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Stars in the rearview mirror: The Grand Tour as a guide to the development of space tourism

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Abstract

Purpose – In this paper, the authors argue that the blueprint that was organically developed over the course of approximately three centuries, from The Grand Tour to this day, is likely to see something close to a repeat in the development of that final frontier.
Design/methodology/approach – The study used the methodology of reviewing the literature and model comparison.
Findings – Opportunities will expand and change along the same trends that lead The Grand Tour to evolve into mass tourism, because as in the past people's perceptions about what is possible and reasonable will change the more common such once fictional ideas become reality.
Originality/value – Nothing is in the current tourism literature, on this topic. This is new and unique.

Keywords Development, Tourism, Space
Paper type Research paper

Introduction

Mention space tourism in polite conversation today and you are likely to be met with polite derision, or expectations of the future predicted by movies such as 2001: A Space Odyssey with orbiting hotels and space planes with regularly scheduled service to the same. Few would mention the six private individuals who paid their own way to the International Space Station during the first decade of the 21st century. Others shun the concept entirely, as did Rick Tumlinson, a Space Frontier Foundation cofounder, who dismissed the focus on tourism as a "Tourist is somebody in a flowered shirt with three cameras around his neck" (Foust, 2004, p. 11). But if we look at the historical perspective of the European Grand Tours of the 1600s through 1800s, the current state bears many of the same hallmarks and may have similar potential to change the world again in much the same way that The Grand Tour did.

As Zuelow outlined in A History of Modern Tourism, The Grand Tour was originally intended to complete the education of young men, predominately British, but it created the framework necessary for the creation of the modern tourism economy (2016) that provides 10.4% of global gross domestic product (GDP) annually (World Travel and Tourism Council, 2021). The Grand Tour participants faced hardships during travel that included high costs, slow speeds, poor roads and a high risk of being attacked. The hospitality industry of the day was focused more on the merchant class than on luxury travel, with limited food service

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options and limited forms of recreation to occupy travelers. These hardships and limitations gradually led to the creation of a worldwide industry focused on the sole pursuit of people indulging in leisure. The current state of space tourism is at the same level as The Grand Tour in the 1700s, i.e. it is the pursuit of the wealthy alone, there is little in the way of accommodations, travel is dangerous and the primary pursuit is more likely to be some greater understanding than indulging in leisure pursuits.

Between 2001 and 2009, seven individuals flew to the International Space Station (ISS) via the Russian Soyuz system: Dennis Tito, Mark Shuttleworth, Gregory Olson, Anousheh Ansari, Charles Simonyi (twice), Richard Garriott, Guy Laliberté, all of whom were either millionaires or billionaires at the time of their flights (Stimac, 2018). As noted by Stimac, Tito's flight costs $20M for an eight-day stay aboard the ISS. These trips were halted in 2011 due to the retirement of the US Space Shuttle, leaving only the Soyuz as a means of access to the ISS, but in June 2019 the US National Aeronautics and Space Administration (NASA) agreed to resume access for private individuals to the ISS in anticipation of the availability of vehicles from SpaceX and Boeing, and Bigelow Aerospace immediately booked four of the available spots NASA announced, at a cost of $52M per participant (Sheetz, 2019). Compared to an estimated cost of $5,075 for a family of four to visit Disney World for a seven-day vacation (Black, 2013), these trips to the ISS are as out of reach for the average vacation traveler as The Grand Tour was for the average British farmer in 1780.

Segreto *et al.* (2009) note that "[a]t the beginning of the 1880's, no Mediterranean city's population reached one million inhabitants," but a century later "over 4,500 sq. km. are occupied by tourist accommodation facilities and associated infrastructure" (2009, p. 3). They also note that fourteen cities had grown to over one million inhabitants. This would suggest, at the end of The Grand Tour era, per Zuelow circa 1815, there was little in the way of accommodation in the likes of Italy, Greece, and the south of France and Spain, prime destinations along The Grand Tour route. By the same token today there is no accommodation for space tourists outside of the ISS. Bigelow Aerospace announced plans for the first "space hotels," that between the two planned structures would offer a habitable volume twice that of the ISS. But these planned structures remain focused on government-sponsored activities first and "tourists" second (Madden, 2018). As NASA notes "The living and working space in the station is larger than a six-bedroom house," (2019, p. 7). Thus, with the addition of the two planned Bigelow stations, the total of space accommodations would equal approximately an 18–20 room house.

