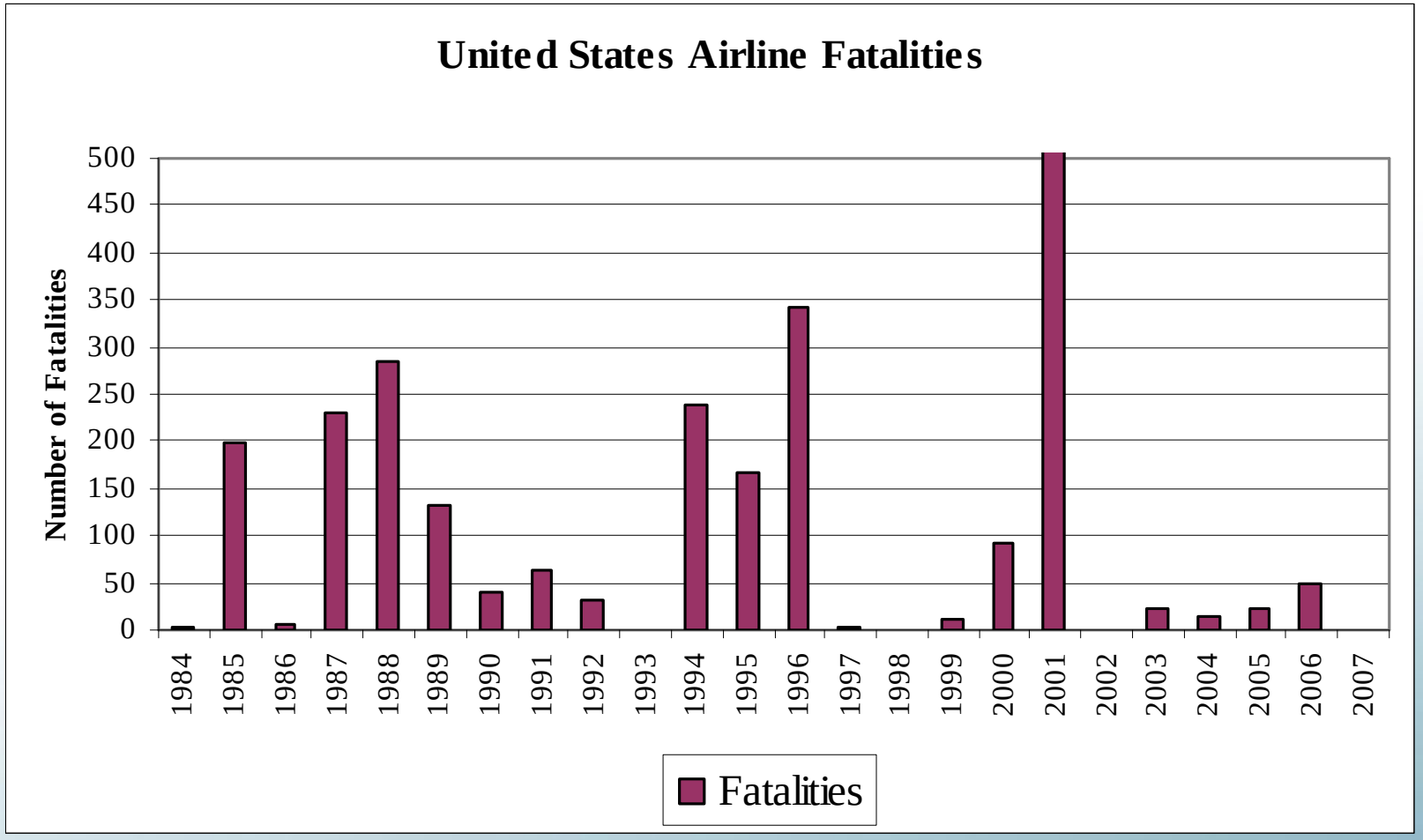
- Comparison to other travel methods
- Airline Fatalities 1984-2007
- Causes of Fatal Accidents

