

SPACE INSURANCE

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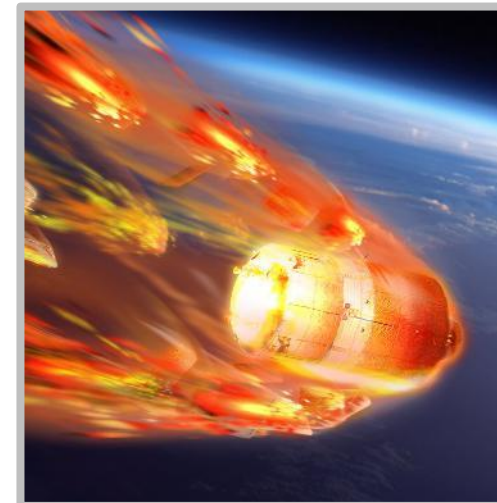
Brief History of Space Insurance

- 1965: Earlybird satellite insured for Pre-Launch cover at Lloyd's
- 1968: Intelsat III insured for Launch
- 1975: Intelsat IV insured for Launch + in-orbit
- 1980's: Initial satellite TV services offered. Insurance cover provided by aviation market
- 1984: Lloyd's supports mission to recover Palapa B2 and Westar VI satellites (see pictures) as salvage. Satellites refurbished and re-launched
- 1990's: Spurred by commercial satellite TV services, Space Insurance becomes a distinct class
- 2000: US passes Open Market Reorganisation for the Betterment of International Telecommunications Act (ORBIT Act) which leads to the privatisation of previous intergovernmental agencies, brings much more private finance into space sector
- 2000+: Growth of commercial space sector across multiple satellite applications provides multiple insurance opportunities