Zuelow notes the hardships of traveling from Britain to the European mainland as well as the perils of travel across the continent. Likewise, while there may not be the pirates and storms of the English Channel to contend with, and no worries of getting stuck in the mud or waylaid by brigands in space, space travel is dangerous. As Borestein noted in 2014, depending on which events are considered as space travel-related deaths (see Table 1 for events and related fatalities), somewhere from a minimum of eighteen to perhaps multiple

Program	Flight	Date	Fatalities
Soviet	ICBM test	1960	160
NASA	Apollo 1	1967	3
NASA/Air force	X-15	1967	1
Soviet	Soyuz 1	1967	1
Soviet	Soyuz 11	1971	3
NASA	Challenger	1986	7
NASA	Columbia	2003	7
Virgin	SpaceShip Two	2014	1

Table 1.
(Borenstein, 2014)
Selected spaceflight fatality events

hundreds of people have died since Yuri Gagarin became the first person to travel to space in 1961 (Borenstein, 2014). These deaths are not limited to the initial stages of the Space Race era of the 1960s but are spread from 1967 and the Apollo 1 launch pad fire and Vladimir Komarov's failed reentry due to a faulty parachute, through the Challenger and Columbia Space Shuttle accidents of 1986 and early 2003, and on to the Virgin Galactic test flight failure in 2014. Orbital Space Systems suffered an unmanned booster explosion in 2014 (Wall, Private Orbital Sciences Rocket Explodes During Launch, NASA Cargo Lost, 2014), and SpaceX suffered the same in 2016 with the same launch vehicle design intended to carry their crewed Dragon capsule to the ISS (Whitwam, 2016).

Due to the expense of getting to the limited available accommodations aboard vehicles that are still inherently dangerous, it stands to reason that the primary pursuit once in orbit is more likely to be focused on research or commercial development than indulging in leisure pursuits, just as The Grand Tour initially focused on education and making financial or political connections more than on the more hedonistic pursuits. Each of the seven private ISS travelers between 2001 and 2009 pursued some research opportunity while in orbit, with little more to do in the way of leisure than trying out "space gymnastics" and watching the Earth, Moon and stars form the ISS Cupola or Window Observation Research Facility.

Review of literature

Zuelow's work (2016) continues past The Grand Tour to explore how technology, broadly defined as the application of new knowledge and methods, during the second "phase" of tourism development (Technological Development), allowed the creation of new opportunities for others to participate in travel, albeit in much shorter bursts than The Grand Tour. The 1820s introduction of steam railways helped to beget the development of package tours by Thomas Cook and others, and an explosion in the level of publication of guidebooks, especially for the new areas opened by the development of the train. Likewise, the codification and creation of certain bureaucracy due to the rise in the 19th century of more homogenous empires and nations made travel simpler in the regards of only having to deal with a single central authority for a larger region compared to the piecemeal principalities that had ruled over large areas of Europe. The creation of these new nations also fostered the desire to see other parts of the world in part to compare how people lived in different nations. Following the two World Wars, tourism then entered the phase of what we observe today, Mass Tourism open to everyone in some form. Today much more of the world's population can travel to points distant from their home to enjoy time pursuing their personal interests or simply spending time away from the labors of daily life. This change is, thanks to improved technology, whether improved air travel or personal automobiles and better roads, and a continued rise in personal wealth levels around the world coupled with the increasing availability of travel, accommodations and dining at a range of price points.