Travel Comparison



Source: National Safety Council Injury Facts

Airline Fatalities



Source: National Transportation Safety Board

Fatal Accident Causes

Fatal Accident Causes by Category (Percentages)
Accidents with Known Causes Only
World-Wide Commercial Aircraft

Cause	1960's	1970's	1980's	1990's	2000's	All
Pilot Error	37%	29%	30%	31%	30%	33%
Pilot Error (weather related)	17%	15%	16%	19%	19%	16%
Pilot Error (mechanical related)	3%	4%	4%	6%	3%	4%
Total Pilot Error	57%	48%	50%	56%	52%	53%
Other Human Error	7%	10%	6%	7%	9%	7%
Weather	11%	10%	12%	9%	8%	11%
Mechanical Failure	19%	21%	21%	21%	25%	21%
Sabotage/Terrorism	4%	9%	10%	7%	6%	7%
Other	2%	2%	1%	1%	0%	1%

Source: PlaneCrashInfo.com

Aviation Insurance

Aviation Overview:
Coverages and Exposures

- Why a Separate Market?
- Covered Risks and Exposures
- Market Players

Why Separate Market?

- Need for Specialization
  - Specialized underwriting and claims handling
  - Separate laws (state, country, international treaties)
  - Current policies typically exclude aviation risks on both an insured and reinsurance perspective
  - Large policy limits – vertical placement

