Tsunami Space Risks Project

Marsh Space Projects

MARSH
An MMC Company

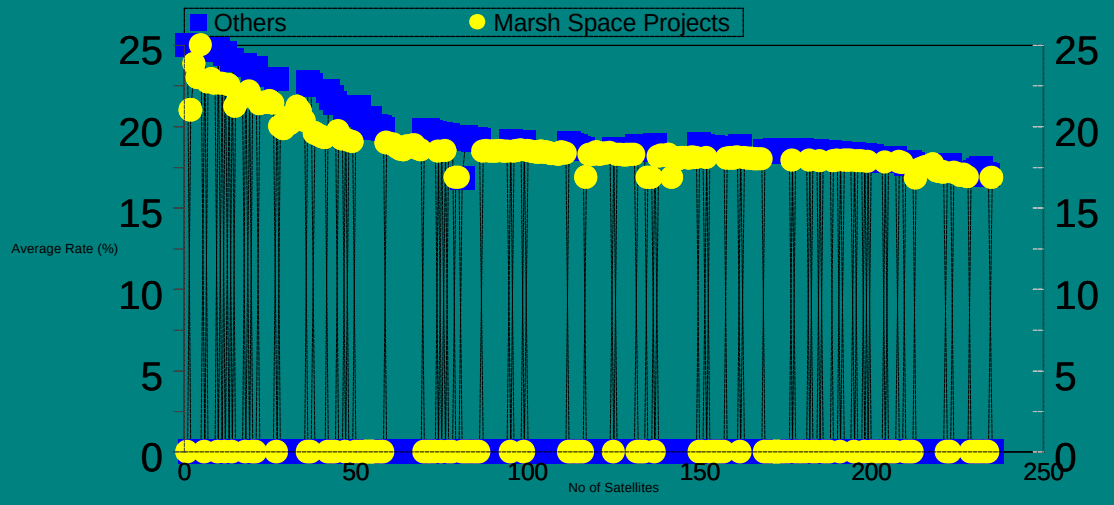
MARSH SPACE PROJECTS

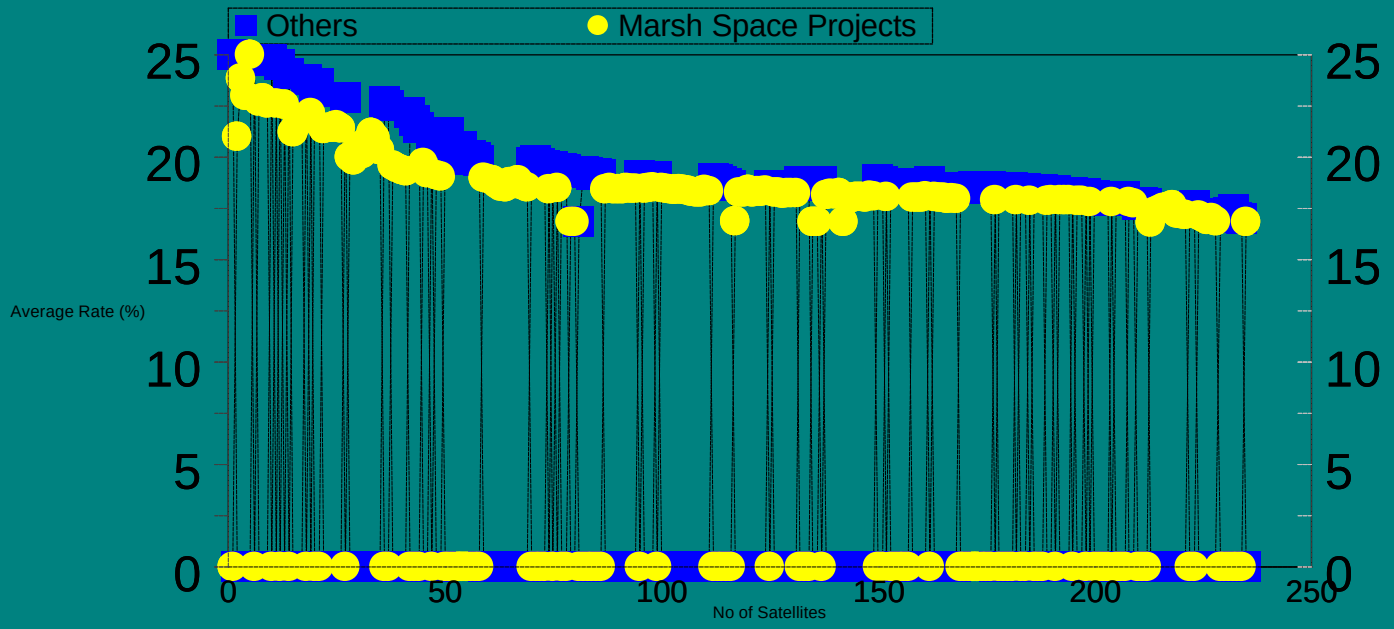
- Specialist Space Insurance Broking Division of Marsh
- Offices in 3 of the 5 major space insurance markets (London, New York & Paris)
- Each office is leader in own market (support from other offices in placing risk)
- In addition Singapore representative office opened August 1996 to enhance our groups service to Asian based clients
- Over 30 full time employees dedicated to space insurance
- Continuity via core of experienced personnel

MARSH SPACE PROJECTS - Group Market Position

- Leading satellite insurance broker over past 30 years
  - Approximately 60% of all premiums placed into the market
  - Approximately 62% of claims collected
- Market leader in achieving groundbreaking terms for clients
- Consistently achieved lower rates than other brokers

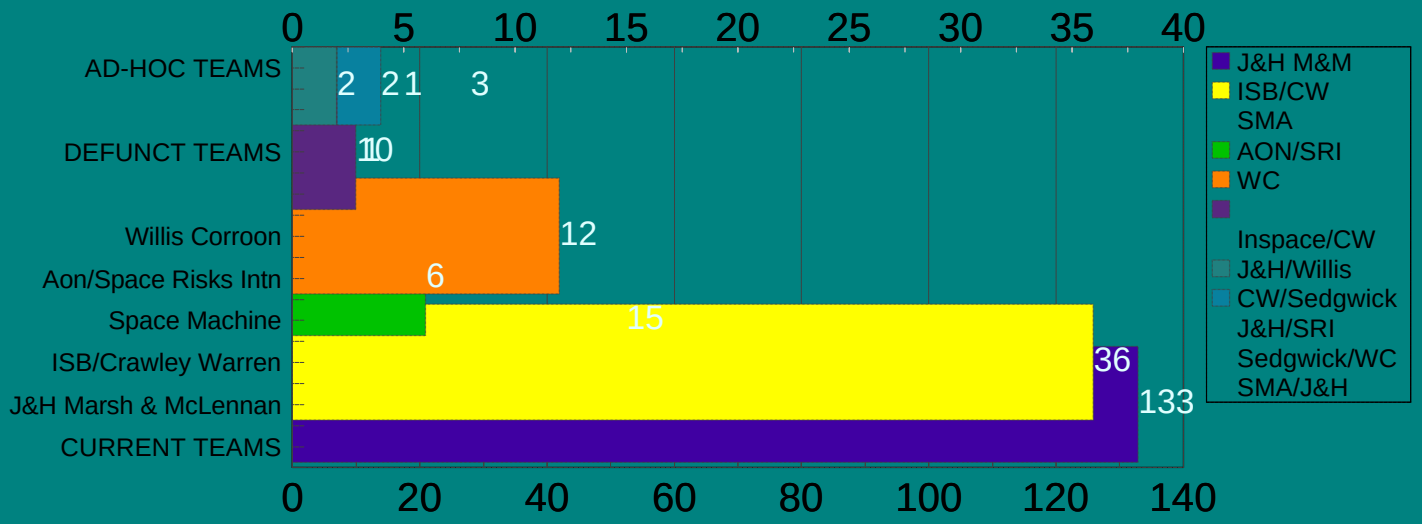
MARSH SPACE PROJECTS - Group Market Position



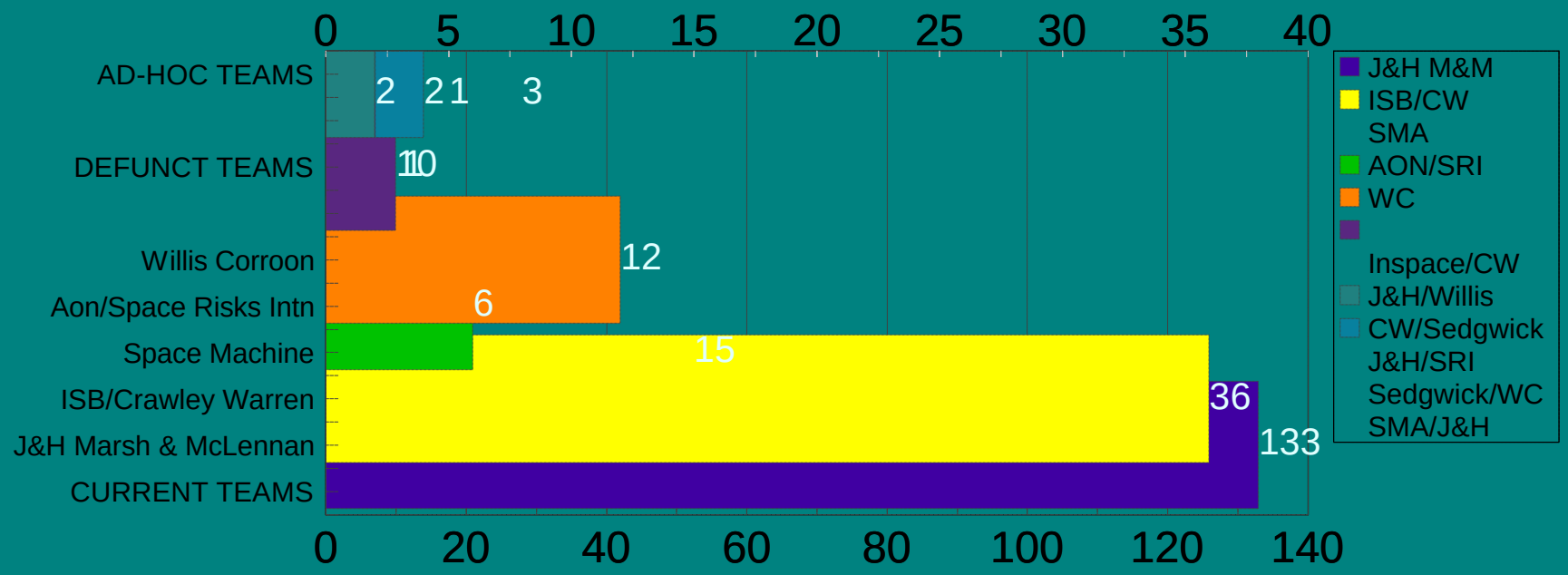

Others
Marsh Space Projects
Average Rate (%)
25
20
15
10
5
0
0
50
100
150
200
250
No of Satellites

MAJOR LAUNCH PLACINGS

(completed since January, 1990)



Total of 220 satellites insured first loss since January, 1990
(At April 1999)



Total of 220 satellites insured first loss since January, 1990
(At April 1999)

Satellite Insurance Products

TYPES OF SATELLITE INSURANCE (RISK PHASES)

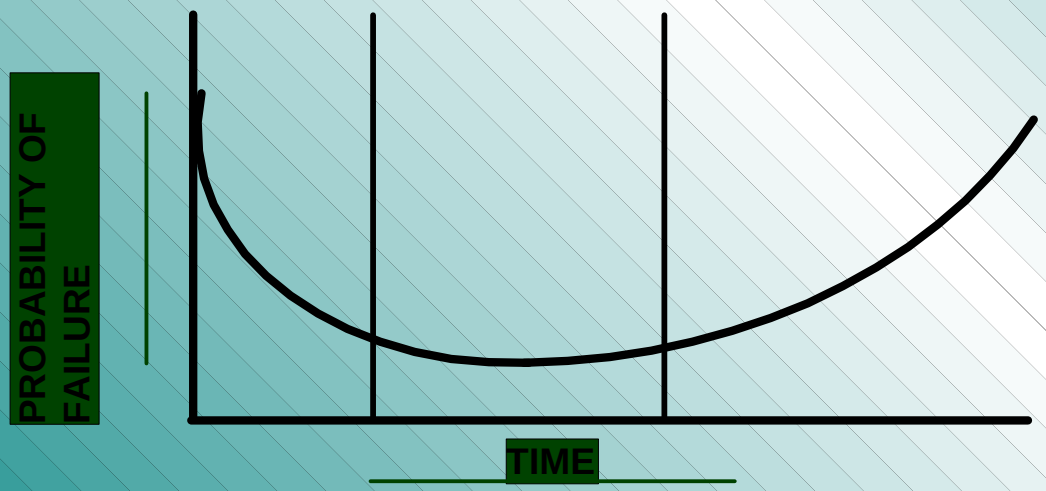
- Pre-Launch
- Launch
- In-orbit
- Consequential Loss
- Launch Risk Guarantees
- Third Party Liability
- Launch Insurance Cost Factors