Cole (2015) presented the development cycle of space tourism as a planning exercise for hospitality classes, but in so doing outlined the same broad brushstrokes that the industry will have to traverse to go from an experimental endeavor restricted to spacefaring nations to one of mass appeal and applicability for the citizens of all nations. He uses the phased breakout as developed by Spacetourism.com to classify the development as Pioneering, Mature and Mass, which correspond well to The Grand Tour evolution as outlined by Zuelow. In the Pioneering phase, participants will be more adventurers than tourists, with limited accommodations and opportunities for activities. Cole sees Mature phase participants experiencing a price drop of at least a full order of magnitude, as well as increased availability of flights, although he sees a relatively slow expansion of accommodations. Finally, in the Mass phase, he anticipates larger facilities in orbit to accommodate a passenger population in the hundreds of thousands to millions. He cites a 1993 survey from Japan that indicated

participants would pay three months' salary to travel to orbit, and a 1995 Americans survey showing a willingness to spend in excess of $10,000 on average for a space cruise. No definition was provided for the length or expected activities of this cruise.

Johnson and Martin's (2016) paper focused more on the forms of mobility that will open this new realm to more people. They note that safe, efficient, reliable but flexible launch systems are the desired outcome of the current development efforts by the likes of SpaceX and Blue Origin. They importantly note that beyond just the launch systems themselves a complex web of legal and political agreements will be required to utilize whatever system ultimately meets those goals, in the same manner that aircraft did following their development in the early 20th-century. They define three primary regimes from previous studies and the popular press: Citizen Space Exploration, Personal Spaceflight and space tourism. They argue the first is most focused on creating an egalitarian availability not only with regards to access to space but to the possible pursuit of scientific endeavors in space, free of the current limits that allow only the wealthy or government-sanctioned from performing these pursuits. The second classification is focused primarily on the development of a lifestyle akin to personal trainers or personal assistants and reserved largely for those with the wealth or connections to enjoy such a lifestyle. The third definition, space tourism, while potentially encompassing the first two ideas, more clearly delineates the anticipated generic mass-market tourism industry (e.g. space cruises) that would be available to a large segment of the population. They presented previous research which highlighted the quandary that such mass-market activities in space would result in a moved body rather than a moving body, but fail to connect that this phenomenon is very present today in packaged tours and cruises where people follow predetermined itineraries, and as in The Grand Tour days, must "see the sights" without thought to what those sights mean to them or in the larger context of the human experience. Zuelow's evaluation of The Grand Tour noted the Tour's impact on shaping the way that people viewed the world as the Industrial Revolution began and allowed them to welcome in the age of rational thought over the predominant religiosity that had characterized previous ages. Johnson and Martin similarly note how the development of aircraft and air travel created a new understanding amongst nations and peoples; and created a new paradigm of how nations interacted with one another, as well as how people of those nations adopted new views of each other. Collins and Autino (2010) considered in part the related phenomena of what the unintended impact could be from a space tourism industry, including environmental protection and, in the extremis, world peace. While that lofty goal may not be met, the idea that the environment might be better understood by those traveling to space, similar to Zuelow's characterization of The Grand Tour's impact on changing how people viewed their world, is furthered by the impact of Apollo 8 and the famous Earth Rise picture taken during that mission. As Scimecca noted in 2017, "Humans saw their planet for the first time as a whole world. Not as continents or oceans, but an entire entity" (2017, p. 3). Given that a single picture is credited with the birth of the current environmental movement, it would stand to reason that having a large multitude of humanity witnessing firsthand the fragility of the Earth would have a significant impact on how they then pressured their political leaders to act with regards to other nations and the whole of the planet.

The expected path forward

By comparing the three models presented by Zuelow, Cole/Space.com and Johnson & Martin, a possible outline of Space Tourism development can be created. As outlined in Table 2 each of the models presents three epochs or phases, which closely align with one another. During Phase 1 all three models expect high costs to limit participation to the wealthy, with limited options for accommodations and activities. Phase 2 sees an increase in participation by something akin to the middle class, with increased availability of accommodations and

activities, but still restricted in comparison to the options available in Phase 3. The final phase of each model opens the experience to the widest possible audience with regards to financial means and offers more options regarding accommodations and activities, as well as accommodates the purpose to be less focused on achieving a particular goal and more focused on leisure.