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Space Insurance Products



Pre-Launch

Launch + 1st year

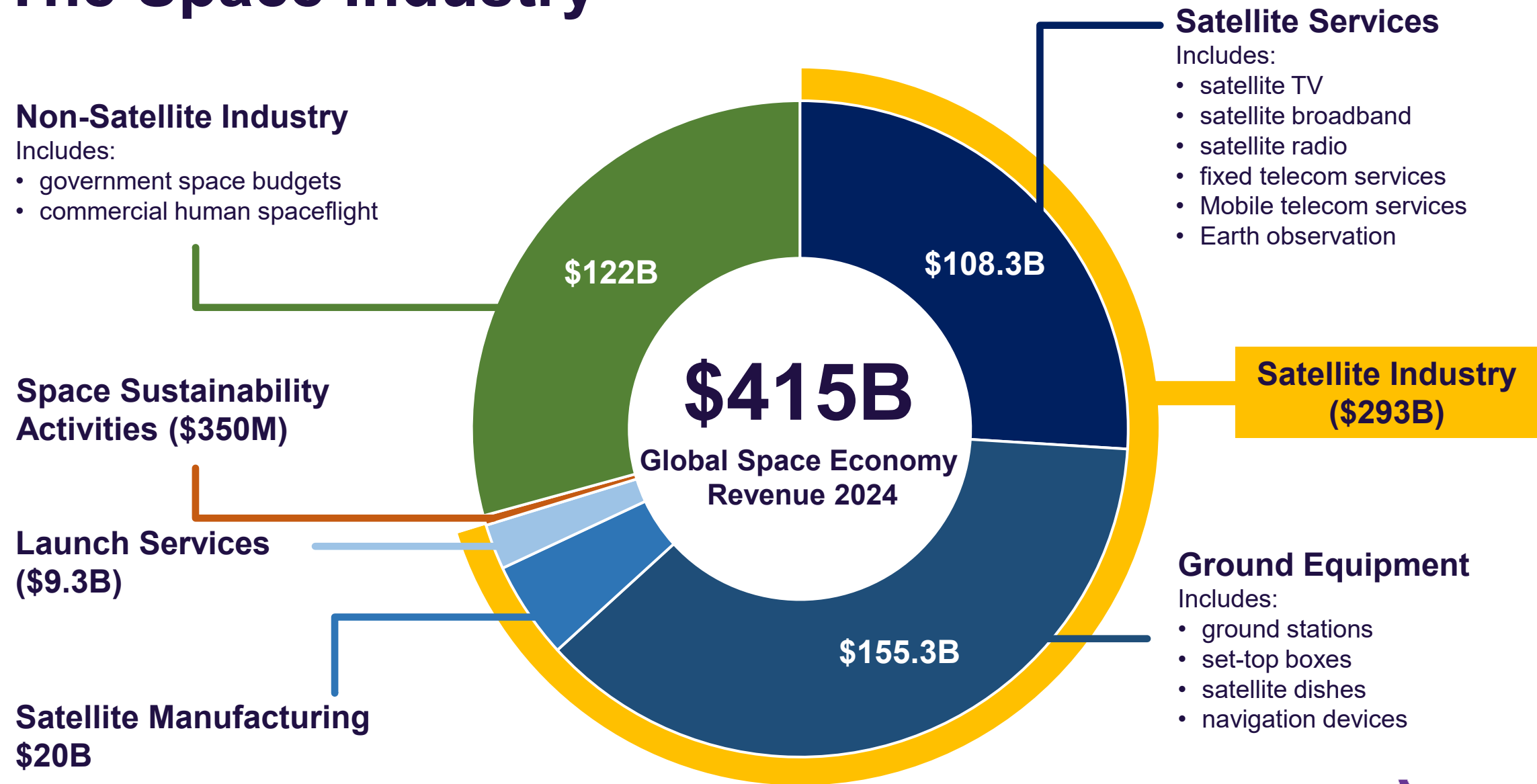
In-Orbit

End of Life

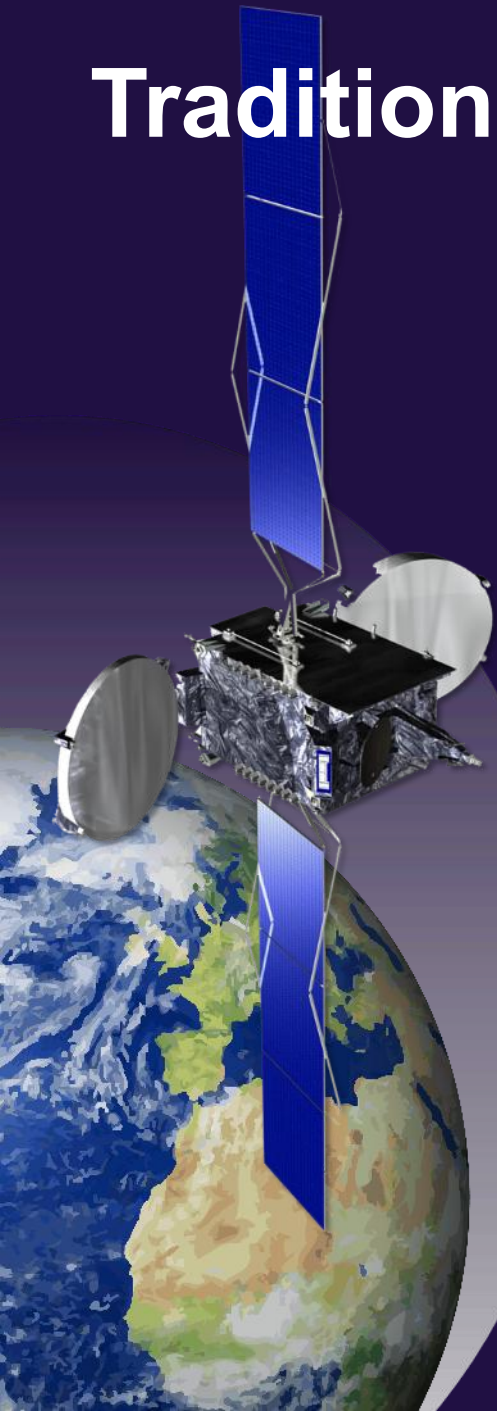
“Asset cover”