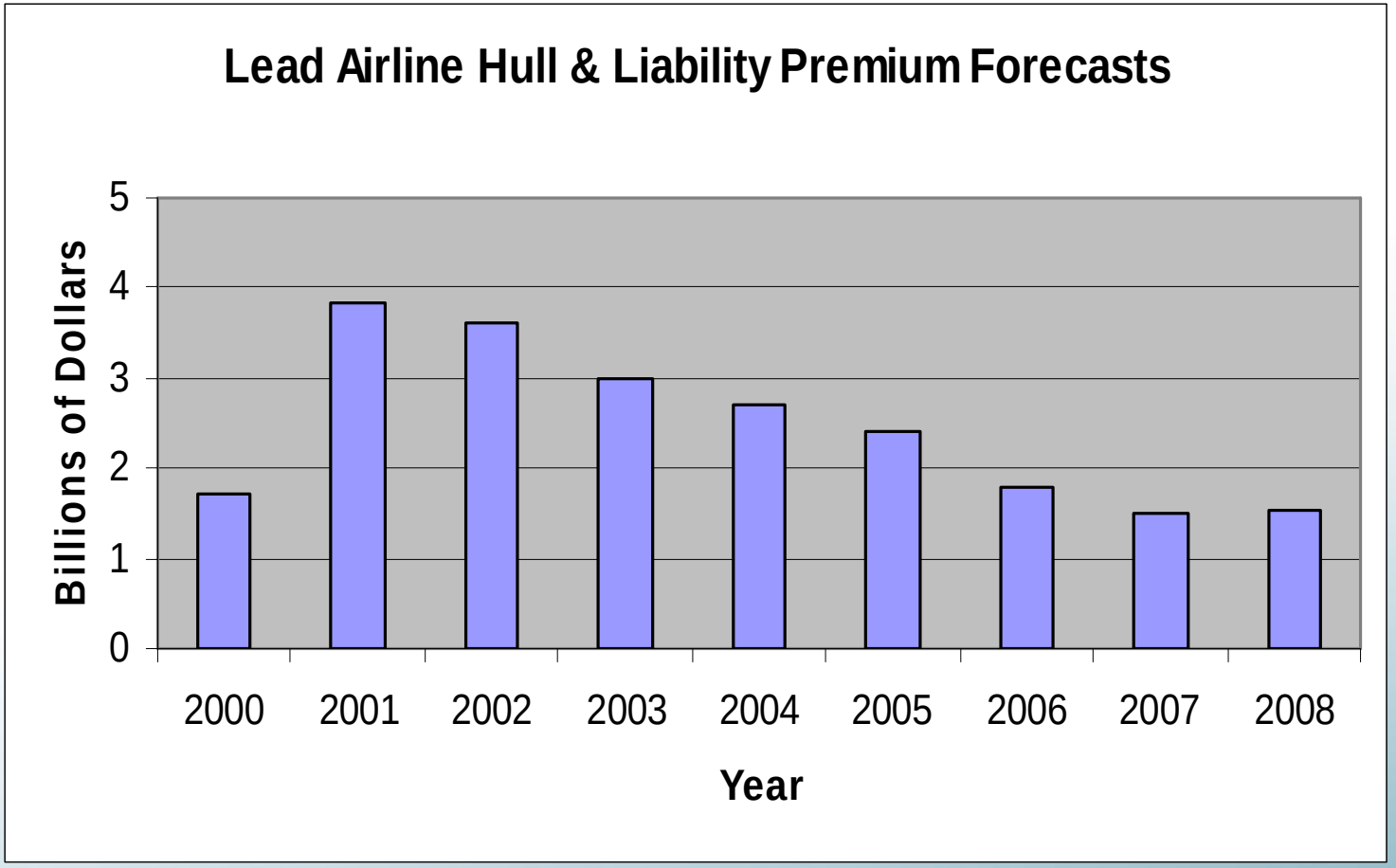
Covered Risks and Exposures

- Major/ Regional /Cargo Airlines
- Major Manufacturers (Products)
- General Aviation
- Workers Compensation
- Other

Covered Risks and Exposures

- Major Airlines
  - All Third-Party Liabilities (up to $2B policy limits)
  - Hull (Property Damage to Aircraft) – Insured value of each aircraft
  - Vertical placements
    - Each insurer takes percentage of policy
    - Lead handles claims and typically is highest rate
    - Other insurers may get different rates for same insured
  - Insured Examples
    - United Airlines
    - Jet Blue
    - Fed-Ex

Airlines Premium Forecasts



Covered Risks and Exposures

- Major Manufacturers (Products)
  - Third-Party Liabilities from Aircraft or Engines – up to $2B policy limits
  - Vertical placements
  - Longer Tailed
  - Insured Examples
    - Boeing / McDonnell Douglas
    - EADS (Airbus)
    - General Electric (Jet Engines)
    - Rolls Royce (Jet Engines)

Covered Risks and Exposures

- General Aviation
  - Commercial (Charters)
  - Industrial Aid (Corporate Jets)
  - Private Business and Pleasure (Privately owned and flown)

Covered Risks and Exposures

- General Aviation (Continued)
  - Minor Manufacturers
    - Aviation exposure excluded in typical products insurance policy
    - Examples include circuit breakers, light bulbs, wiring, seat coverings, etc.
  - Airports/Service Firms
    - Sky Chiefs, Refuelers, etc.
    - Typical slip and fall claims
    - Runway maintenance