UNIQUE FEATURES OF SPACE INSURANCE

- Covers the operation of technically complex launch vehicles and satellites
  - Launch Vehicles prone to catastrophic failure
- Satellites can't be fixed in orbit
  - Almost all causes of loss can be directly traced to human error (during design, manufacture, testing or due to procedural errors
- Operates in a specialist market of technically-minded underwriters
- Insuring process is long and involved
  - significant amounts of technical data

BASIC FEATURES

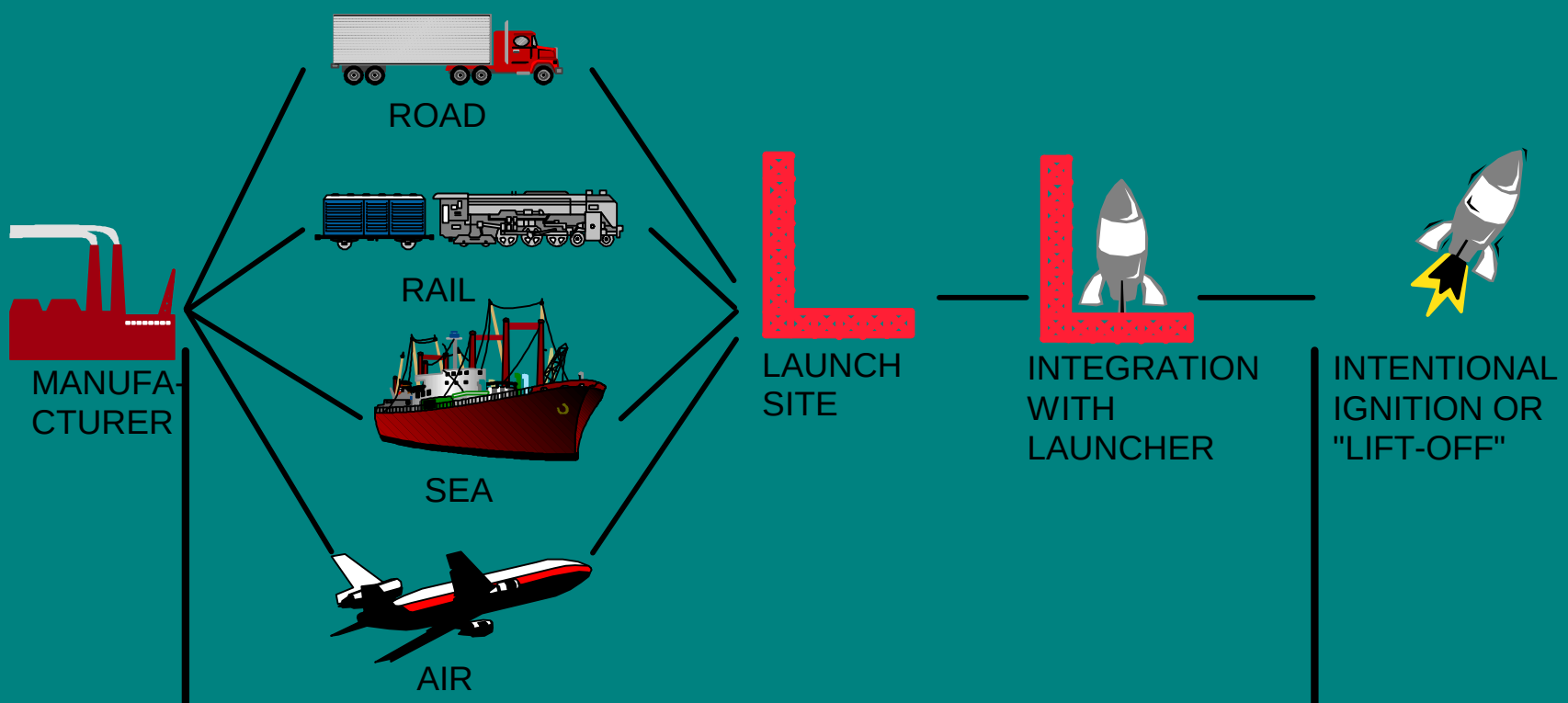
- Historically, main cause of satellite loss is during launch and early orbit phases. Therefore primary requirement for insurance is during these phases
  - High risk of loss at launch due to ballistic risk
  - High risk of loss during early in-orbit life explained by 'bathtub' failure curve below



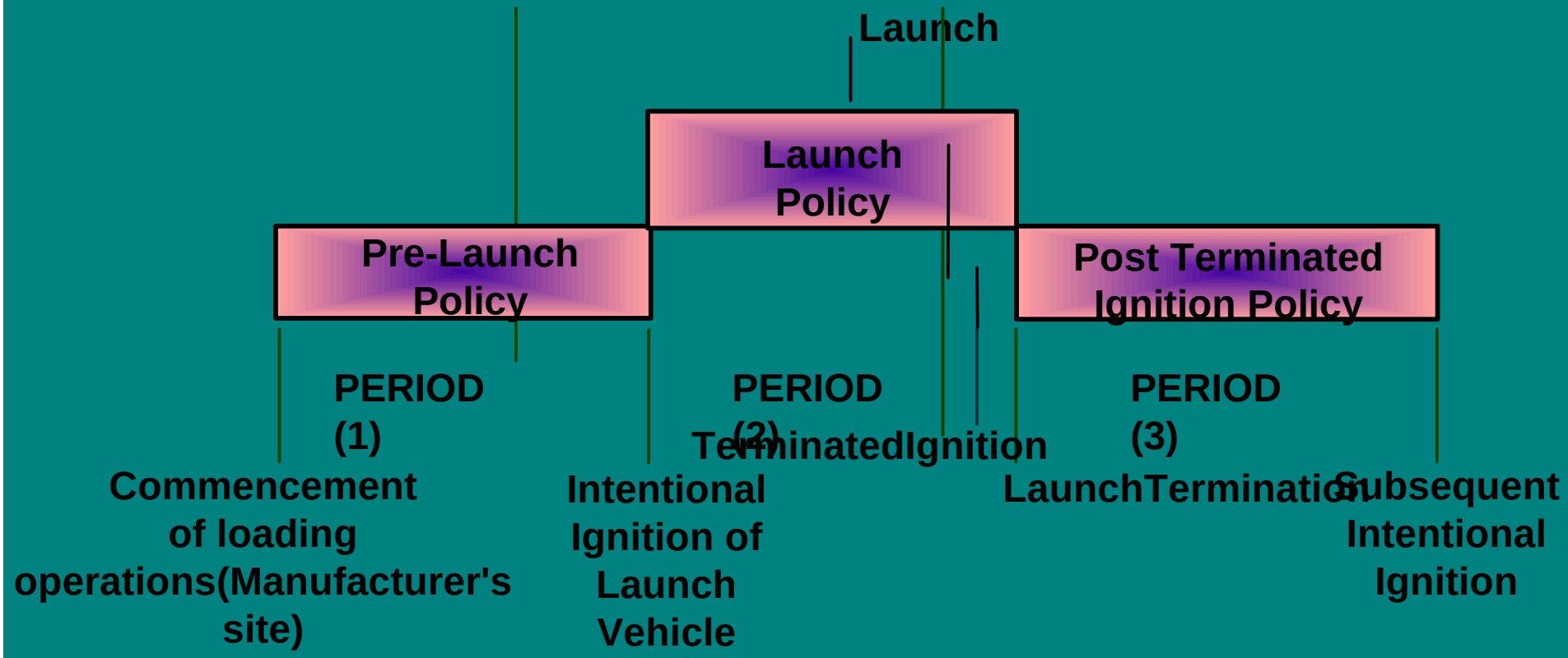
BASIC FEATURES

- In addition to launch coverage, extensions to coverage developed in specialist market for
  - Pre launch exposure - from delivery to launch site until launch, covered within non-marine / marine cargo markets
  - Post-terminated ignition insurance
  - In-orbit exposure - ongoing operational period after successful launch
- Liability risks insured in same market as aviation liability risks

PRE-LAUNCH COVERAGE



SATELLITE GROUND RISK & LAUNCH POLICIES



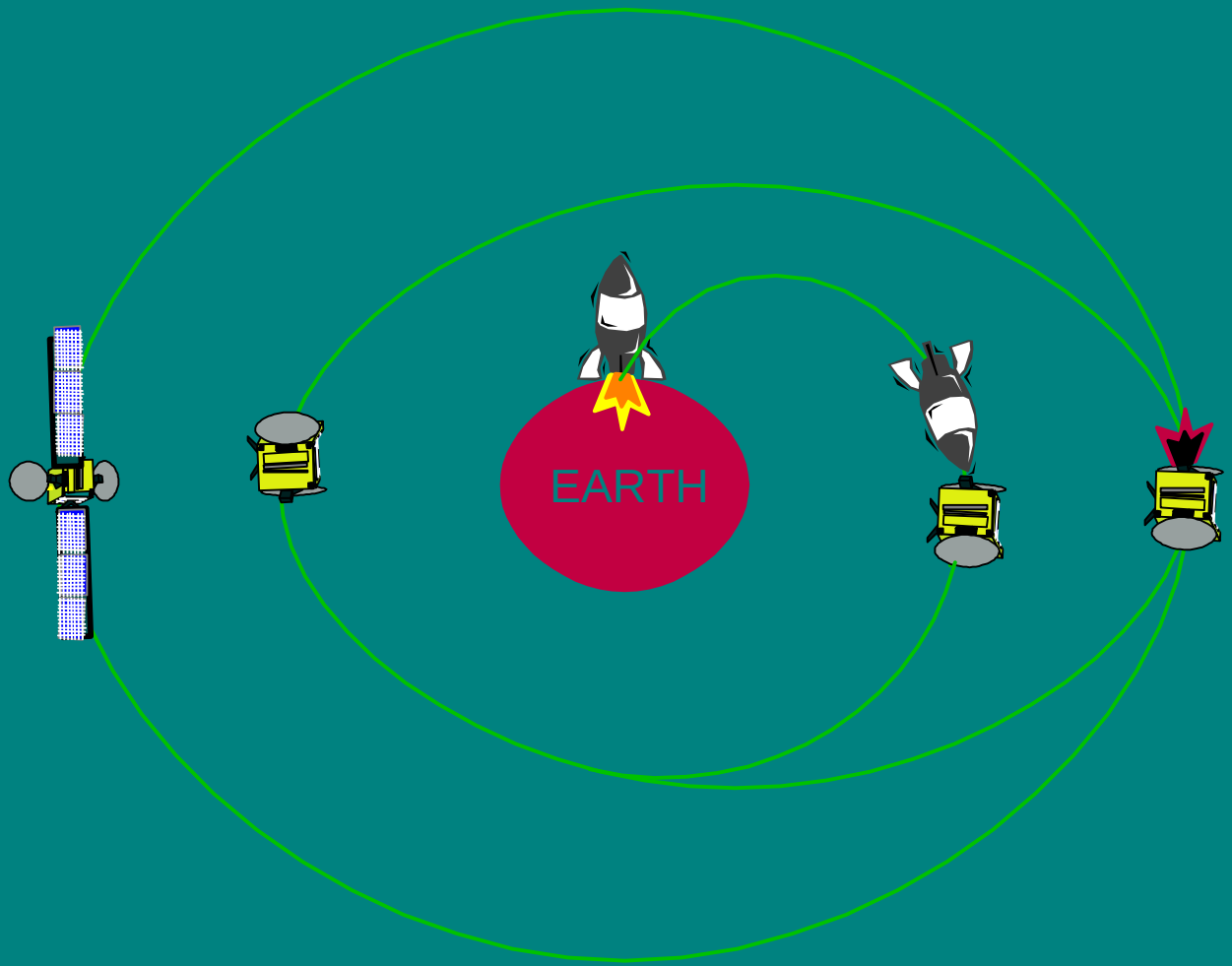
LAUNCH COVERAGE

- Main coverage purchased in the Space insurance market
- Covers physical loss or damage or failure to meet specifications resulting from:
  - Launch phase failure
  - Satellite failure or loss
  - that result in
    - Physical loss of spacecraft
    - Loss of lifetime / Loss of operational capability