Third Party Liability

The Space Industry



Traditional Space Insurance



ISS Cargo Delivery

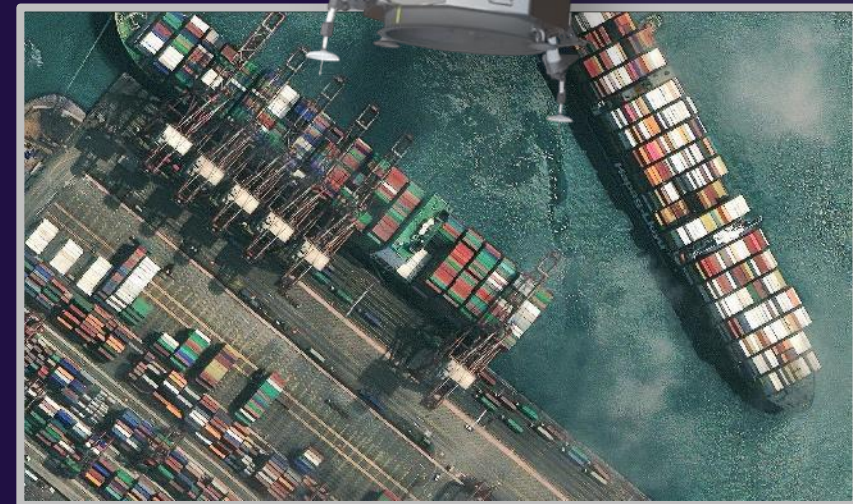
Insured values USD 50m – 150m

Communications

Insured values USD 100m – 500m

Earth Observation

Insured values USD 50m – 400m



New Space

- “New Space” describes a shift from government-dominated space programmes to commercial space activities
- Large influx of private investment (SpaceX; Blue Origin, etc)
- Reusable launch vehicles reduce launch cost
- Advanced electronics reduce cost of satellites
- Lower costs make new satellite applications competitive when compared to terrestrial alternatives
- Governments / militaries switch from dedicated satellite programmes to purchasing satellite services
- New satellite and launch vehicle designs proliferate to capture share of burgeoning market



