The Shape of Things to Come

Stephen Dawson

*Only **private space flight** can keep returning people to the sky*

Sometimes governments can achieve things that would not be done by the private sector. Take space travel, for example.

I'm not saying that the private sector would never have broached the high frontier. But government involvement certainly changes the timing, not to mention the purpose and the economics.

When NASA seriously started to shoot for space, it was all about national prestige, or perhaps more appropriately, embarrassment. The launch of Sputnik by the Soviet Union in 1957 was a technological challenge to the United States' view of itself—not to mention its prompting of fears of domination from a Communist-controlled space.

Of course, the US was more technologically advanced and, after a few missteps, it rapidly matched, then exceeded the Soviets in space capabilities. The latter, it was revealed after the fall of the Iron Curtain, would never have been able to manage a manned lunar landing.

But even for a space fan such as myself, the Mercury, Gemini and Apollo programmes were misguided, both as to purpose and in timing. The purpose I have discussed. The timing was early. Far too early. They did, though, have the slight redeeming merit of actually achieving their goal: putting the first man on the moon.

After the Apollo programme, that all changed. The 'airplane into space' concept was intended to replace the expensive, expendable rocket programme. As realised in the Space Shuttle, it has been a fiasco. There are two reasons for this.

First, it is just as expensive to launch the Shuttle as it is a normal rocket. Second, it caused huge delays to private exploitation of space.

The reason for that is what so often happens with failed government programmes: subsidies. Each Shuttle launch costs at least half a billion US dollars, without even counting the cost of the two destroyed Shuttles. One estimate even puts the cost of each Space Shuttle launch, if depreciation of the Shuttle and its development costs are taken into account, at over $US2 billion. The US taxpayer picks up a big proportion of that, so how are private companies to compete?

Thus, for 47 years, space launches had been confined to government operators. The expense of the Shuttle prompted other nations to compete in the commercial market using old-fashioned rockets. In 2000, it cost over $US10,000 per kilogram to get something to Low Earth Orbit (LEO) on the Space Shuttle. For the Ukrainian Zenit 2 launcher, it was just over $US3,000. For the higher geosynchronous orbit, Shuttle costs were more than $US50,000 per kilogram, compared with $US9,000 for the Zenit 2.

These prices could have been drastically lowered by the private sector.

PRIVATE OPPORTUNITIES

In 2004, a small US custom aircraft builder run by Burt ▶

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Rutan did something no-one outside of a government had done before: it built a working space ship. The company, Scaled Composites, had earlier firsts. It made the Voyager airplane, which in 1986 became the first airplane to circumnavigate the globe without stopping or refuelling. Scaled Composites also built the jet used by Steve Fossett in early 2005 for the first non-stop, non-refuelled, solo global circumnavigation.

The SpaceShipOne launch is a two-stage affair. A jet powered carrier, called White Knight, carries the rocket to around 14,000 metres, from where it launches. On 21 June 2004, its first shot, despite a minor malfunction, saw it pass just over the 100,000 metre altitude, the official threshold of space. In September and October of 2004, it repeated the feat twice in less than two weeks, thereby winning the Ansari X Prize: $US10 million to the first team that could launch a three-person space ship into space, and successfully land it again, twice within a fortnight.

Total cost? No one knows, but it's widely believed to be well under $US30 million—a cost that includes the entire development and building phase of the spacecraft and its White Knight launch platform. You could develop and build fifteen SpaceShipOnes for the marginal cost of just one Space Shuttle launch.

Now just reaching the threshold of space is far short of achieving LEO, but something interesting happened between the two X Prize shots. Richard Branson of Virgin fame launched Virgin Galactic with a contract for Scaled Composites to provide several spacecraft for, of all things, tourist flights.

The pricing was set for $US210,000 per head. If that seems excessive, it has recently been reported that some 34,000 people have already registered with Virgin Atlantic, and by April 2005 a hundred people had paid a $US20,000 deposit. The first flights are scheduled for 2007. Branson says that the profits will be ploughed into developing orbital tourist spacecraft (currently a six-day tourist flight on a Russian space ship costs $US20 million.)

To date, only 500-odd people have been in space. Virgin Galactic plans to double that within a year of operation.

COMMERCIAL OPPORTUNITIES

Thousands of satellites have been placed into orbit. The development of low-cost space launchers by the private sector will revolutionise this. Presently, because of launch costs, satellites have to be engineered with a view to remaining in operation for many years, despite the certain knowledge that their technology will be obsolete within a couple of years. Thus, the capabilities of satellite communications, on average, lag some years behind the state of the art. If launching were cheaper, they'd be replaced and upgraded more often.

But that's only based on current commercial uses for space. What else is there?

Science fiction novels often have some of us Earthlings travel to some other planet or moon within our solar system for colonisation. There the planet is 'terraformed'. But as pointed out by physicist Gerard K. O'Neill in his 1976 book, *The High Frontier*, that's wasted effort for limited space. Mars only offers a doubling of land area over that already available on Earth, and has the disadvantage of low gravity (one-third of this planet's).

Far easier would be the building of space habitats located in stable orbits in space. These would be gigantic cylinders, rotating on their axes to produce Earth-normal gravity on their inner surface. What O'Neill calls 'Island Three' would have a diameter of 6.5km and a length of 32km, providing a living space of over 1,200 square kilometres, or enough room for several million people.

That, he calculated, could be built with 1976 technology, mostly from materials mined on the moon.

And what could they do up there? One early activity would be to build solar power plants. They need them for their own energy requirements, of course. But huge ones could be built in space to gather solar energy and beam it down in the form of microwaves to Earth, where it would be converted to electricity. If most of the materials were gathered from the lunar surface, the cost would be comparable with building a new power station down on the ground, while running costs would be almost non-existent.

But the truth is, no-one really knows what means of exploiting space will be found. All we know is that with a competitive private sector involved, new opportunities will be opened up—limited only by the human imagination.

And, in the process, the current government space monopolies will become mere bad memories.

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