Phase 1

With the aforementioned forays to the ISS Phase 1 of Space Tourism has begun. Only the ultra-wealthy were able to afford those trips, with only the ISS as a possible destination/accommodation, and all focused their activities on pursuits related to advancing their business interests. They all traveled on the Russian Soyuz, a system that has seen failures that resulted in at least four deaths during the Soviet space program (Borenstein, 2014), and a 2018 launch failure that required firing of the emergency escape system and subjected two crew members to a landing that experienced seven times the force of gravity (Weitering, 2018). As noted above, immediately following NASA's announcement to begin allowing private citizens to return to the ISS, Bigelow Aerospace contracted with SpaceX to reserve four launches, each carrying up to four people, at a per-seat cost of $52M for a one to two-month stay on the ISS (Bigelow, 2019). The danger of the trip, the limited and Spartan accommodations of the ISS, and the expected continued focus on some form of business development research while in space all closely match the descriptions of the three Phase 1 models. SpaceX's trans-lunar mission planned for 2023 with Japanese billionaire Yusaku Maezawa and six to eight artists as the first passengers aboard the company's Starship vehicle (Sheetz, 2018) does blur the line with Martin and Johnson's argument of a moved vs moving body as the participants will be confined to the vehicle for the duration of the weeklong trip and only able to observe their journey, not actively control it. But the scenario otherwise follows the Phase 1 definitions.

Phase 2

Phase 2 will require a change in mindset as much as it will require improved technology. Part of that mindset will be what constitutes affordable access to space, which Elon Musk addressed when he stated in November 2019 that the SpaceX Starship may cost as little as $2M per mission, with a 100-person capacity (Wall, 2019). This is intended to be a colonizing vehicle for Musk's planned Mars effort, but if these costs were achieved for Low Earth Orbit (LEO) or Lunar access as well as Mars that would reduce the expected cost per ticket to only $20,000 per seat, which is more than three orders of magnitude cheaper than the Bigelow seat cost above, and approximately equal in cost to a round trip first-class seat on a January 2020 Air France flight between New York and Paris as quoted at AirFrance.com in November 2019. Additionally, as per Cole's requirements, the SpaceX Starship is planned to launch from a new launch facility in Boca Chica, TX, (Leinfelder, 2019), rather than from the Kennedy Space Center where manned launches have historically been conducted. This continues the trend of increasing the number of potential launch sites from the three NASA sites in the US–Kennedy Space Center (Florida), Vandenberg Air Force Base (California), and Wallops Flight

Table 2. Synchronicity of the three models

Phase	Zuelow	Cole	Johnson and Martin
1	The Grand Tour	Pioneering	Personal spaceflight
2	Technological development	Mature	Citizen space exploration
3	Mass tourism	Mass	Space tourism

Facility (Virginia) –to the current total of fifteen licensed spaceports in the US (the three NASA centers, nine FAA non-federal centers and three single-user sites, which includes Boca Chica) (Federal Aviation Authority, 2019).

In addition to this reduced cost and greater availability, there will need to be more facilities and activities, but some of that demand may not be only Earth-bound. The US Department of Defense has begun to reconsider an idea first introduced in the 1970s, called Power Satellites, that would place football-field-sized solar panels in Earth orbit to generate electricity that would be beamed to remote locations as microwaves to be reconverted into electrical energy (Mizokami, 2019). Such satellites are likely to be placed in higher orbits, and military assets would likely require monitoring and the ability to quickly repair them to ensure they provide the necessary support to troops in combat zones, requiring a team to be resident in orbit with the satellites. Additionally, Bigelow Aerospace has already proposed the launch of a private space station, the B330, that would be available to support several different operational or mission needs sometime after 2020 (United Launch Alliance, 2017). Along with NASA's proposed Deep Space Gateway and base on the Moon, and Musk's plans to colonize Mars that will likely require some orbital support there is a growing community of potential customers who will want some form of rest and relaxation in space to avoid the impact of coming back to the Earth's full one-g gravity due to physiological effects, costs or simply that the space environment may be preferable to some people after longer duration exposure.

