

Implications for Social Science Development of the Growth of the “NewSpace” Industry

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Abstract—The historically extraordinary delay of more than half-a-century in the use of rocket propulsion to supply passenger space travel services, is finally coming to an end: recent work by private companies to offer "sub-orbital" passenger flights has generated sufficient demand, even at initially high prices, to ensure that passenger space travel services will grow exponentially through the 21st century as air travel services did through the 20th century. In addition to directly and indirectly employing tens of millions, this will lead to the growth of a wide range of other commercial space activities, known collectively as the “NewSpace” industry, which is now being developed: orbital and lunar accommodation, space-based solar power generation and wireless power transmission, extra-terrestrial materials utilisation, micro-gravity manufacturing, and others. These developments will relieve many of the economic and social stresses in the world today, which provide many of the subjects of social science research. In addition, the expansion of human civilisation into the fundamentally new environments of extra-terrestrial space will create the basis for a cultural renaissance, which will revive today's younger generation currently oppressed by the failure of economic and social policy in the rich countries. This coming “Space Renaissance” raises a fascinating range of positive new issues for social science research.

Keywords - lack of new industries, new space paradigm, NewSpace, space tourism, Space Renaissance

I. INTRODUCTION: HALF-CENTURY DELAY IN DEVELOPMENT OF POPULAR SPACE TRAVEL

Humans' evolution into a space-faring species has been delayed for over half a century: the engineering team developing the A-4 sub-orbital rocket achieved the first ever successful space flight on October 3rd 1942. At the party that evening, project leader Walter Dornberger made a speech noting the historic significance of having developed the technology for humans to travel in space, and a toast was drunk to the future of space travel, which his team hoped to realise soon after the end of the war.

However, more than 70 years later we are still waiting for the start of space travel services! After the end of ww2, the visionary engineers at Peenemunde were taken to the USA and USSR where they were obliged to spend the rest of their lives working to produce thousands of long-range missiles, rather than to develop popular space travel services for the general public. Government space agencies were set up to use these missiles for non-military purposes, notably launching satellites and government astronauts into orbit. But

despite some *2 trillion* dollars having been spent to date, rocket technology has still not been used for its most economically valuable use – providing space travel services to the general public, as could and should have started during the 1940s! This delay represents a major historical distortion in human technological development, and it has imposed major costs on human society.

II. THE MAJOR PROBLEM FACING WORLD ECONOMY: LACK OF NEW INDUSTRIES

The process of economic growth which has been under way since the industrial revolution has raised living standards greatly world-wide. However, the process of increasing the productivity of work in itself creates unemployment, which has been balanced until recently by the creation of numerous new industries. In recent years, the speed of technological development has eliminated many jobs, while corporate “offshoring” has moved many others to low-cost countries. The relative lack of ideas for new areas of business activity in the rich countries has led to the highest levels of unemployment since the 1930s. This in turn has had many bad effects on society: in addition to historically high levels of unemployment, low salaries (“working poor”), surge in part-time employment, commercialisation of education, branding “mania”, massive speculation, “resource wars”, cutting back of welfare services including health insurance, basic education and dependable pensions, and others.

Corporations have reacted to the lack of new industries in many ways damaging to society. They have grown gigantic in the effort to reduce excessive competition. They have also put relentless pressure on governments to privatise services that are better performed by government organisations than by profit-seeking ones. (For example, America's largely private health industry is the most costly and least effective among the rich countries.)

Many negative aspects of rich societies and many of the problems studied in the social sciences can be seen as due to this major distortion. Fortunately there is an easy solution to this problem: the expansion of human economic activity into space can be started at very low cost. Sub-orbital flights, lasting just a few minutes are technologically easy. In the face of government space agencies' continuing failure to develop these services, private companies are now starting to do so, led by the American companies Virgin Galactic Inc and XCor Inc. As these services grow in popularity they will lead on to

orbital travel. Although orbital passenger flights require vehicles that will cost billions of Euros to develop, this is similar to the cost of a new airliner today, and is likely to follow soon after sub-orbital passenger travel services become profitable. This will create the orbital hotel industry – of which the leading company Bigelow Aerospace has already contracted to connect one of their accommodation modules to the space agencies' international space station currently in orbit. The orbital hotel industry can grow almost without limit, and will in turn lead on to the development of lunar tourism.

