

# Re: top ten reasons there'll be faster progress

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Joe Strout wrote:

Well, for starters, this is almost always the nature of technological progress. Check out any of Kurzweil's work, for example [1]; he has plotted quantitative progress over time on a wide variety of technologies, and finds an exponential curve again and again. The illusion of linear progress is a result of the fact that, on the very short timescale at which our attention generally operates, an exponential curve is approximately linear. But that approximation quickly breaks down at longer time scales.

To be precise, progress in a technology proceeds in S-curves. A long slow start which at a certain point curves upwards exponentially, until it approaches the physical limitations of the scientific principle being exploited, at which point it asymptotically approaches that limit. At this point, what generally happens is that a new technology starts, and the S-curve repeats itself for that technical purpose. You can see this in transport tech with (for example) railroad trains, groundcars, and airplanes. What Joe's saying is that we're almost done with the long slow start phase and orbital spaceflight is about to grow exponentially. I hope he's correct on this.

Next, let's consider all the things that were being done wrong for the last 30 years, which are finally starting to change:

– Space was developed as a massively wasteful government program; without any tangible benefits, such programs are politically unsustainable, leading to the stagnation we have seen. Now, we are seeing substantial progress being made on a commercial basis (e.g. Zero Gravity, Virgin Galactic, SpaceX), and this is far more likely to be self-sustaining, leading to progress.

Yes. The reason is that private carriers are more likely to push for efficiency over prestige or perfection.

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– Once the cold war rivalry as justification for space development evaporated, the space community seized on science as its *raison d'être*. This was a mistake; space science is almost entirely pure research, and there isn't much money in that (in the short term anyway); moreover, similar amounts of pure research could be done on the ground for far less money, making every space project a political battle.

Not only that, but it led to a scientific elitist attitude towards space as some zone of purity which must never be corrupted by human beings or their dirty little practical purposes. This has produced absurdities such as space scientists actively *opposing* the manned exploration of space, even though such exploration would actually advance their research purposes as well (by putting scientists literally "on the ground" of many of the celestial bodies they want to study). And, of course, the public has been unenthusiastic about paying for research whose *advocates* are arguing is purely theoretical and never to be of any practical value to any non-scientists!

Now space is being developed for more mundane but far more profitable purposes, like space tourism. The only politics involved here is in regulation, and that seems to be going reasonably well so far.

Right. One thing that helps is that there are multiple national agencies involved in orbital launches: witness what happened when NASA tried to block tourism on the ISS.

– Flight rate. So far, about 500 humans have ever been in space. Virgin Galactic plans to fly about 500 passengers per year. Manned space launches currently happen at a rate of about half a dozen (launches, not people) per year; Virgin will be flying more than once per week. And of course, VG will not be the only game in town; Space Adventures also seems pretty credible to me in their plans for suborbital tourism. So in a few years, we're looking at a flight rate orders of magnitude higher than what we have now. Even if this is suborbital rather than orbital, this will result in a much faster feedback & revision cycle, and so faster progress.

.... and the technologies required for suborbital and for orbital flight are essentially the same; the difference is an issue of single versus multistage rockets.

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– Advances in related technologies. Electronics, GPS, avionics, and other technologies are now available in forms that were science fiction 30 years ago. They're not only dramatically more capable, but dramatically cheaper, too. These make up a substantial fraction of the cost of a spacecraft, even if not the weight, and advances in these should drive the overall cost down too.

Very much so.

Anybody want to add to this list?

Sure.

More national-level players. The first Space Race was America vs. Russia. We now see America, Russia and China launching manned missions; Europe, Japan and Israel are close to manned spaceflight technology. National-level players are important for two reasons (a) they do the licensing of private space ventures, and (b) as of yet, they are doing all the orbital launches.

The more players the merrier because if one player (say, America via NASA) wants to discourage private space ventures, it will swiftly find that the other players are only too happy to take the business away from them. (This is what actually happened over the last 25 years with NASA and the Russian Space Agency). Also, if one player (say, Russia) withdraws from a specific goal such as Lunar Exploration, the other players can keep advancing towards that goal.

The multipolarity of present space exploration and exploitation renders it robust; makes it less probable that there will be another Retreat from Space such as we saw in the 1970's.

Sincerely Yours,  
Jordan

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