Phase 3

Phase 3 will require significant development compared to where industry stands today. In Phase 1 and 2 the launch rate will continue to be low enough that necessary equipment and supplies can be launched from Earth for each mission, or in regular supply runs to replenish outpost locations. Phase 3 will require resources to be sourced in orbit or *in situ* at locations such as a Moon or Mars base. To achieve this state will require not only improved technology but likely new bureaucratic structures beyond the existing national-level organizations today. Many of these concepts have been discussed already, more often in the works of science fiction than academics, but some have started to be seriously considered. NASA has partnered with SpaceX to discuss the development of orbital refueling depots, a long-considered technology that has been acknowledged as critical to expanding the exploration of space (Berger, 2019). If the resources could be found in space rather than carried up from Earth's surface, these envisioned depots could become more economical. Observations of the Moon and Mars have identified water is present on both planetary bodies, each of which would allow more hydrogen and oxygen, i.e. rocket fuel, separated from that water to be launched to orbit compared to what could be lifted from the surface of the Earth. Also, the development of additive manufacturing, often called 3D printing, creates another opportunity for this phase to be achieved in a much faster timeline than the 300-year history from The Grand Tour to today's mass tourism markets. NASA and other agencies have already confirmed that materials present on the Moon can be used with this manufacturing technique to "print" a habitat rather than having to bring one with them (Gannon, 2012), which would allow structures to be built more quickly as the materials would not have to be transported and assembled in the necessary locations. It must also be noted that asteroids and other non-planetary bodies represent a significant resource base in space today that is not being exploited and that could provide the necessary materials to build new space stations, planetary bases, power satellites, and the air and water needed as the bare minimum to support human life in space. Such exploitation could reduce costs as materials already in space do not require associated launch costs, and some methods already exist that would reduce the repositioning costs between two points in space. One estimate from Goldman Sachs estimates that a single asteroid could contain $25B to $50B in platinum alone,

with associated platinum group metals including gold (Edwards, 2017). Many have talked about the idea of bringing that material down to Earth, but it is pointed out that single asteroid would crater the terrestrial metals market (Edwards, 2017). Those same metals, particularly gold, are good materials for electrical conductance, only not used on Earth due to the significant cost. If the material is readily available and in place, gold wiring could become as common in space as copper wiring is on Earth.

This fusion of new technology, 3D printing and abundance of materials will face an interesting challenge in the realm of government control, one very akin to that faced by the empires and nations starting in the 1500s, exerting control when travel and communication are not the near-instantaneous occurrence they are on Earth today. Communication will be better than was possible in the 1500s, but not the real-time systems in use today terrestrially. Communication between a Mars colony and Earth will lag between 3 and 20 minutes due to the relative distances of the two planets (Space Communications with Mars, 2021), and hence the simple conversation of "Hello, how are you?" "I'm fine, thank you. And yourself?" would take between six and 40 minutes to complete. With current technology, a trip to the Moon, including two days on the surface, is a week-long trip, and a roundtrip to Mars is a two-year endeavor. These communication and transportation lags will have to be addressed in some manner with a level of autonomy and authority that is not present in today's ground-controlled space programs. These challenges were faced by the European empires of the 1,500–1700s before the advent of the telegraph and later the aircraft, and are thus not insurmountable, but it should be noted that these empires ultimately gave way to new nation-states around the world.

And the "simple" logistics of providing a true tourist experience will have to be addressed to achieve Phase 3. What will accommodations look like, and how will they be furnished for this new class of tourists? Foodservice today is a primary focus of tourism; how will that transition to the off-Earth environment? How will food be grown, raised or manufactured for this environment? How will it be prepared and served for guests in different environments? Will the same dishes that are popular on Earth be popular, or have the same flavors, off-world? How will the waste created by all these activities be treated and handled? Each of these topics, and all of the other logistics that make mass tourism possible on Earth, will have to be redeveloped to accommodate that experience off-world.