LAUNCH COVERAGE

- Period :
  - For in-orbit deliveries by the manufacturer, typically launch + 365 days
  - For ground deliveries to the satellite customer, between launch + 365 days and up to launch + 5 years depending on the individual risk involved
  - Attachment of risk normally: Intentional Ignition or Lift Off (as defined in launch contracts)
  - If Intentional Ignition, provision for suspension and reattachment of risk required

LAUNCH COVERAGE



LAUNCH COVERAGE - PARTIAL AND TOTAL LOSS COVERAGE

- PARTIAL LOSS COVERAGE
  - Coverage for losses of operational capability or lifetime but do not result in a Total Loss or Constructive Total Loss
  - Payable amount is based upon :
    - Fuel (Proportion of required mission life lost due to fuel shortage)
    - Payload capability (Proportion of payload capacity lost over required life due to payload failure or shortage of electric power)

LAUNCH COVERAGE - PARTIAL AND TOTAL LOSS COVERAGE

- TOTAL LOSS COVERAGE
  - Total loss will apply if:
    - Satellite is not operational in any respect, or
    - Satellite is operational but overall communications capability or lifetime is seriously degraded
  - For example, the policy may pay a Constructive Total Loss (CTL) if Partial Loss exceeds 50%
  - In event of CTL, salvage provisions apply
  - Total Loss Only coverage may be purchased, advantages of this over 'full coverage' are:
    - may result in a small premium savings
    - may make a difficult risk acceptable to underwriters

LAUNCH COVERAGE - TYPICAL RATES - JULY '99

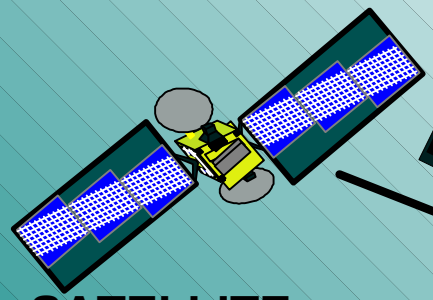
- Assuming satellite / launch vehicle combination with good track record
  - Launch + 12 months : 9.00% - 10.50%
  - Launch + 24 months : 10.00% - 11.50%
  - Launch + 36 months : 11.50% - 12.50%
  - Launch + 48 months : 12.50% - 14.00%
  - Launch + 60 months : 13.50% - 15.50%Note: Due to recent losses, rating of risks is very sensitive issue and is not as readily predictable as in the past

IN-ORBIT

- Attaches after launch policy expires
- Similar coverage and criteria to launch policies
- Attachment subject to health letter
- Typical period of upto 48 months each policy without review

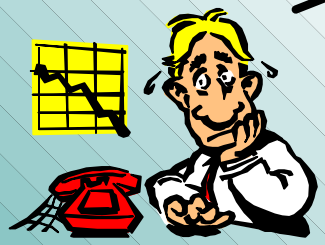
CONSEQUENTIAL LOSS

- Revenue Loss or Extra Expense caused by non-availability of satellite resulting from physical damage / loss
- Separate compensation from asset value



LOSS

SATELLITE ASSET VALUE



SATELLITE OPERATOR

LOSS

REVENUE FROM SATELLITE OPERATIONS

THIRD PARTY LIABILITY

- Coverage usually purchased by Launch Services supplier
- Covers all parties to Launch against physical damage / bodily injury to third parties
- Necessary to meet requirements of UN Convention on Damage Caused by Space Objects
- Depends on "inter-party waiver of liability" between all participating parties
- Various amounts of insurance up to US$500,000,000 depending on statutory requirements and business approach of launch supplier
- Separate market from space market

SUM INSURED COMPOSITION

- Cost of Launch Service Agreement If insured on asset value, sum insured may reduce overtime
- If reducing sum insured rate is charged on average value at risk over Policy period
- Sum Insured can be defined as either:
  - marginal cost of taking up contract options, therefore, sum insured need not include non recurring costs
  - full replacement cost, therefore, sum insured will include non recurring costs
- Can be insured on Asset Value or Replacement Cost

LAUNCH INSURANCE RATING FACTORS

- **Internal Factors (within clients control)**
  - Insurance requirements
  - Total / Partial loss definitions
  - Salvage proposals
  - Period of coverage
  - Amount of insurance required
  - Type of launch vehicle
  - Technology of the Satellite
    - Heritage and reliability of components
    - Redundancy / Single point failure modes
    - Performance requirements
- **External Factors (outside clients control)**
  - Number of launches
  - Recent market experience
  - Reputation of satellite manufacturer, satellite type and subsystems
  - Reputation of launch vehicle

CONCLUSION

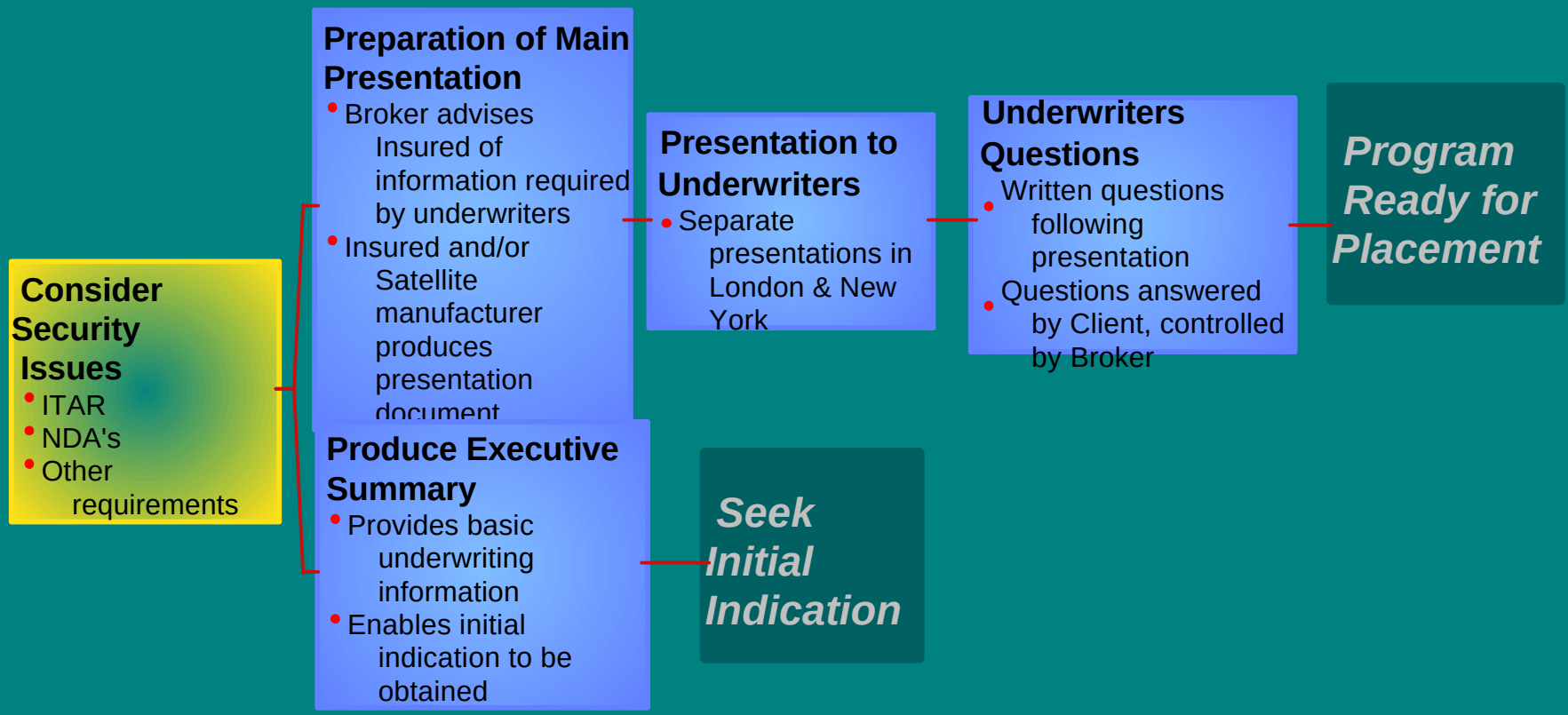
- The satellite market is generally very flexible and is prepared to consider most requirements for coverage
- Many related satellite insurance issues can be covered by markets other than those specialising in the launch and in-orbit risks
- The coverages discussed in this briefing are the main forms of cover available in the market place

Insurance Broking Services

Consulting Phase

- Placing a complex satellite risk into the insurance market requires a co-ordination of dedicated specialists to prepare, negotiate place and administer the insurance
- In order to maximise the benefits for clients a well thought out and well executed placing strategy is required
- The steps required to complete the placing are:Consultancy
  - Insurance Program Design
  - Production of Underwriting Information
  - Marketing & Placement
  - Policy Wording & Documentation
  - Post Placement Activities
  - Claims

Production of Underwriting Information



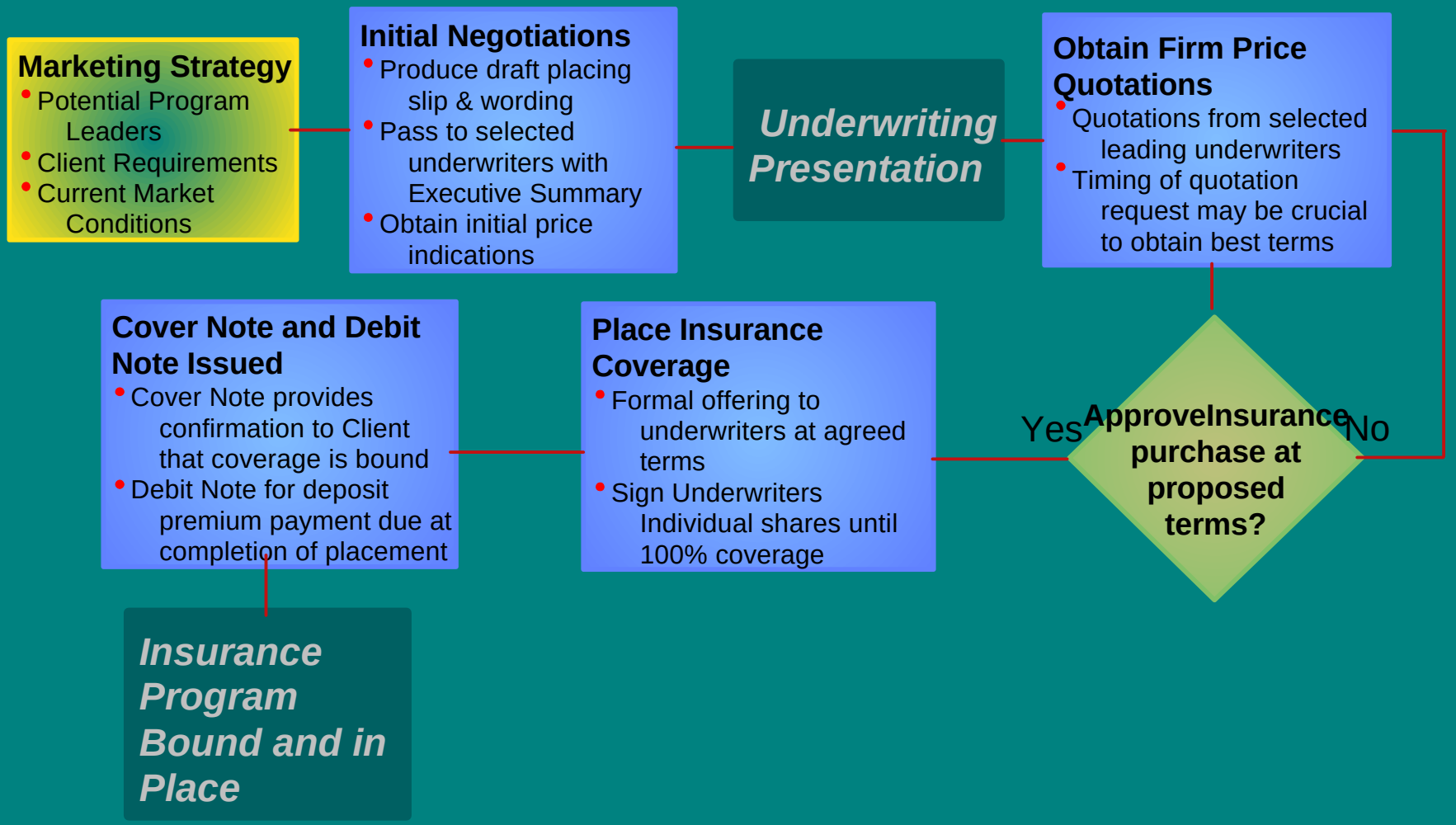
Production of Underwriting Information

- Provision of good underwriting information essential in current underwriting climate
- A well presented risk creates a favourable impression with underwriters and will enhance the opportunity to secure competitive terms and conditions
- Security and Technology Transfer issues (i.e. ITAR) must be considered as early as possible to ensure adequate time to comply with requirements. Particularly important area due to recent US Govt legislation
- Executive Summary provides basic underwriting information for indication purposes

