



RTT TECHNOLOGY TOPIC December 2023

Space Politics

On Saturday 18th November, 5000 metric tons of rocket loaded with 4500 tons of super cooled liquid oxygen and methane took off from the Space X launch site in Boca Chica, close to the Mexican border. The world's largest firework flew to space and then went bang which is what fireworks tend to do.

1800 engineers were glued to computer screens measuring every possible mechanical and chemical and pressure and temperature parameter.

This was just another stage in a long journey started by Space X in 2002, partly funded by the sale of Pay Pal but underwritten over the next twenty years by almost super human amounts of self-belief and focussed ambition.

Put simply, Space X has changed the economics of getting to space based on the underlying principle that larger rockets are more efficient (the ratio of fuel weight to rocket weight improves with size).

The rule of thumb for smaller rockets servicing low earth orbits is that the payload is typically between 1% and 2% of the overall weight of the rocket. To put this in the context of a 5000 metric tonne rocket then Super Heavy today is somewhere between 2 and 3% when the stages are reusable and 5% when both the booster stage and upper stage are expendable. The stated ambition is to increase this to 10% through thousands of small incremental improvements.

Rocket Weight	Payload (Re usable)	Payload ratio to launch weight
5000 metric tons (5000T)	50 T	1%
	100 T	2%
	150 T	3%
	Payload (Expendable)	
	250 T	5%
	500 T	10%

To put this into perspective, 50 Shuttle launches were needed to build the International Space Station. A 500 tonne payload would mean that a like for like replacement for the International Space Station could be delivered in one launch.

On the basis that fortune favours the bold and the brave, Space X has leveraged technology and competitive advantage into an 80% share of the global launch market with China accounting for 10% and the Rest of the World the other 10%. The company is now profitable and for the moment at least has the advantage that it is impossible for companies trading with the US to use alternative Chinese or Russian launch capacity. Europe has at least four years to wait before Ariane 6 is ready to fly. In the US, potential competitors such as the United Launch Alliance and Blue Origin are finding it hard to attract space engineers particularly engineers locked into Space X with stock options pending.

It is not unusual for US companies to have an 80% global market share. Motorola had 80% of the market for cellular phones and cellular networks in the mid to late 1980's. Nor is it unusual historically for those companies to be effectively owned by one man who takes all the decisions. Rockefeller (oil), Carnegie (steel), Vanderbilt (railroads and shipping) and JP Morgan (banking) are examples and all of them ended up wealthy. What is perhaps different with Space X is having

Starlink as a side hustle with competitors such as One Web now dependent on Space X launch capacity. Starlink are building a network in space that can potentially do everything. The latest proxy filing via Tonga is for 30,000 satellites building on the existing multi shell multi inclination constellation scaling from L band to V and W band with optical cross connect and optical cross links and downlinks. But it is not just the number of satellites but their size that is important.

First generation satellites were originally designed to weigh 200 kilograms; the planned third generation (late 2024 launch schedule) are 2000 kilograms (2T) and could potentially support low bit rate IOT, earth observation (RGB, multi/hyper spectral imaging), Synthetic Aperture Radar (SAR), RF trilateration, voice and voice plus broadband, direct to cell phone, cellular backhaul, PNT (Position Navigation and Timing), fibre and subsea by-pass and 6G by-pass including fixed and mobile V-SAT (Very Small Aperture Terminals), maritime, aviation and terrestrial and DBS (Direct Broadcasting from LEO Satellites in Ku band). Some of these will probably be military payloads.

A terrestrial 5G base station by comparison has a single revenue stream (it is a bit pipe) plus landlord costs and energy costs (no landlords in space and energy is free).

This also sets Starlink apart from other aspiring space operators such as AST Space Mobile who have an initial 1.5T satellite in space (a 64 square meter array at 54 degree inclination to service AT&T's coverage footprint in the US) with stated plans to double this size in next generation satellites. This is a satellite constellation with a single purpose (direct to cell phone IOT and or broad band connectivity from space) and as such has a business model dependent on a single (communications) revenue stream.

It is therefore not inconceivable that Starlink could replicate the 80% market share enjoyed by Space X across multiple global terrestrial telecom markets.

The US government might be happy with this state of affairs but the Rest of the World is likely to be less enthusiastic including 600 cellular operators with a sunk investment of close to half a trillion dollars in terrestrial radio spectrum. Space and satellite radio spectrum by comparison is given away for free.

But the story could have a happy ending. Mr Rockefeller and Mr Carnegie became noted philanthropists, a worthy tradition carried on by Bill Gates and fellow travellers.

Mr Musk may have a different but more important legacy. The US DOD were by all accounts impressed that a constellation with 5000 satellites was essentially impossible to jam or destroy. The supply of Starlink terminals into Ukraine in the early stages of the 'Special Military Exercise' was widely reported, as was the company's refusal to extend coverage into Crimea.

Building a space port in Texas has created thousands of jobs for the local and national US economy but the retired dentists in nearby Boca Raton remain less than impressed at the prospect of sharing their back gardens with a large noisy dusty smoky bomb that will soon be setting off to space (and back) on a weekly basis. The odd egret is probably dying too.

The two countries with the best launch facilities in the world are in China and Russia (including the new Vostochny Cosmodrome) and it is therefore no surprise that Elon Musk has the occasional chat with President Xi and President Putin. 80 out of every 100 Teslas are now built in China and a rocket factory or two might be a useful addition.

Over the past twenty years, The International Space Station has been hugely successful in bringing astronauts and aeronautical engineers and space scientists together from all parts of the world and there is no reason why the next generation of Space Stations shouldn't do the same. Our prediction is that Mr Musk at some stage will win the Nobel Peace Prize. I think he might like that and his Mum and Dad would probably be pleased as well.

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