The meteoric growth of air travel to reach 1 billion passengers in 2000, and 2.5 billion in 2010, was not foreseen by the pioneers of aviation. However, if space travel follows in the footsteps of air travel, we might expect 1 billion space travelers in 2100. Considering the innumerable new business opportunities, including design, construction, operation, maintenance and repair of orbital and lunar accommodation facilities, these services alone could directly and indirectly employ tens of millions of people. Based on research performed by the Japanese Rocket Society through the 1990s, and market research in other countries since then, we can project growth of the space tourism industry as in Figure 1.

In addition, the development of space-based solar electricity generation and wireless power transmission could create another major axis of space development, as will the use of extra-terrestrial resources, as already being pioneered by Japanese researchers and US venture companies Planetary Resources Inc and Deep Space Industries Inc. The “wall of money” searching for profits world-wide led to the 1990s “IT bubble” and the 2000s “Green energy bubble”. The field now known as “NewSpace” in the USA could profitably absorb huge amounts of investment over the coming decades, and total employment might reach approximately 100 million by the end of the 21st century (see Figure 1).

III. POSITIVE IMPLICATIONS FOR SOCIAL SCIENCE

The importance of the above ideas for social science development is best described by the president of Space Renaissance International, Italian engineer-philosopher Adriano Autino in his books [1, 2] and other papers. He uses the analogy of the Earth as being like a pregnant woman who has become dangerously ill due to delay in giving birth. He argues that human culture is suffering from increasingly serious stresses due precisely to the long delay in opening the space frontier to the general public. Among many other attributes, humans are creatures who have spread their habitation and cultures into all available niches – from African deserts and jungles to northern and southern forests and mountains, islands, rivers, steppes and even polar regions. Having long ago developed the key technologies of rocket propulsion and life-support systems, humans should have already started to live outside the Earth, but this activity has been greatly constrained by government space agencies' failure to develop low-cost reusable launch vehicles. Autino argues that the growing stresses of 7 billion people living in the present “closed Earth system” are largely responsible for the record unemployment, economic stagnation, poverty, “resource wars”, environmental destruction, declining

educational standards, cultural degeneration and other social ills from which we are increasingly suffering.

These ideas are supported by engineer-philosophers Marco and Cristina Bernasconi's prophetic 1997 paper [3] which argued that the inefficiency of political systems entails that governments will become increasingly brutal as human economic activity approaches the limits of the Earth's biosphere, and that this problem can be alleviated in only one way - by moving rapidly to exploit extra-terrestrial resources, thereby reducing the stresses on the biosphere. The recent spread of terrestrial “resource wars”, and the rapidly growing domestic repression by governments waging them – notably the UK and US governments, both of which have greatly reduced the human rights of their citizens in recent years, including ubiquitous surveillance, indefinite imprisonment without trial, secret courts, and even torture – are shocking proof of the accuracy of this prediction – which seemed almost outlandish at the time of writing in 1997.

In collaboration with Autino, the author described in some detail how the likely rapid growth of commercial space travel services, as a first key component of the “NewSpace” industry, will contribute greatly to solving many of the problems facing the world today, notably the above-mentioned unemployment, economic stagnation, environmental destruction, declining educational standards, cultural degeneration and resource wars [4]. Perhaps most encouraging is the fact that the first steps towards spreading human culture into space are easy because market research shows that simply traveling to and from space is itself hugely popular.