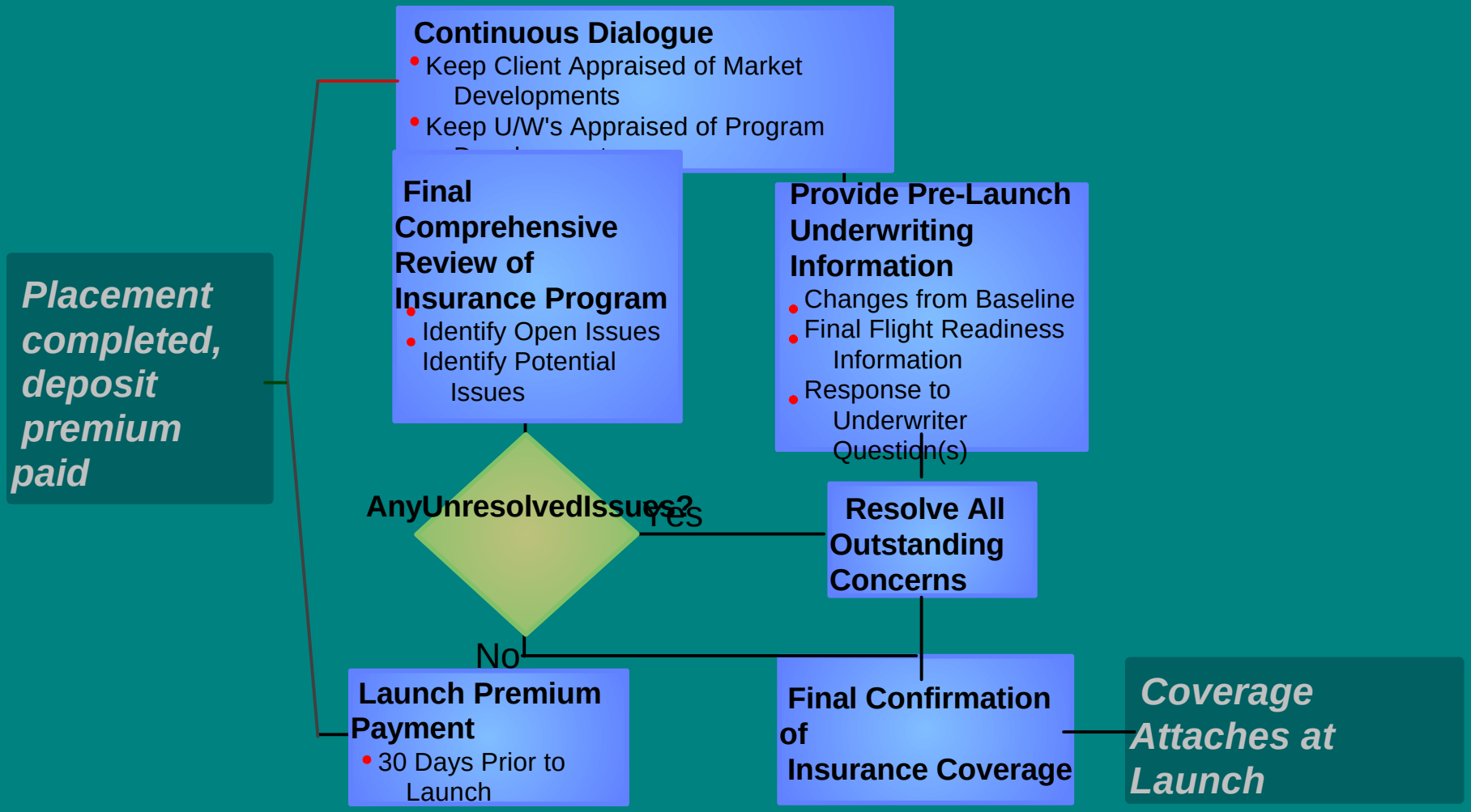
Production of Underwriting Information

- Underwriting Presentation provides detailed underwriting information and ensures disclosure of material facts
- Post presentation questions from underwriters are received by Broker and passed onto Client who provides written answers to underwriter via Broker
- Aim is to close out as many of the written questions as soon as possible following the presentation to ensure underwriters have all the information in order to be able to provide binding quotations
- Some questions will not be able to be answered until near to launch date i.e.
  - Final Fuel Budget
  - Waivers

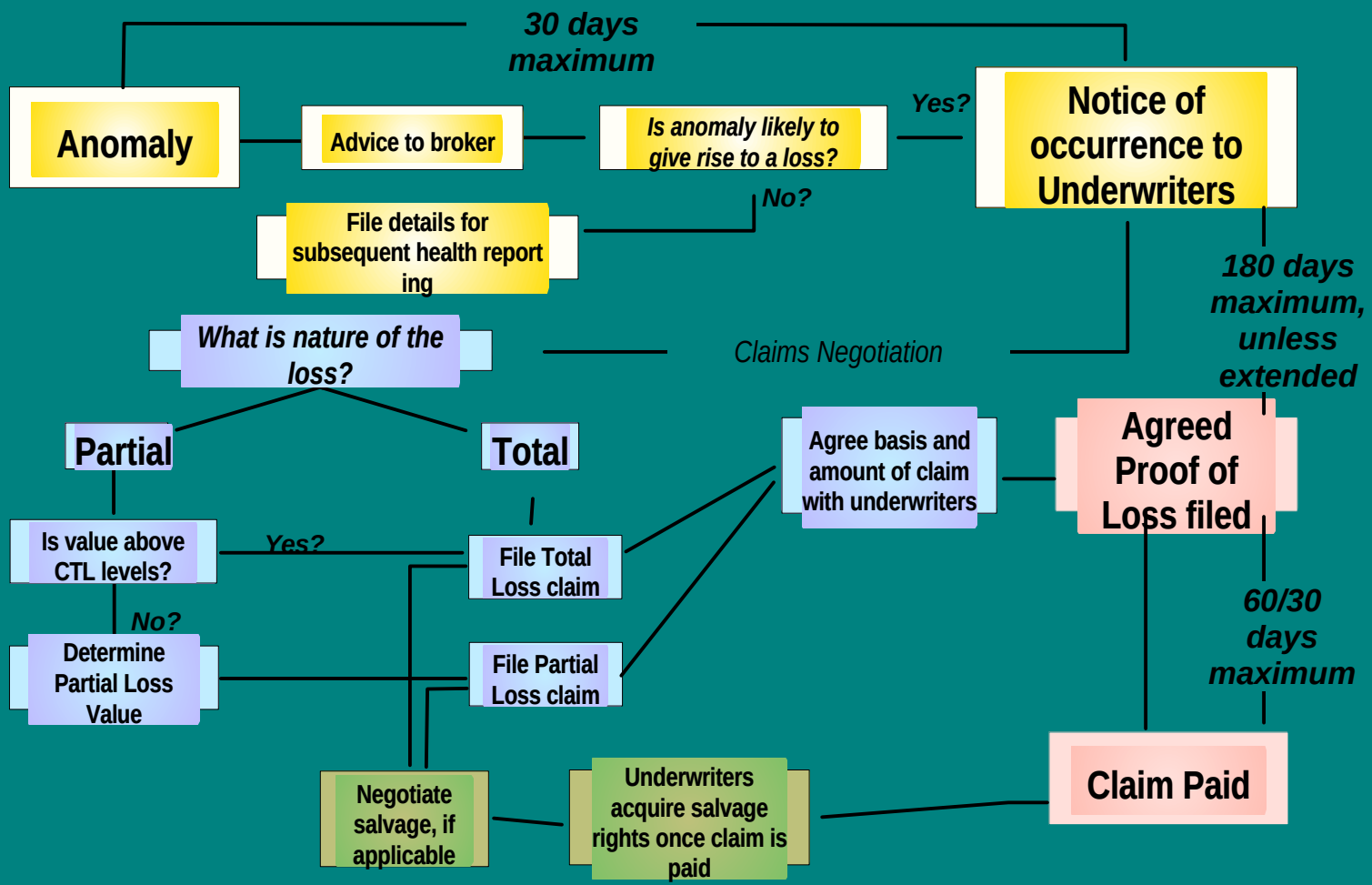
Marketing & Placement of Risk



Post Placement Activities



Claims Procedure



Conclusion

- Placing a complex satellite risk in the market requires a multi-discipline team able to co-ordinate the many activities which have to be completed to ensure a cost effective insurance is obtained
- Placing requires considerable preparation and evaluation of contracts prior to marketing
- Effective marketing requires the identification of the most appropriate underwriters for a given risk and the ability of the broker to capitalise on market conditions for the benefit of the client

Satellite Insurance Market Review

INTRODUCTION

- This briefing outlines the background of the current insurance market
- It includes a list of the 1998 and current 1999 premiums and claims levels and an assessment of the status of the current satellite insurance market
- The briefing also lists all the major underwriters and their current capacity

CONTENTS

- Premiums and Claims
- Market Status
- Capacity

PREMIUMS AND CLAIMS

- 1998 underwriting year resulted in deficit
- Incurred claims are over US$1.65 billion vs. premium of US$850m
- Final figure for 1998 could exceed US$1.90 billion.
- 1999 underwriting year currently in deficit
- 1999 losses to date exceed US$450m vs. a 1st quarter premium of 1999 US$303m

REPORTED CLAIMS FOR 1998

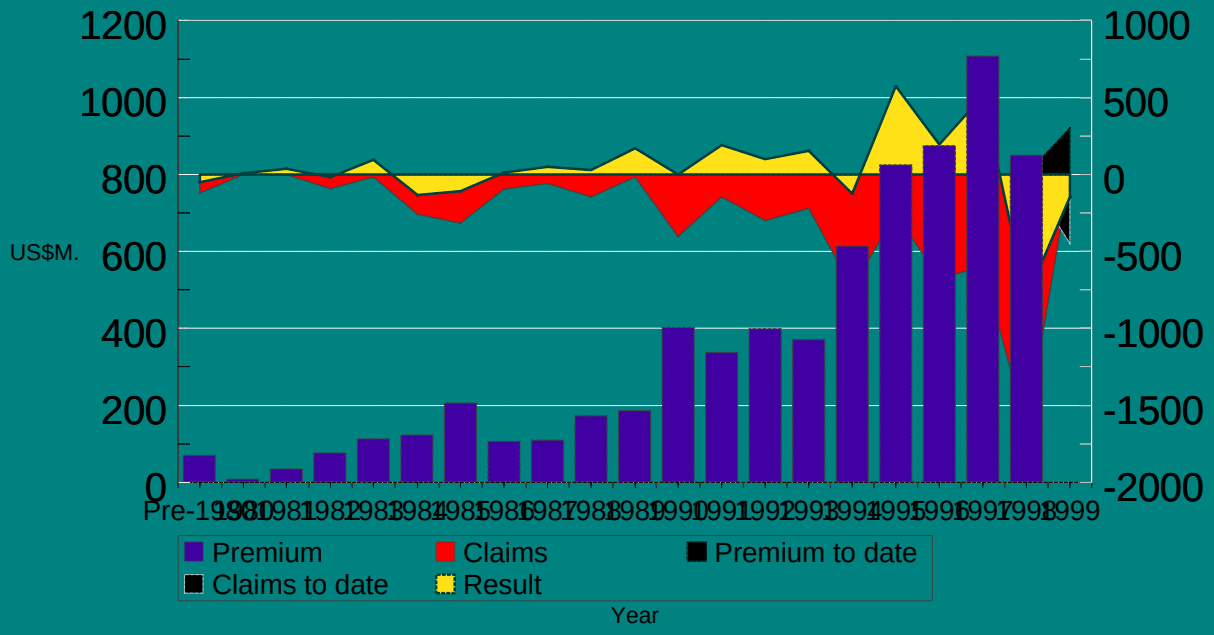
Date	Launcher/ Satellite	Claims (US$)
	Mermaid Sounding Rocket	500,00021/02
	COMETS	8,000,00026/02
	BATSAT	15,200,00016/03
	Cakrawarta -1	20,000,000 (EST)28/02
	UHF F8	1,648,00017/03
	KUPON	84,300,00019/05
	Galaxy IV	165,000,000 (In-orbit)2
	Echostar IV	219,250,000 (EST)14/0
	Iridium Plane 2	59,100,000
17/07	Iridium Plane 6	59,100,0001
	Iridium Plane 5	59,100,00027/08
	Galaxy 10	250,000,000 1/09
	Sirius II	17,457,864 9/09
	Iridium Plane 2	59,100,000 9/09
	Globalstar (12 satellites)	199,500,000 0/11
	Galaxy 8i	No estimate 0/11
	Pas 5	205,000,000 0/11
	Pas 8	68,000,000 (EST)23/11
	Palapa C1	166,500,00025/11
	Afristar	No estimate
	Total	1,656,755,864
		==========