© NASA / Monica Fuentes Carroll / Houstoniamag.com

New Space: Reusable Launch Vehicles

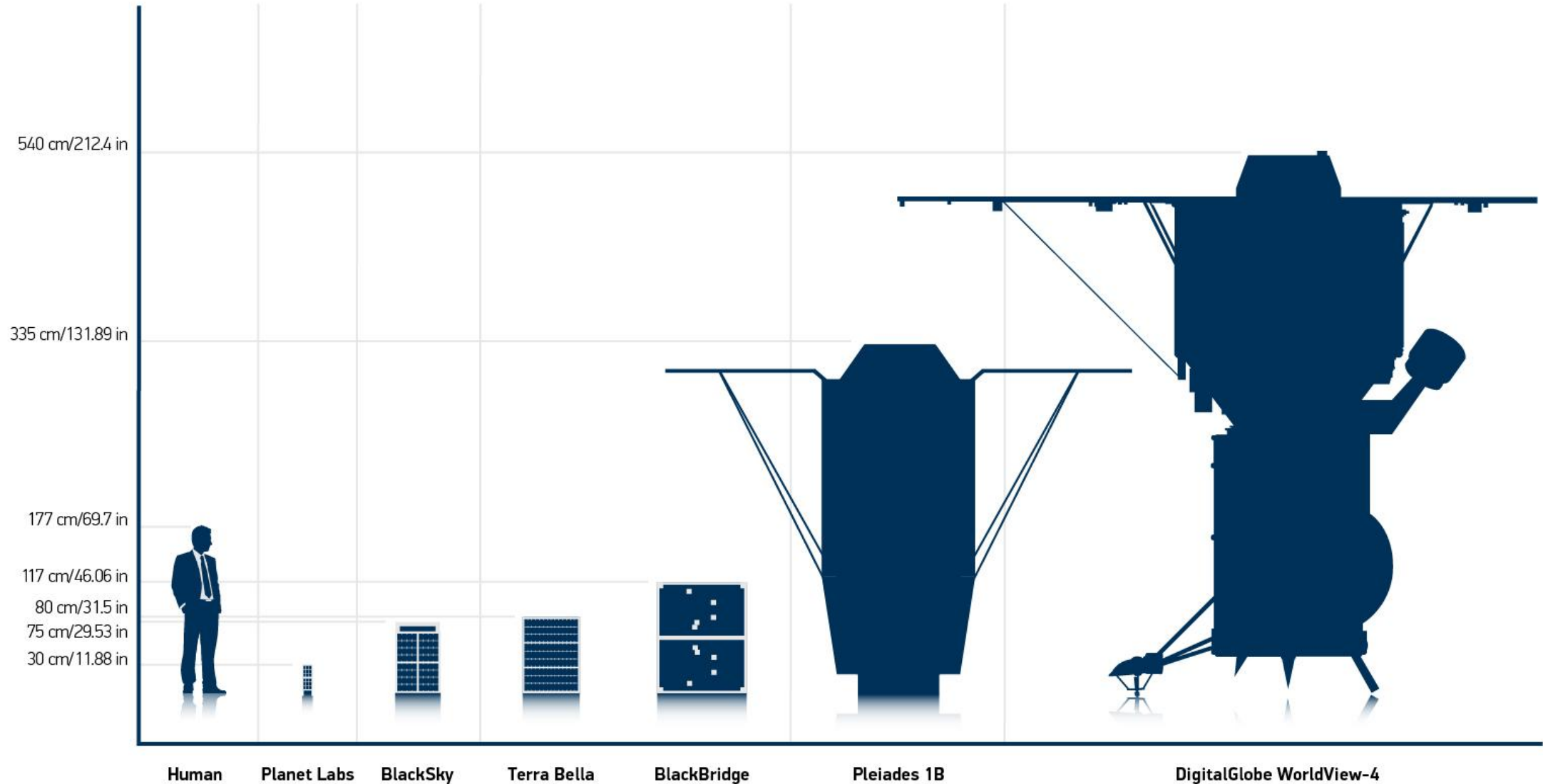
Falcon 9 launch vehicle

First stage
Reused >550x
Individual stage 34x



Payload fairing
Reused >300x
Individual fairings >36x

New Space: Advanced Electronics



New Space: Constellations

EXISTING CONSTELLATIONS

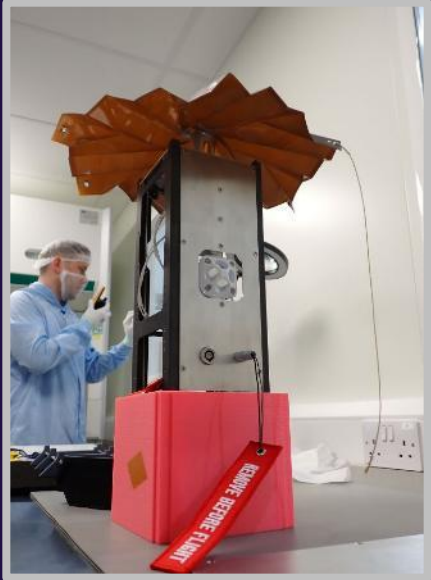
Name	# sats launched	Altitude
SpaceX Starlink	10,302	550 km
OneWeb	654	1100 km
Amazon Kuiper	239	590-630 km
Planet	129	475-525 km
Qianfan	126	800-1160 km
Spire	82	400-600 km
Iridium Next	80	780 km
Globalstar	48	1400 km
Kepler	33	575 km
O3b	28	8062 km
Globalstar	48	1,400 km
Maxar WorldView	10	480 km