A large proportion of the enormous productive capabilities of modern engineering industries are currently being kept idle by the massive unemployment in Europe, USA and Japan. However, these capabilities have only to be directed to develop the vehicles, equipment and infrastructure needed to realise the above scenario, using the space science and technology developed over the past half-century, in order to revive economic growth world-wide, as well as creating a major new human culture.

IV. SUMMARY: THE BEST OF THE OLD AND THE BEST OF THE NEW

The creation in turn of orbital civilisation, lunar civilisation and solar system civilisation will create tens of millions of jobs, revitalising the economies and societies of the richer countries which have become unbalanced by rapid off-shoring of older industries while being simultaneously destabilised by US financial market instability. In doing so, western civilisation will recover a more “natural” trajectory of technological development, in the sense of using new technologies to provide popular services which the general public wish to buy, thereby continuing the virtuous circle of economic growth. As described above, this will create innumerable related new industries, many of them space-based, amounting to a genuine “Space Renaissance”. Humans' development of space-based civilisation offers fascinating new opportunities for social science development. As the ultimate extension of urbanisation and “machine civilisation”, the start of large-scale living in space offers enormous scope for

positive social science research and other contributions, rather than being focused on trying to ameliorate endless problems of terrestrial civilisation caused by the unnaturally prolonged “Closed Earth” era.

A related insight is that it is becoming clear that what has long been called the “Post-Cold-War” era or “Post-Modern” era should now correctly be called the “Pre-Space Age” – the very last era before human life changes forever as traveling to and from space for a wide variety of reasons will become as ordinary as taking an airline flight [5]. At first the majority of space flights will be just for tourism – for just a few minutes on sub-orbital flights, then for a few days in an orbiting hotel, and then a few weeks on a round-trip to the lunar surface – and then permanently or semi-permanently in orbiting colonies and lunar cities. Described realistically in science fiction as long ago as the 1950s when the key technology of rocket transportation was first developed, space travel has been delayed until recently by mismatch between governments’ “space policy” and the needs of economic policy. Hence, astoundingly, despite having spent over \$1 trillion, Americans today can only fly to space by paying for flights on the same type of rocket on which Gagarin first flew in 1961! Such total technological stagnation for half-a-century is surely unique in the modern era.

As a consequence of the spread of the “new space paradigm”, exciting new fields for social science research will arise. A particularly encouraging social change will be the growth of optimism and ambition among the younger generation as the current cul-de-sac, in which they face a lower standard-of-living than their parents, gives way to a vision of an open frontier with unlimited opportunities for fascinating new types of employment. Sociologists, historians, anthropologists and many others can already find fresh and stimulating research topics at the present early stage of this movement. The enthusiasm of those working for the “NewSpace” industries itself is already a fascinating topic – envisaged as a “New Frontier” in the USA, and a “New Renaissance” in Europe.

We can also anticipate that the Space Renaissance may provide the key to finally achieving stable and sustainable relations between the countryside and cities throughout the world. The progressive destruction of traditional country life, along with much traditional culture, due to ever-expanding industrialisation since the 19th century, led to numerous social movements including Pre-Raphaelites, Distributists, Social Credit, Futurism, Vorticism and others. The consumerism following the horror of the 20th-century world wars has now led to dystopian urban societies, with soaring divorce rates, ever-growing loneliness, depression, suicide, allergies, “nature deficit disorder”, consumption of processed foods containing thousands of artificial additives, poisonous genetically-manipulated foods, growing corporate attacks on natural farming and health foods through the “codex alimentarius”, spreading use of damaging vaccines, and other anti-social trends driven by profit-seeking corporations.

Moreover, many of today's large cities are literally not sustainable, as seen in the fact that their birth-rates have fallen

below replacement: they rely on continual immigration by young people born and reared in the countryside for their continuation. This alone is a measure of how much more town planners have yet to learn in order to create environments in which humans thrive with good bodily and mental health.