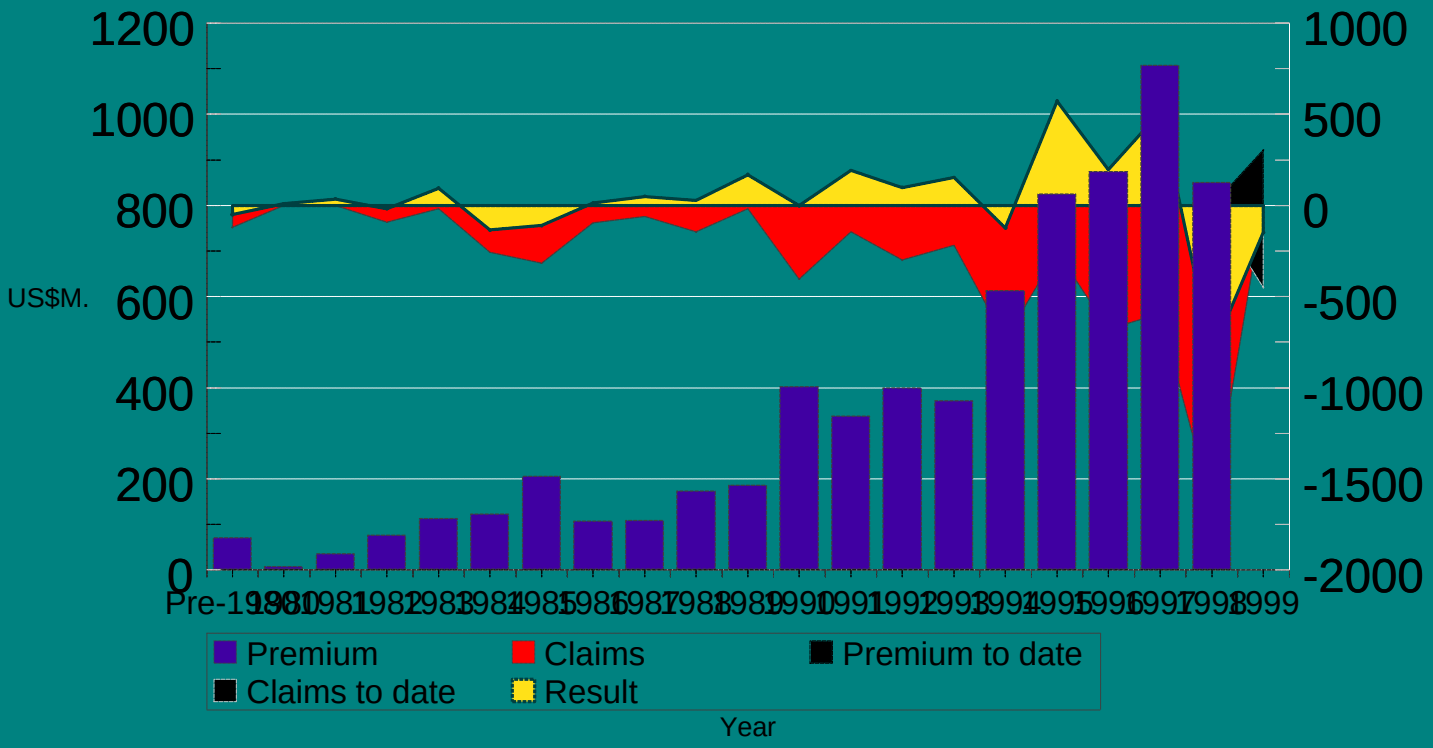
REPORTED CLAIMS FOR 1999

- REPORTED CLAIMS FOR 1999Date Launcher/ Satellite
  Claims (US$)26/03 Astra 1A
  27,400,00027/04 Ikonos 1
  157,000,000 4/05 Orion 3
  265,606,000
  12/04 Eutelsat WF3 No estimate 0
  Solidaridad 1 No estimate

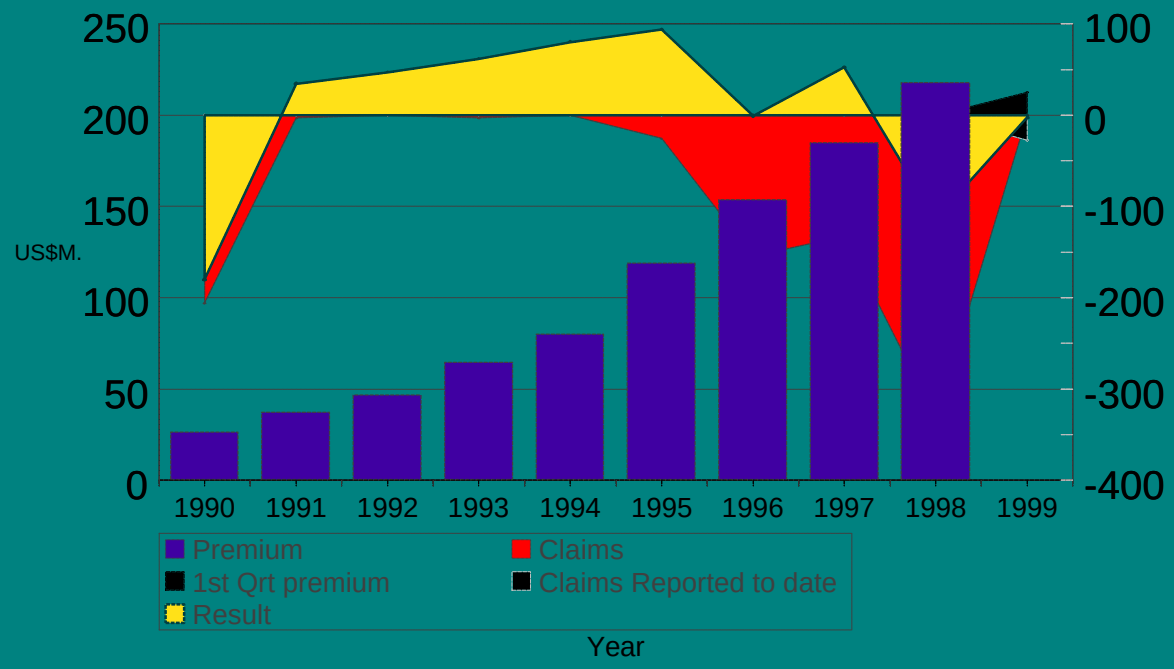
  Total 450,006,000
  ==========

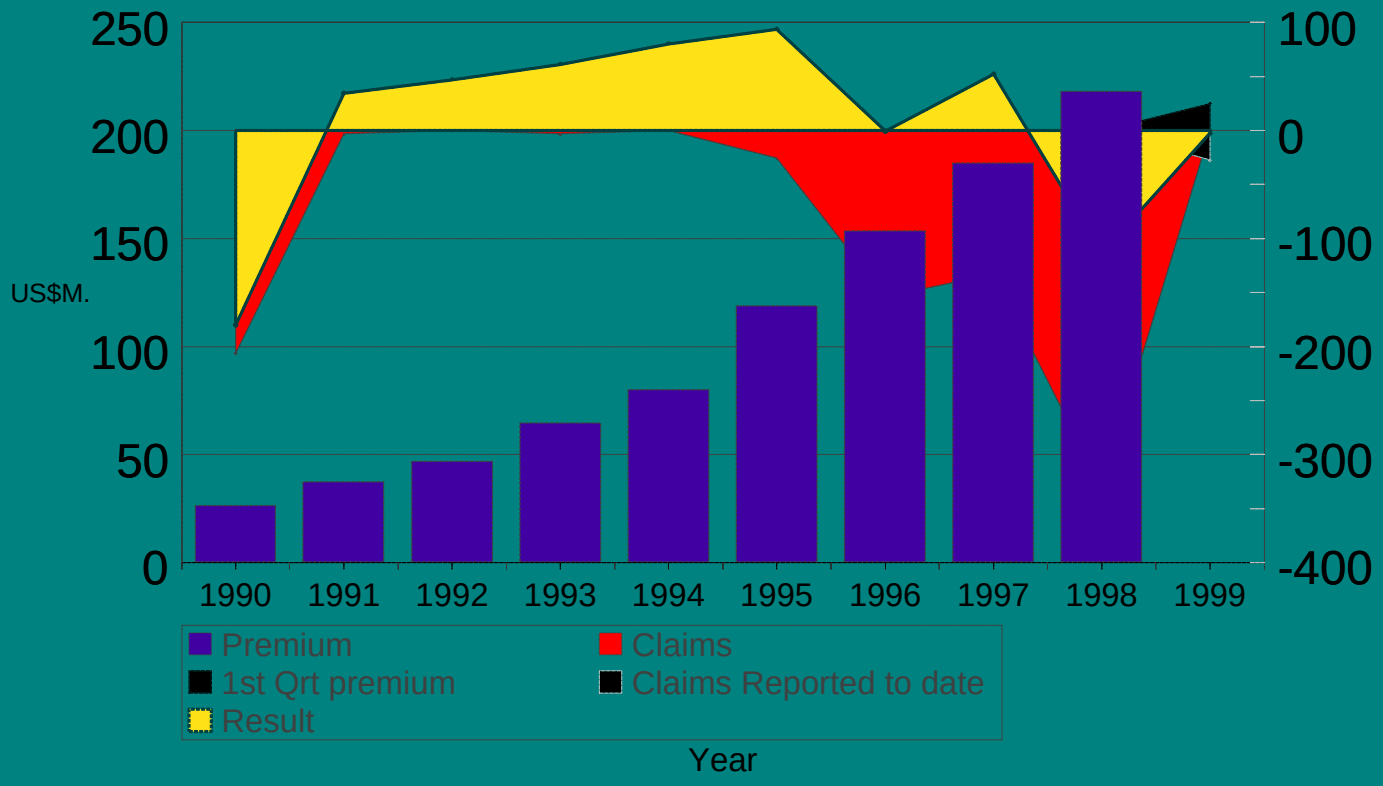
ANNUAL PREMIUMS AND CLAIMS (INCURRED)



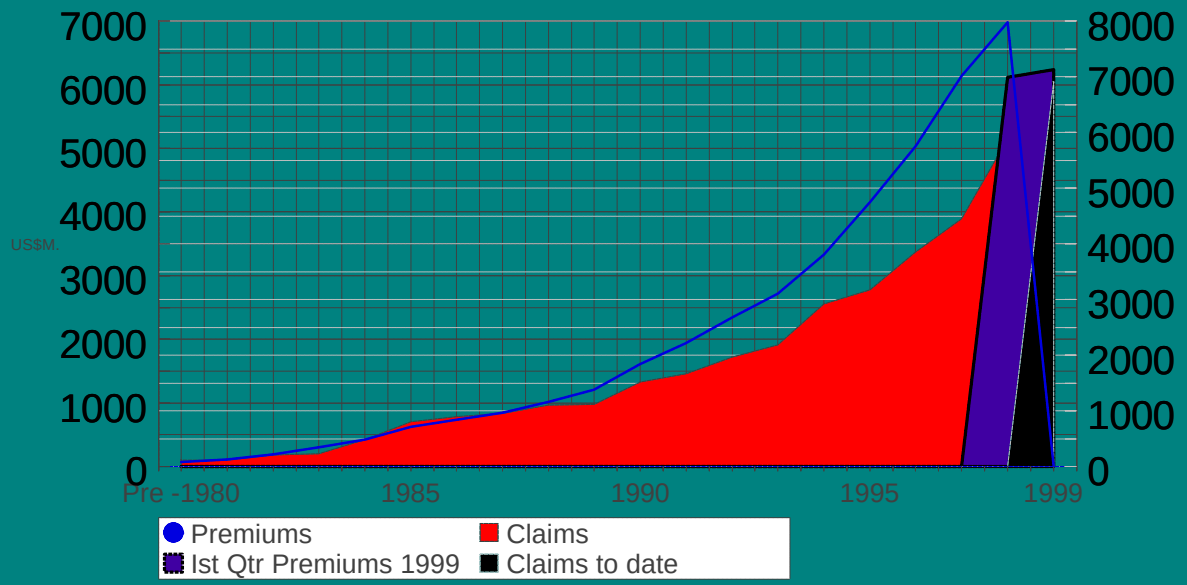

1200
1000
800
600
400
200
0
US$M.
1000
500
0
-500
-1000
-1500
-2000
Pre-1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Premium
Claims
Premium to date
Claims to date
Result
Year