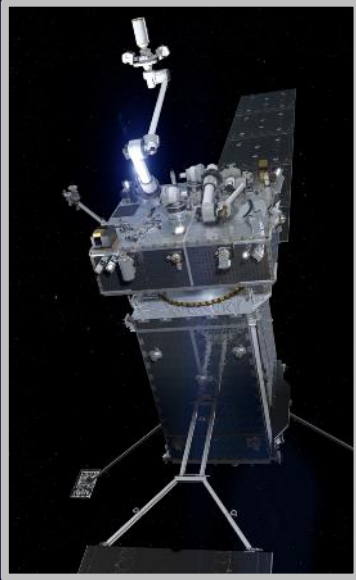
PLANNED CONSTELLATIONS

Name	# sats launched	Altitude
Cinnamon 937	337,320	550-640 km
SpaceX Starlink	>6,000	550 km
Amazon Kuiper	~3,000	590-630 km
Hanwha Systems	2,000	TBA
Qianfan	~1,150	800-1160 km
Hongyan	~500	1150 km
AST Bluebird	243	520 km
Telesat Lightspeed	117	1000 km
Globalstar Thunder	17	1400 km
Rivada Networks	600	1050 km

New Space: New Applications



**In-orbit
manufacturing**



**Satellite
Servicing**



**Lunar
Missions**



**Space
Tourism**



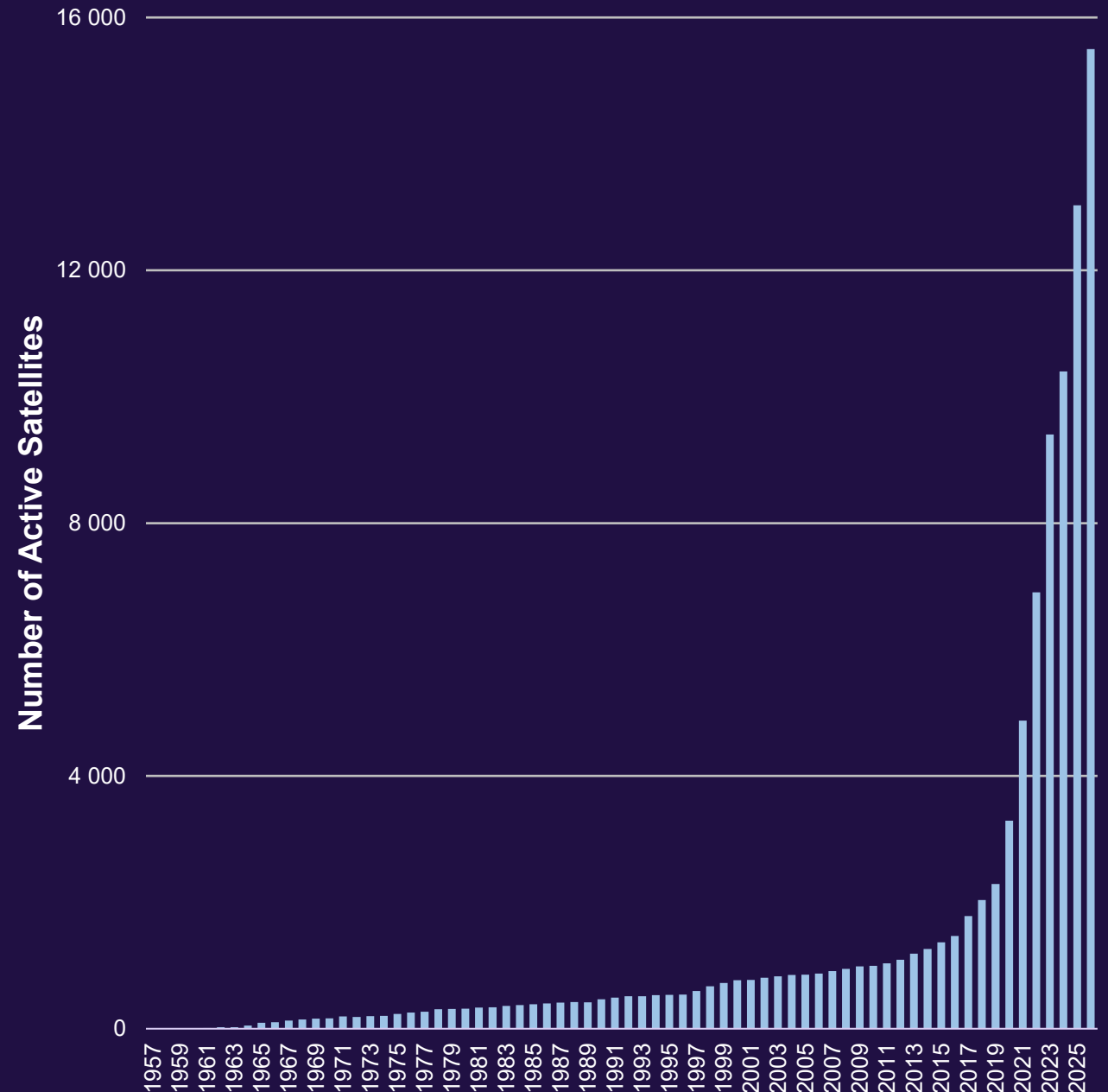
**Commercial
Space Stations**



**Military
Services**

New Space: New Risks

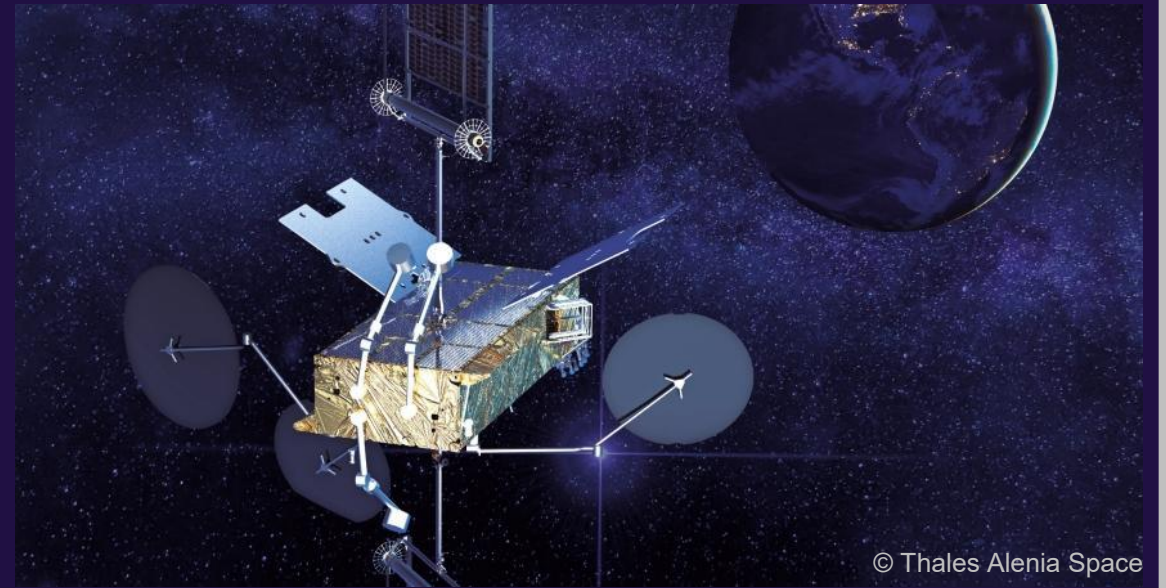
- Reduced testing: Mass production means only first few satellites fully tested prior to launch
- COTS technology: Commercial-Off-The-Shelf components increasingly used rather than space qualified components to reduce cost
- Space weather: some COTS components may be more susceptible to the effects of space weather
- Generic defect: a latent defect in a component used in a constellation of satellites could affect multiple satellites
- Targets of interest: as commercial satellites provide more services to militaries they could become targets of interest for hostile actors
- Congestion: the vast number of satellites now being launched (see chart to right) means space is becoming increasingly crowded



New Space and Insurance

INSURANCE CONCERNS

- New technology
- Significant accumulation of exposure to latent defects in constellations
- Congestion
- Will sufficient insurance capacity be available for some of the largest projects