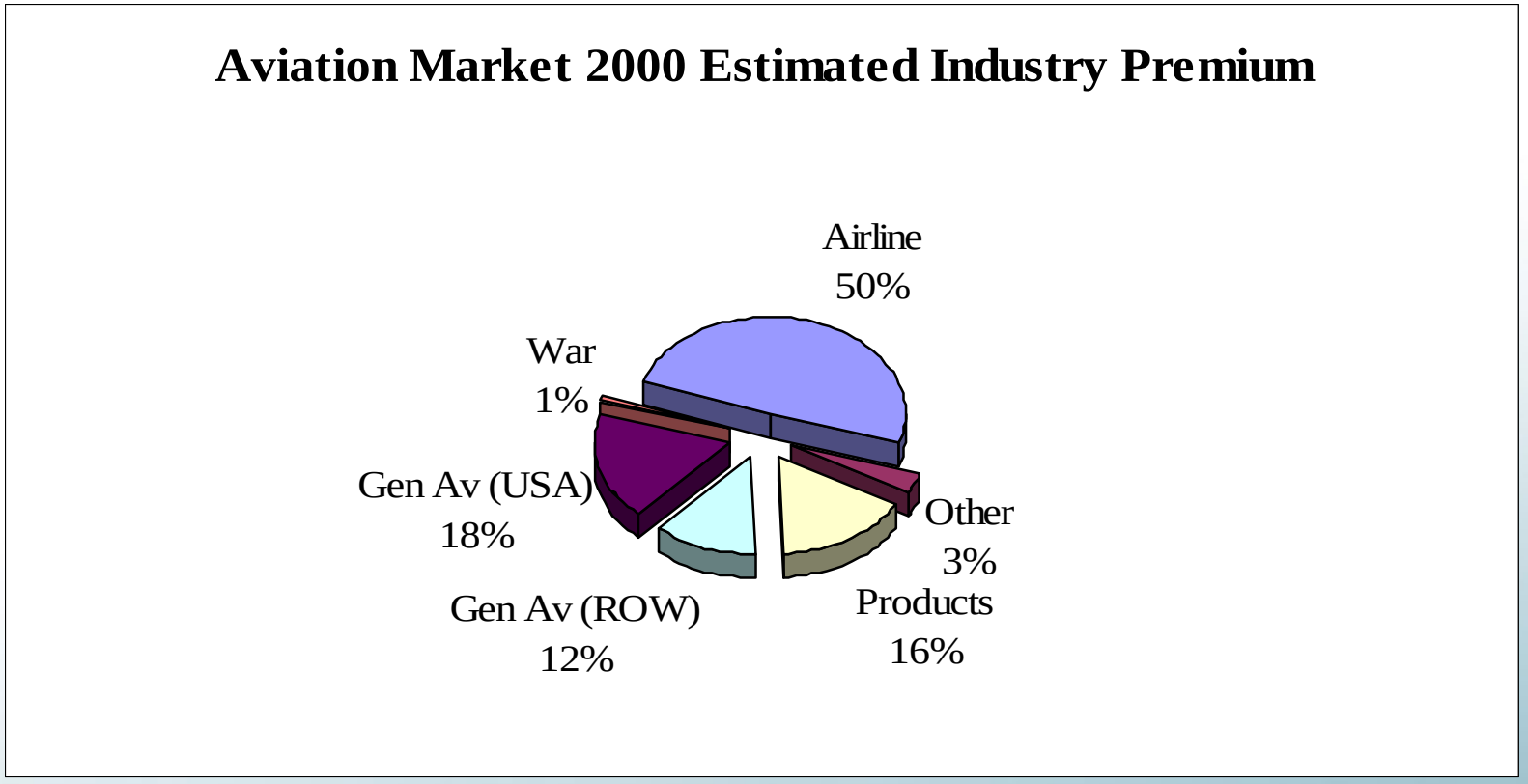
Covered Risks and Exposures

- Workers' Compensation
  - Traditional WC insurers avoid aviation
  - Aviation exposure excluded from typical reinsurance treaties
  - Traditional WC underwriters unfamiliar with aviation exposure

Covered Risks and Exposures

- Other Coverages
  - Satellite
  - War
  - Loss of License (Pilots)
  - Financial Institutions (Loan default protection)

Covered Risks and Exposures



Source: The Aviation and Space Insurance Market Working Party

Market Players / Infrastructure

- Lloyds Syndicates
- European Pools
- Rest of World and U.S. Pools
- Some U.S. Direct Writers of General Aviation Only
- Bermuda/Specialty Writers
- Heavily broker placed

Actuarial Considerations

Actuarial Considerations

§ Reserving for Attritional Claims

- Defined as claims under some large dollar value
- (i.e $100 Million Market Loss)
- More predictable than major events, can use loss history to predict future losses
- Separate losses by line (airlines, products, etc) and by hull or liability

Actuarial Considerations

- Reserving for Attritional Claims
  - Traditional Actuarial triangles and methods
  - Make loss development factor selections
  - Use incurred and paid ldf and BF methods
  - Look at net and gross losses separately, be careful of changing net retentions