Transportation will also need to become more regular and affordable if true mass tourism is to be realized, which could be realized by the Skylon craft in development by Reaction Engines Limited (REL) (Pettit, 2018). Based on REL's Synergetic Air Breathing Rocket Engine (SABRE), this vehicle is expected to take off like an airplane from a standard airport runway and achieve orbit without having to carry liquid oxygen as part of its fuel load. This will mean more payload mass off the runway into orbit, and a vehicle that is as reusable as today's jumbo jets, both attributes that would reduce the costs associated with getting into orbit. No prices have been published yet, but it is not unreasonable to foresee this technology leading to trips into space costing no more than standard coach fare for long-haul airline trips today. It will certainly need to be competitive with the projected $20,000 target put forward by Musk for the SpaceX Starship. The SABRE development cycle was impacted by the COVID-19 outbreak, but one of the three major components was successfully tested in 2019, a second February in 2021, and the third is dependent on the lifting of COVID-19 restrictions in Britain (Reaction Engines, 2021).

Conclusion

The World Economic Forum's Global Future Council on Space Technologies projects that Hospitality and Real Estate services will generate $37bn in the decade of the 2020s (Landon and Schneider, 2017). Today, private citizens have flown to space on

government-developed vehicles to a government-developed outpost. Billionaires such as Elon Musk, Jeff Bezos and Robert Bigelow are developing the necessary technologies to allow private citizens to fly on vehicles that are largely developed at private expense to privately developed and owned outposts in space. Science fiction is becoming science fact, and as with much of the technological development since the industrial revolution, the creation and adoption of this new technology will be much faster-paced than what came before it.

The space tourism field is likely to see the same patterns as were present in the March from The Grand Tour to modern Mass Tourism. This will see programs that have historically been controlled by national governments become at first the purview of the ultra-wealthy who are likely to use their time in space to conduct some type of research to expand their business or personal interest, or pay for someone else's access to do the same. Once appropriate technology is developed to allow the more affluent (i.e. the US upper middle class and their international counterparts) access to space that same technology will allow greater accommodations to be provided and is likely to also benefit from the leading edge of a new space-based industrial base. With additional development of not only the technology to continue to reduce the cost to access space, but also to provide more of the logistical support from non-Earth based sources something more akin to today's mass tourism is likely to develop. These phases are not likely to require the 3 to 400 years that were necessary to progress from The Grand Tour to Mass Tourism due largely to a higher technological starting point.

Failing to note all of these changes and considering what options exist to take part in the development of this new industry may relegate companies that are well-known in the hospitality industry today to be locked out of this new realm in the future or having to play catch-up with their counterparts who are taking part in these early days. The movie 2001: A Space Odyssey imagined a future where the largest station in orbit around the Earth included a hotel ran by Hilton. In reality, Budget Suites of America founder Robert Bigelow spent his personal wealth over the course of a decade to transform an idea originally developed by NASA into an operational vehicle that has been demonstrated on the International Space Station and forms the basis for Bigelow Aerospace's proposed private space station. He holds the exclusive license to this technology (NASA, 2013), which means competitors would have to spend their own money on a completely new technology, likely over the course of the next decade, to bring their own stations or hotels into operation.

There of course is no crystal ball to identify what the exact path ahead is for this new field, but there are several trends that can inform the broad ideas to be pursued. If the original Grand Tour was focused on seeing the sights of antiquity this new incarnation is likely to want to see the sights available as well. Amongst the most easily identifiable of these are a space-based sunrise, Earthrise seen from the Moon or its orbit, the Apollo landing sites and the major craters of the Moon. How to provide access to these or best accentuate a guest's experience of them needs to be considered. Whether addressing these issues, developing the vehicles to get to these new destinations, or creating the hotels, outposts, or stations there are myriad opportunities in this new frontier. And those opportunities will expand and change along the same trends that lead The Grand Tour to evolve into mass tourism because, as in the past, people's perceptions about what is possible and reasonable will change the more common such once fictional ideas become reality.

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