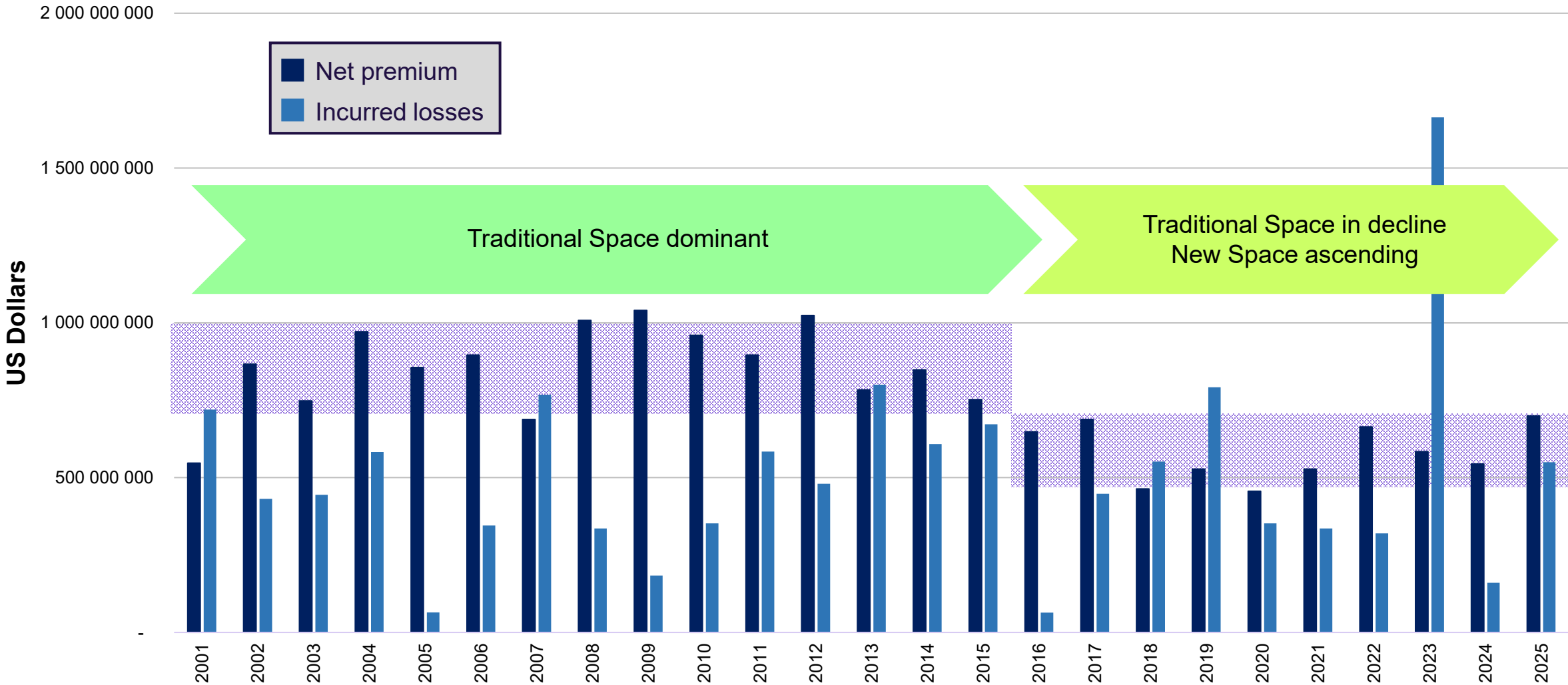


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INSURANCE OPPORTUNITIES

- Broader portfolio of risks
- Increasing number of risks to insure
- Better salvage opportunities with reprogrammable satellites and on-orbit servicing
- Space War coverage?
- Parametric solutions?

New Space and Insurance (cont)



Ref: Axa XL

Conclusions

- The space industry is in a period of significant change
- Traditional satellite applications are in decline
- The space insurance market premium remains depressed making the class very volatile to large losses
- Space insurers are having to adapt to a new paradigm
- New space applications are constantly emerging
- Humanity's ever greater reliance on satellite services will continue
- Space is a finite resource and sustainability of the space environment is essential
- Demand for space insurance is expected to grow as many of the New Space startups exit their early-stage financing and raise debt to fulfil their expansion plans