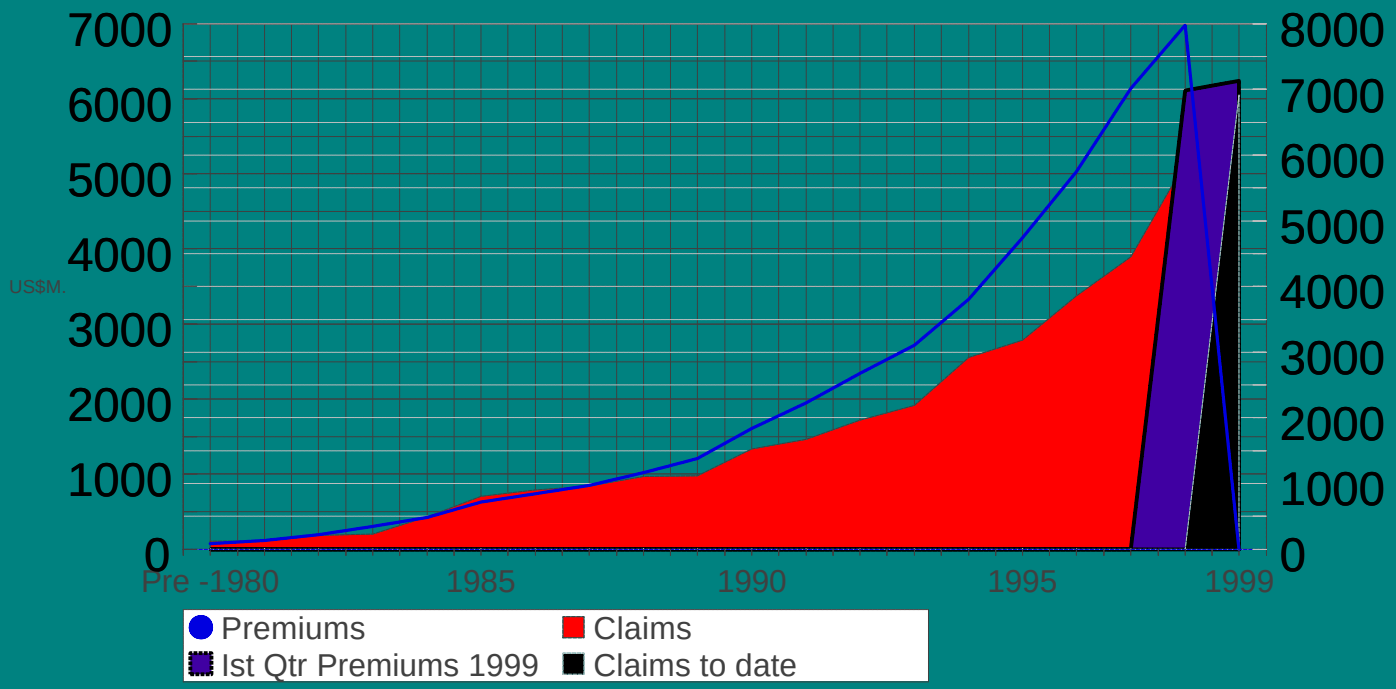
ANNUAL IN-ORBIT PREMIUMS AND CLAIMS




250
200
150
100
50
0
US$M.
100
0
-100
-200
-300
-400
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Premium
Claims
1st Qrt premium
Claims Reported to date
Result
Year

PREMIUMS AND CLAIMS SINCE 1975

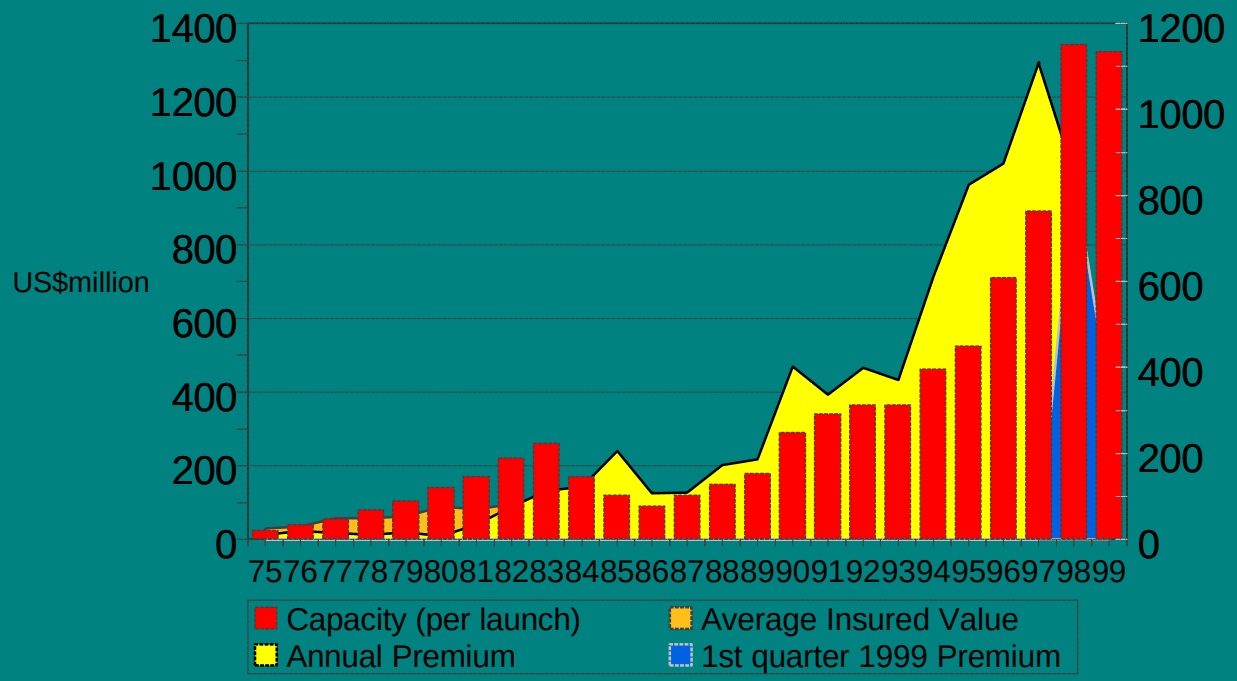


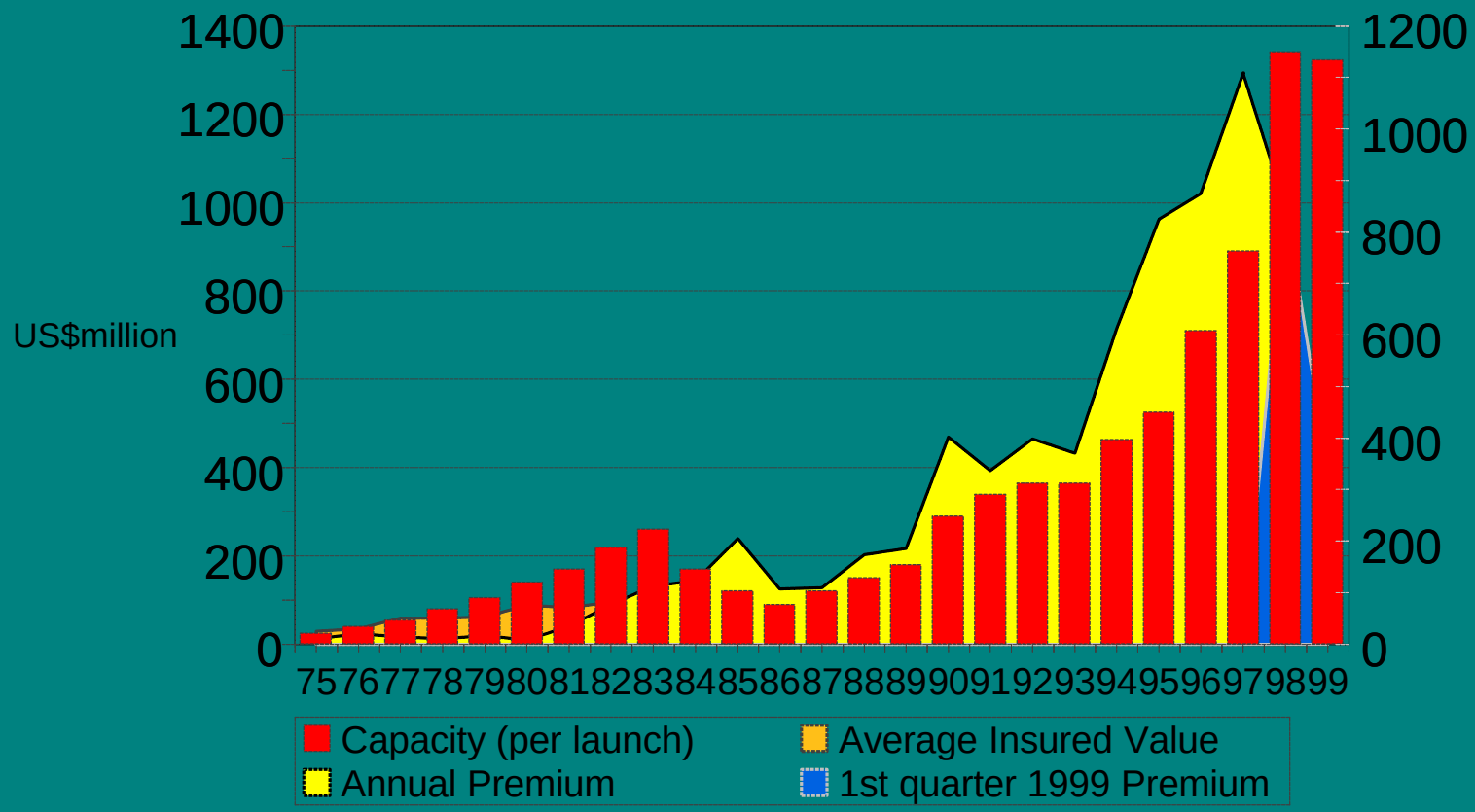

7000
6000
5000
4000
3000
2000
1000
0
US$M.
8000
7000
6000
5000
4000
3000
2000
1000
0
Pre -1980
1985
1990
1995
1999
Premiums
Claims
Ist Qtr Premiums 1999
Claims to date

UNDERWRITING RESULTS

- Overall market is still profitable although the difference between total premium and claims is becoming smaller all the time
  - Total premiums to end March 1999: US$7,129,220,000
  - Total claims at May 4 1999: US$6,609,021,800
- 1998 and first half of 1999 have represented a substantial change in the underwriting result
- Recent history has seen several years of steady profits followed by significant losses in the past one and a half years
- Much speculation as to whether trend of losses will continue in the future or market will return to profit