Thus it is particularly promising that the range of space-based industries mentioned above offers unlimited scope for corporations’ “industrial drive” to expand outwards to create a new space-based civilization, rather than continue to destroy humans’ terrestrial environment. The putative end of corporate pressure to continually “modernise” life on Earth, even when this is undesirable, will enable human life on Earth to return to a better balance between nature and machine, between country life and city life, between culture and work – a fundamental goal of major social movements over nearly two centuries.

Hence, the expansion of human civilisation into space offers unlimited scope for humans’ astonishing engineering drive – the largest scale of “macro-engineering” – while allowing us to preserve all that is best in our varied cultures. Social sciences will have a range of positive issues on which to focus rather than negative ones. An interesting historical issue is the analogy with the original Copernican Revolution, when ideas that had been taught for more than a thousand years were found to be wrong, ushering in an era of unprecedented intellectual excitement as new fields of research were pioneered, and new philosophies created. The overthrow of the “old space paradigm” that only government staff can travel to space by the “new space paradigm” that anyone can travel to space, where there are numerous new business opportunities waiting to be exploited, will usher in as exciting a new era as did the first European Renaissance.

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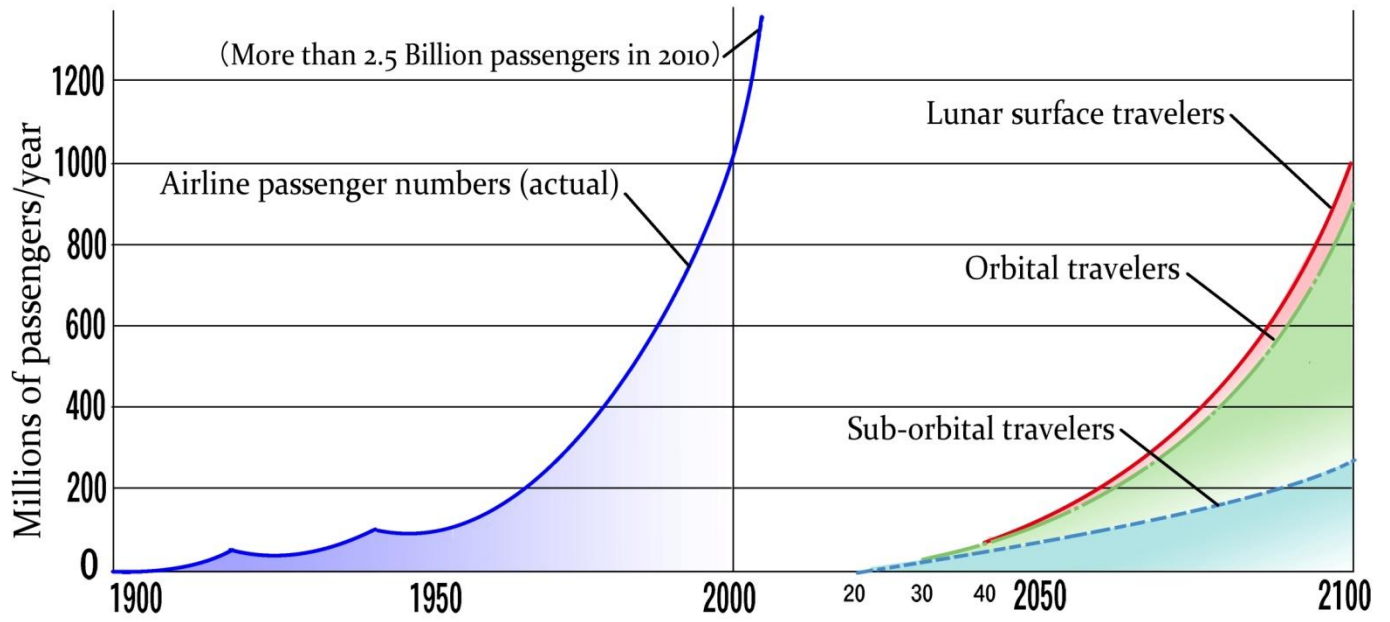


Figure 1: Growth of 21st century space travel following the precedent of 20th century air travel.