Actuarial Considerations

Sample of Major Events

Airline	Loss Date	Approximate Market Losses
Japan Airlines	August 12, 1985	**$450 Million**
US AIR	July 2, 1994	**$70 Million**
US AIR	September 8, 1994	**$475 Million**
Valujet	May 11, 1996	**$315 Million**
Trans World Airlines	July 17, 1996	**$500 Million**
Swissair	September 2, 1998	**$590 Million**
American Airlines - WTC	September 11, 2001	**$1.9 Billion**
Air France	August 2, 2005	**$165 Million**
Brussels Hangar Fire	May 5, 2006	**$250 Million**
Comair/Delta	August 27, 2006	**$300 Million**

Actuarial Considerations

§ Reserving for Major Events

- Need to pull out major events as these claims develop differently than attritional claims
- Claims are “event driven” – no need to reserve for crashes that didn’t happen
- Need to factor in unearned exposure for policy year analysis

Actuarial Considerations

§ Reserving for Major Events

- Reserve amounts shift between airlines and manufacturers; legal rulings can significantly change total liability
- Example:

Company Line Size Airlines = 10%
Company Line Size Products = 15%

	Development Period (Months)					
	12	24	36	48	60	72
Airline Losses (Millions)	100	100	75	75	75	50
Products Losses (Millions)	0	0	25	25	25	50
Total Company Liability (Millions)	10	10	11.25	11.25	11.25	12.5

Actuarial Considerations

- Reserving for Unearned Major Events
  - Model based on industry losses
    - Number of Events
    - Average Market Loss
    - Losses by Class
  - Incorporate Company statistics
    - Miss Factors
    - Line Size

Actuarial Considerations

Major Event Model - Example
Line of Business: Airlines America, Liability, Gross

	Market Layer	60M x 40M	200M x 100M	…… Up to 1B x 1B
(1)	Average Market Loss	60M	170M	
(2)	Company Line Size	10.0%	10.0%	
(3)	Average Company Loss = (1) * (2)	6.0M	17.0M	
(4)	Estimated Number of Events	1.5	0.7	
(5)	Miss Factor	25.0%	25.0%	
(6)	% of Loss by Class	35.0%	35.0%	
(7)	Gross Company Loss =(3)*(4)*[1-(5)]*(6)	2.36M	3.12M	

Add Row (7) to get total expected loss
Depending on evaluation period and year, factor in unearned factor

Actuarial Considerations - Satellite

- Launch
  - Can put several satellites on one launch
- Post-Separation
  - Placement into orbit after launch (Usually covers the first year of orbit)
- Orbit
  - Warranty for several years

Actuarial Considerations - Satellite

- Losses during launch
  - Typically total loss
  - Highest frequency of loss during launch and Post-Separation phases
- Losses during orbit
  - Loss of use; occasionally not a total loss
  - After first year, lower probability of loss
  - Frequency increases again towards end of the satellite's life

Actuarial Considerations - Satellite

- For reported claims and case reserves – traditional development methods
- Small amount of IBNR for reporting delays
- Largest exposure is for unearned premium related to launches that haven't occurred yet or satellites in orbit
- Premium usually broken down into three main phases and earned separately over each of these periods

Actuarial Considerations - Satellite

- For In-force policies use loss rate with unexpired exposure
- Industry statistics available to help determine loss rates
- Contagion Risk – Design or manufacturing problems can span several satellites

§ Current Trends

Current Trends

- Market has softened in recent years
- Low number of US fatalities since 2001 lowered industry losses and attracted new markets
- 2007 first year market at loss since early 2000's
- Due to steady number of catastrophes in the rest of the world

Closing Thoughts

Closing Thoughts

- Historically relatively few actuaries involved in ratemaking or reserving
- Low barrier to entry and short-term memories allows for volatile underwriting cycles
- Difficult to spread risk, especially in excess of loss market