CAPACITY/LAUNCH COMPARED TO INSURED VALUES & PREMIUM

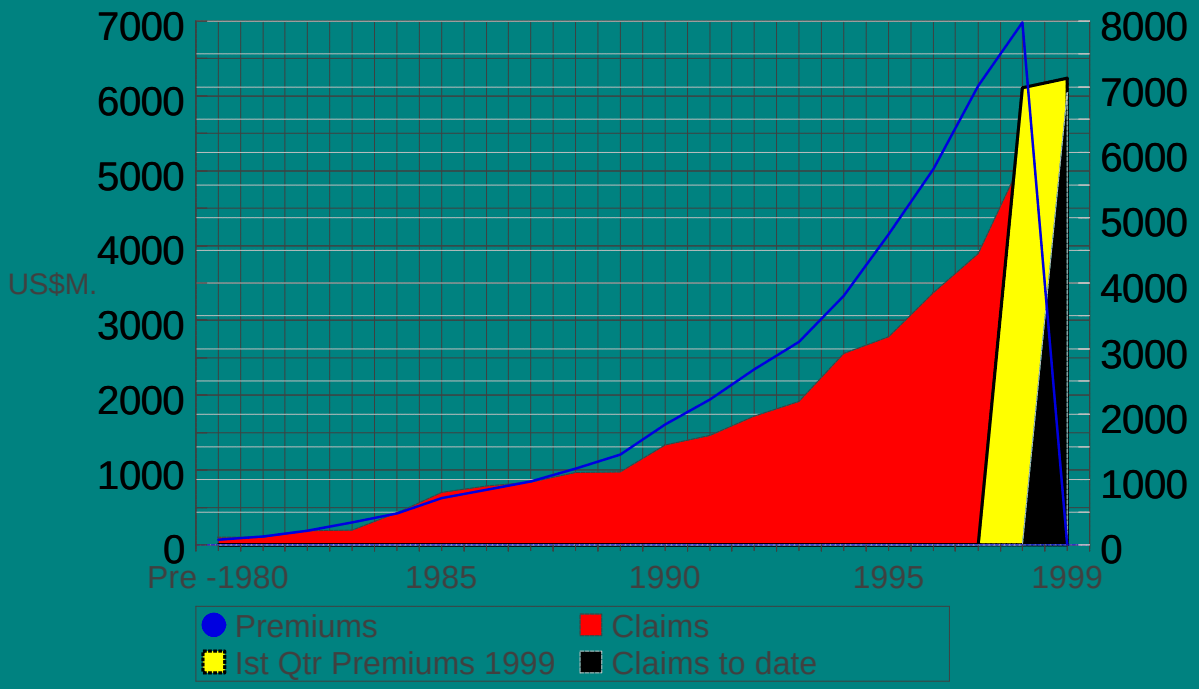


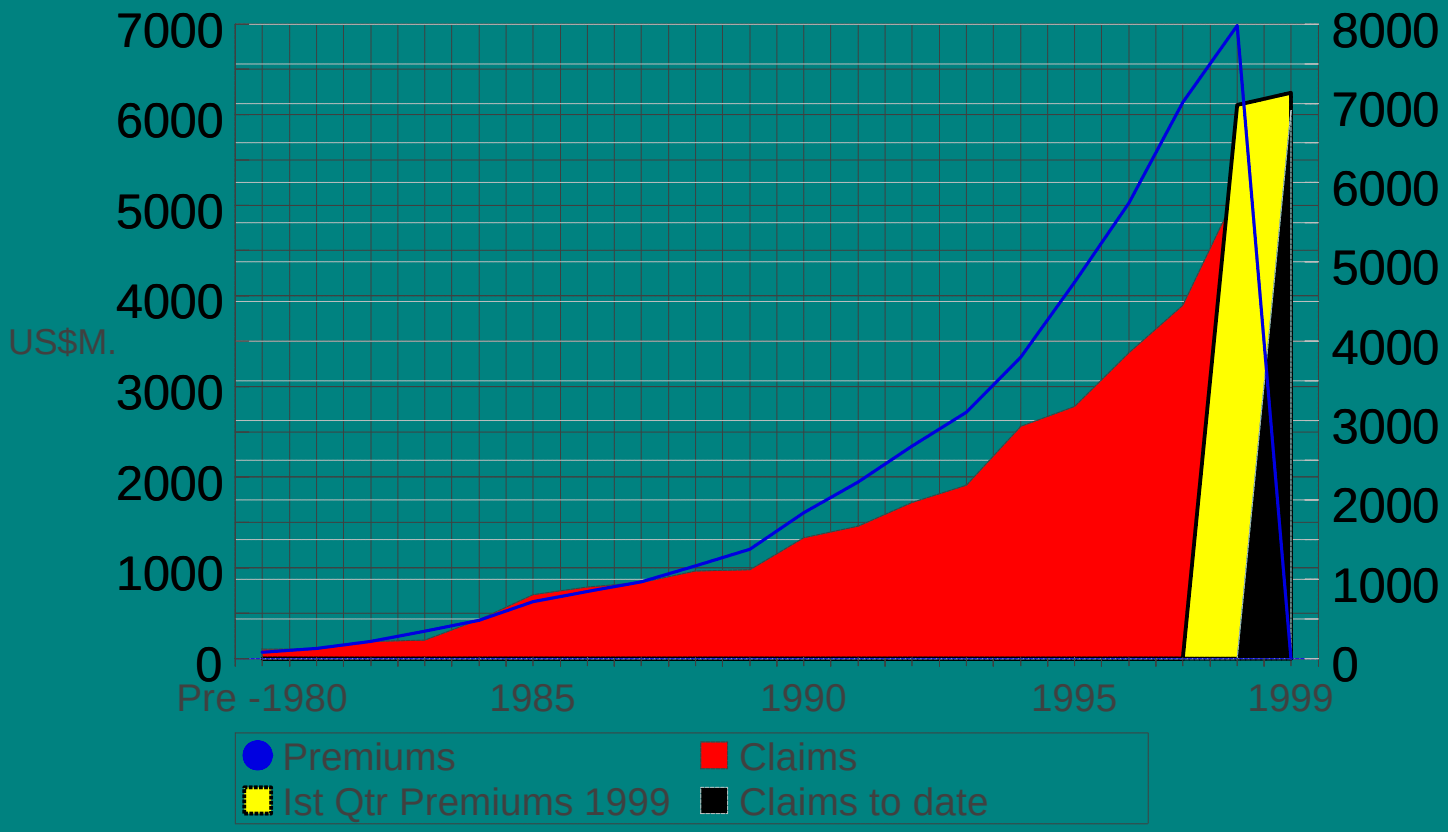

US$million
1400
1200
1000
800
600
400
200
0
1200
1000
800
600
400
200
0
75767778798081828384858687888990919293949596979899
Capacity (per launch)
Average Insured Value
Annual Premium
1st quarter 1999 Premium

IMPACT OF CLAIMS ON MARKET

- Timing of final settlement of claims has exacerbated impact on market
  - In December 1998 losses for 1998 year reported as being approx. 1.4bn
  - By June 1999 actual settled losses for 1998 have risen to US$1,656,755,864
  - In addition new 1999 losses up to June '99 - US$673,006,000
  - Therefore effective 'new' losses during 1999 - US$ 929,761,864

Premiums & Claims since 1975




7000
6000
5000
4000
3000
2000
1000
0
US$M.
8000
7000
6000
5000
4000
3000
2000
1000
0
Pre -1980
1985
1990
1995
1999
Premiums
Claims
Ist Qtr Premiums 1999
Claims to date

IMPACT OF CLAIMS ON MARKET

- Effect of claims mitigated to some degree by substantial new underwriting capacity in recent years
- This new capacity avoided many of the losses in the past year and thus kept rates competitive
- However new underwriters have now started suffering similar losses to rest of the market and as a result are adopting similar attitudes

CLAIMS ANALYSIS

- No single reason for increase in claims although significant factors are
  - Increasing number of in-orbit failures
  - Failure of launch vehicles, particularly new models/variants
- A number of satellites in-orbit have suffered anomalies, which do not result in claims but have left satellites operating with reduced margins or potential single point failures

Natural Phenomena

- No real evidence that Natural Phenomena have caused losses to modern satellites
- Low and Medium orbit constellations may be more at risk from debris or meteorite damage
  - redundancy built into system
  - procedures developed for damae limitation
    e.g. Leonid period
- Understanding of problem should be incorporated into design & system architecture
- Trade off between mass, cost & reliability

Natural Phenomena

- Insurers are concerned with unknown factors
- Catastrophe potential needs to be understood
  - to develop market to reduce aggregate exposure
    - space market already taking original losses
    - ?? market to underwrite the "natural phenomena" losses
  - to develop realistic rating levels

CURRENT UNDERWRITING PHILOSOPHY

- Following recent claims underwriters are very cautious of underwriting new risks
- Increasing requests from underwriters for detailed technical information prior to underwriting risks, however, this is becoming more difficult due to US Govt ITAR restrictions
- Underwriters less inclined to offer longer coverage periods and are looking to reduce their long term commitments
- Underwriters are trying to impose rate increases but over capacity of market may still restrict amount of any increases
- Natural Phenomena not a major consideration

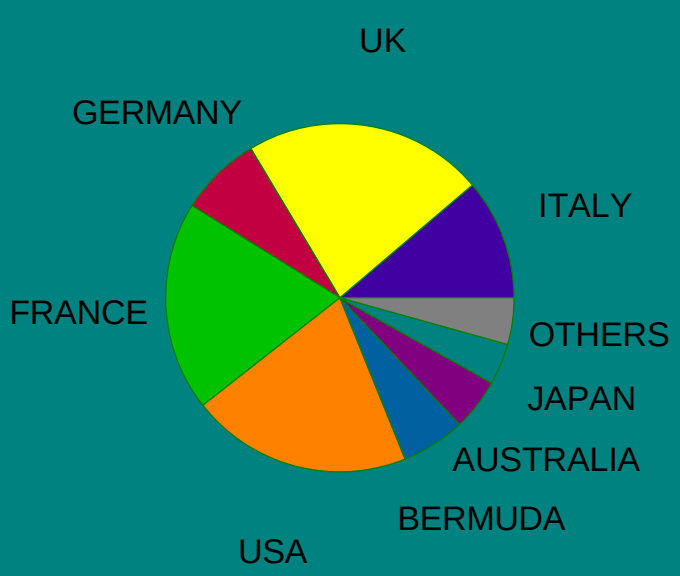
CURRENT UNDERWRITING PHILOSOPHY

- Failures have also led to several types of launcher being grounded and delays in delivery of new satellites (due to investigation into failures of similar satellites in-orbit) underwriters will require evidence that investigations and tests have been completed
- These launch delays have restricted premium income to underwriters, which further exacerbated underwriting results
- Introduction of new types of satellite and launch vehicle has presented underwriters with a serious problem. Loss experience, especially recently, suggests that a conservative approach is required for such risks

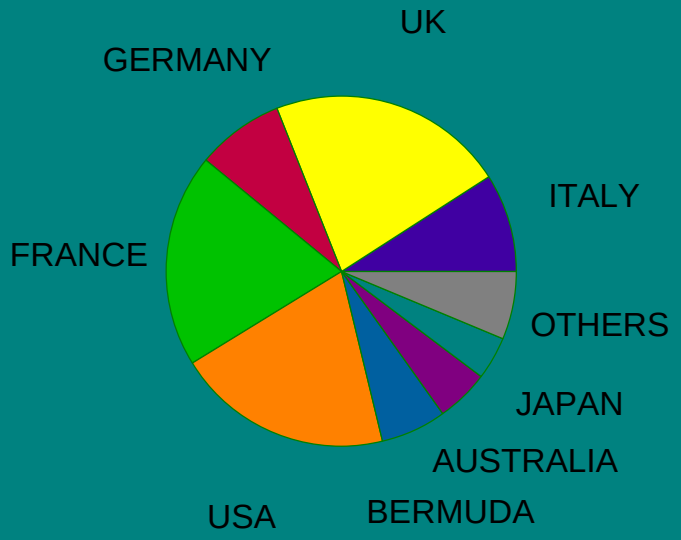
UNDERWRITING CAPACITY

- As yet overall space market capacity has not been adversly effected by the poor underwriting results
- However in the current climate underwriters may not be as willing to commit their full capacity to any one placement
- This means the 'actual' capacity available for any placement may be substantially less than the 'theoretical' capacity shown in the following charts

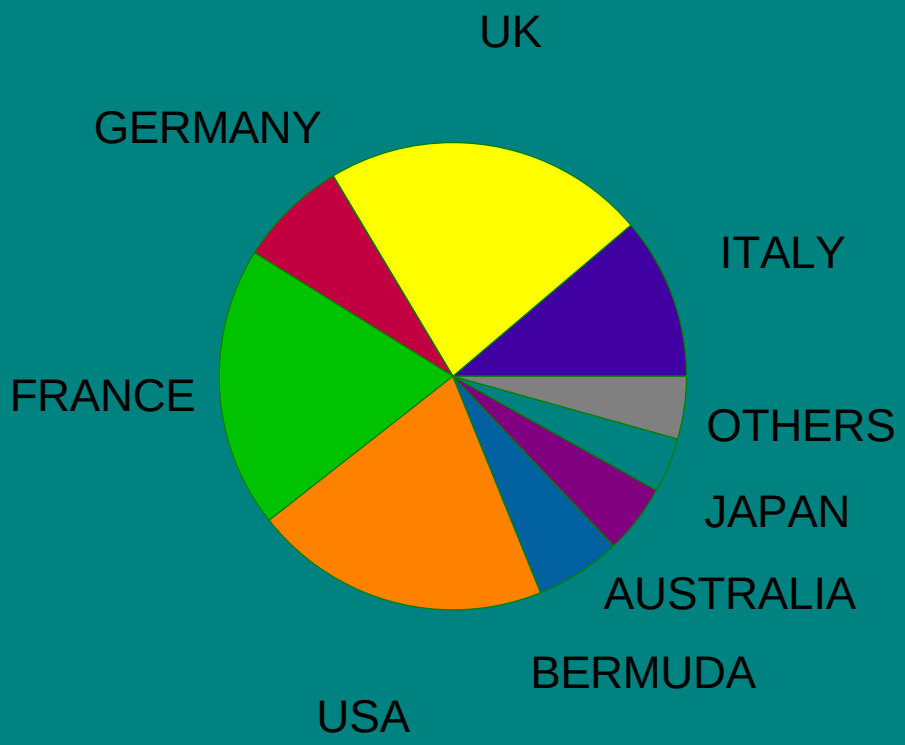
GEOGRAPHICAL CAPACITY DISTRIBUTION

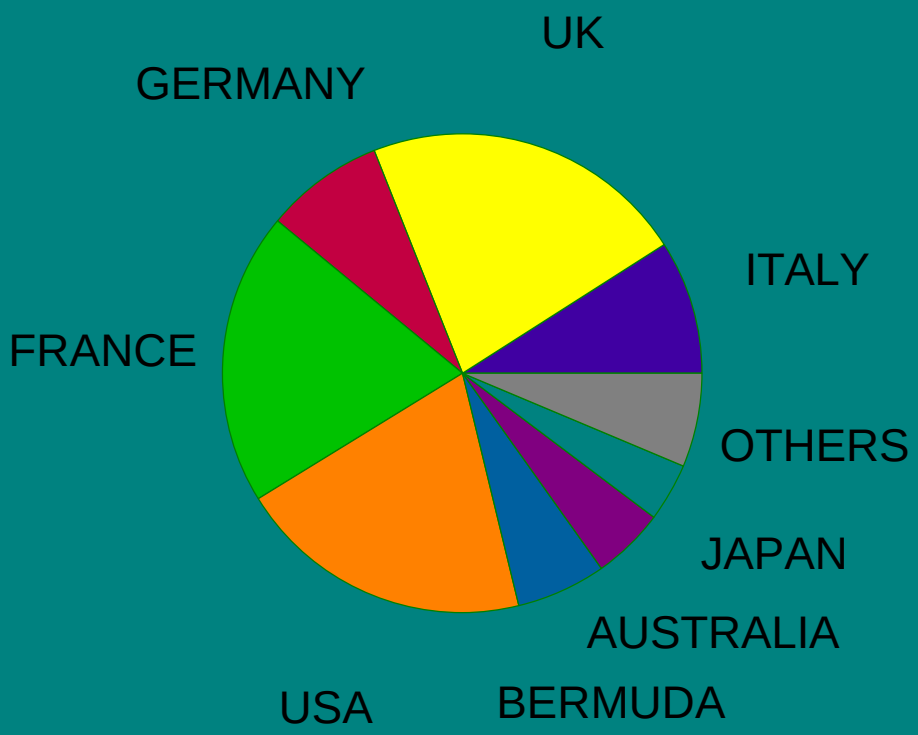


Based on a maximum launch capacity of US$915,245,000

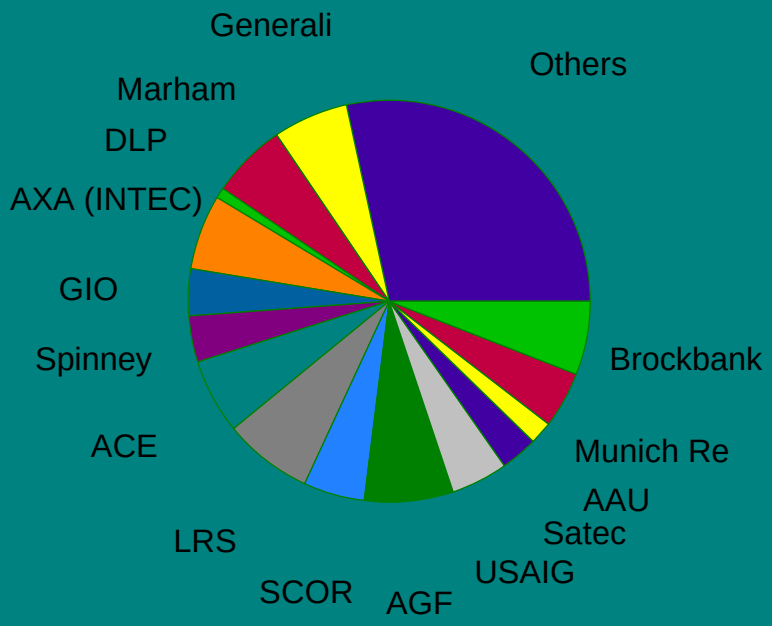


Based on a maximum launch capacity of US$1,342,250,000

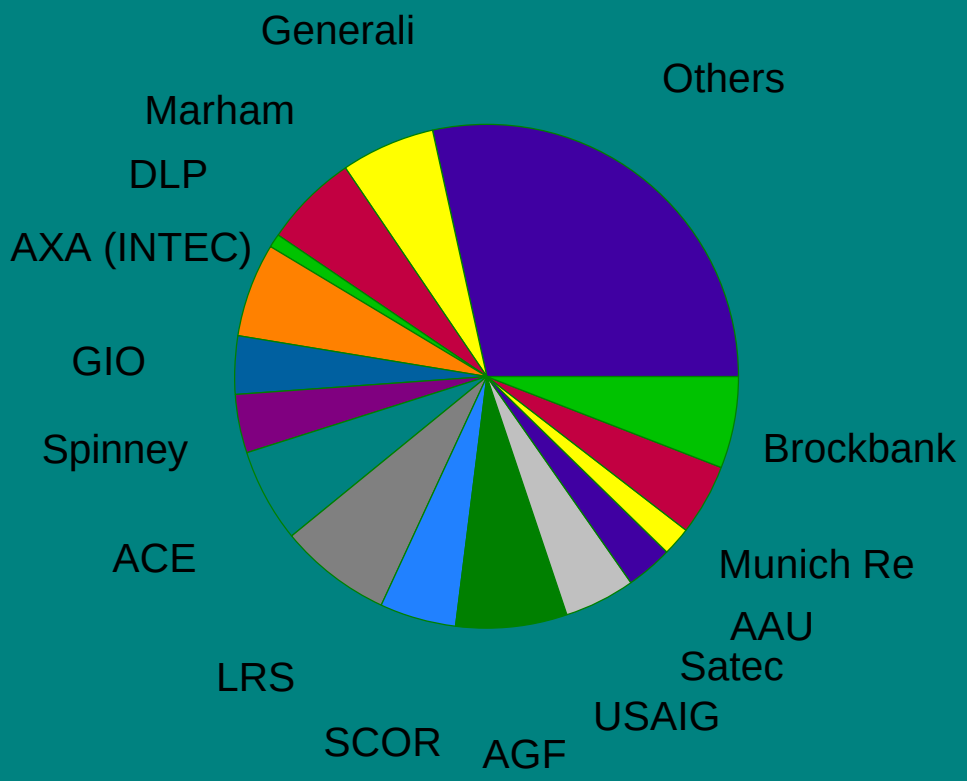

UK
GERMANY
ITALY
FRANCE
OTHERS
JAPAN
AUSTRALIA
BERMUDA
USA


UK
GERMANY
ITALY
FRANCE
OTHERS
JAPAN
AUSTRALIA
USA
BERMUDA

KEY MARKET CAPACITY - 1999

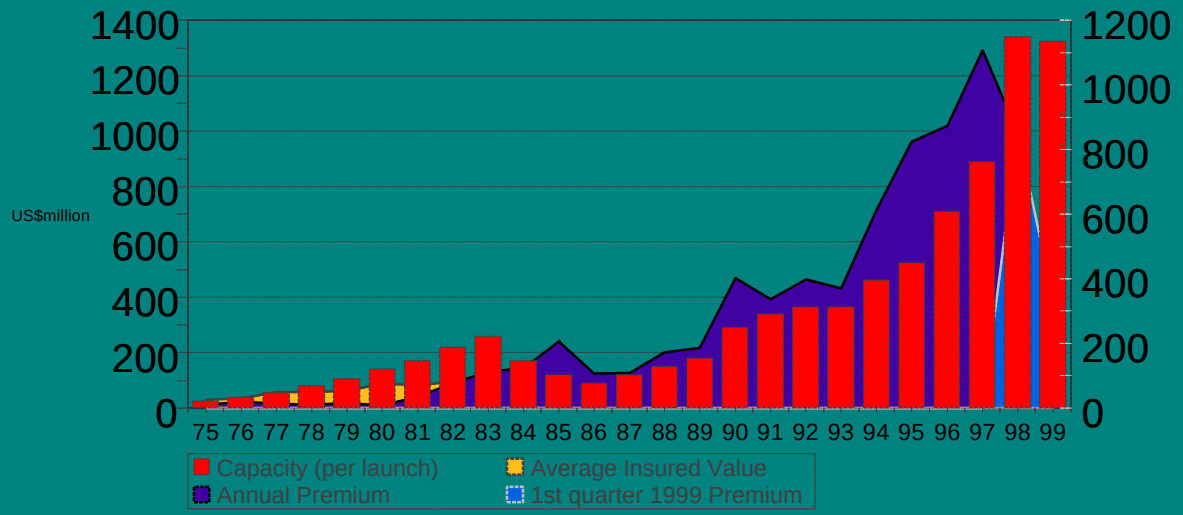


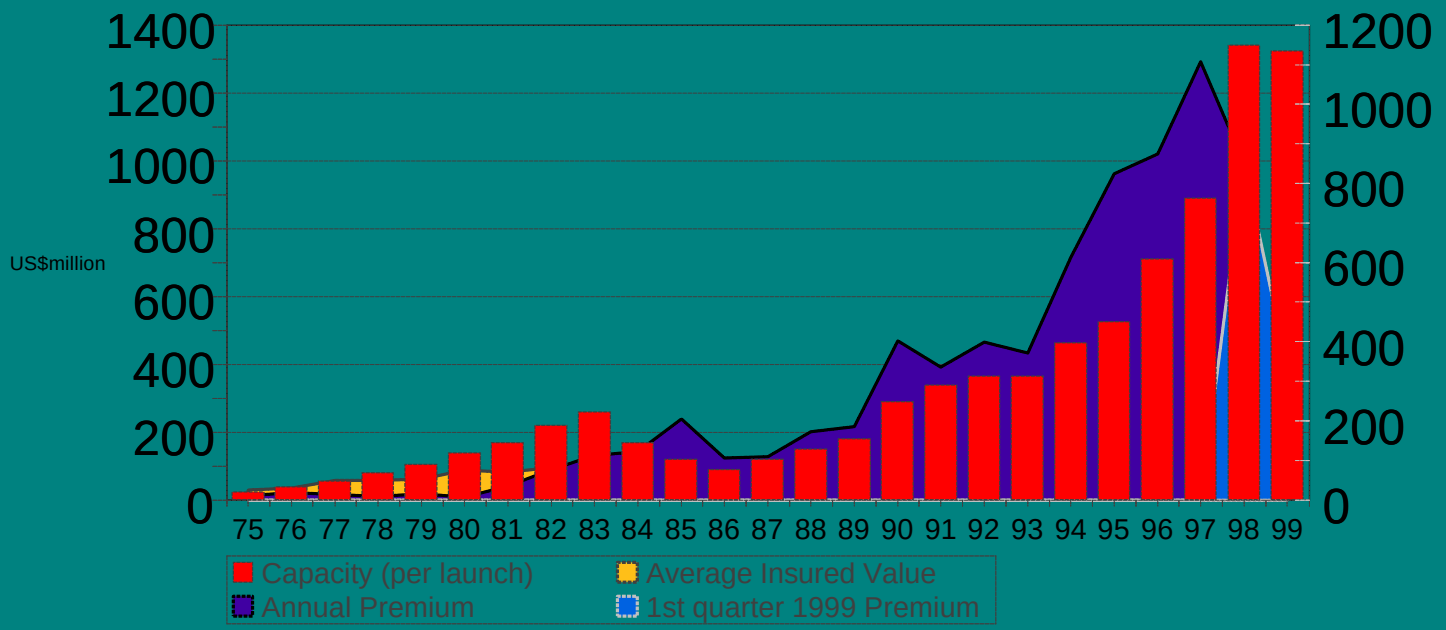
Based On Total Maximum Per Launch Capacity of US$1,323,750,000
All figures in US$millions



Based On Total Maximum Per Launch Capacity of US$1,323,750,000
All figures in US$millions

CAPACITY/LAUNCH COMPARED TO INSURED VALUES & PREMIUM




US$million
1400
1200
1000
800
600
400
200
0
1200
1000
800
600
400
200
0
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
Capacity (per launch)
Average Insured Value
Annual Premium
1st quarter 1999 Premium

CONCLUSION

- Market is in a state of change following worst claims year on record
- 1999 has started badly and many underwriters are talking about the need for a sharp increase in rates or restrictions on coverage terms and periods
- Whilst the over capacity in market has restricted ability to change current market practices, losses borne by new capacity with an insufficient premium base provides further pressure for significant changes in terms and conditions
- Underwriters are also likely to request more detailed technical information and health reporting