

# Ethical Issues Regarding Informed Consent for Minors for Space Tourism

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**Abstract.** This paper describes the difficulty with informed consent and debates whether or not whether adults should be able to ethically, morally, and legally consent for their children during the high-risk activity of space tourism. The experimental nature of space vehicles combined with the high likelihood of medical complications and the destination places space tourism legally in the category of “adventure activities,” which include adventure travel to exotic locations as well as adventure sports, such as mountain climbing, rafting, etc. which carry a high risk of danger (<http://rescommunis.wordpress.com/2008/02/14/interview-tracey-l-knutson-adventure-sports-defense-attorney-on-space-tourism-risk-and-informed-consent/>). However, unlike other adventure sports, adults currently cannot consent for their minor children. Other topics also receive attention, such as a “mature minors” clause, radiation exposure of potential future children, and other difficulties preventing adults from legally consenting to space travel.

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## INTRODUCTION

More often than not in this lawsuit-happy society there comes a time when one encounters an informed consent form. From preparing to embark on a dangerous journey and placing your trust in a company to assure you get there and back unharmed to undergoing a relatively routine surgical procedure to even something as innocuous as taking a survey, often a signature on an informed consent is expected and required. Only those considered competent adults in their state or region can sign what is colloquially called an “informed consent” form, or what is legally called a “release and waiver of liability” (Paterick *et al*, 2008; <http://www.thespaceshow.com/detail.asp?q=904>). For those under the age of majority, a parent or legal guardian’s signature is often necessary (Kuther, 2003). This begs the question, can parents or other legal guardians ethically place their children in harm’s way by consenting for them in situations, such as space tourism, where there could be a delayed onset of symptoms or an increased risk of illness later in life?

## SPACE TOURISM

Space travel is a dangerous business. The experimental nature of space vehicles, the real threat of medical complications, and the exotic location officially makes space tourism an adventure activity (<http://rescommunis.wordpress.com/2008/02/14/interview-tracey-l-knutson-adventure-sports-defense-attorney-on-space-tourism-risk-and-informed-consent/>). As of September 2009, there have been 507 astronauts and cosmonauts who have flown in space since Yuri Gagarin became the first man in space (<http://www.cbsnews.com/network/news/space/democurrent.html>). However, of these 507 astronauts, 18 died while on a space mission and several others died during training. The list of space missions and their associated death toll is as follows: Soyuz 1 (one death), Soyuz 11 (three deaths), Challenger (seven deaths) and Columbia (seven deaths). Additionally, three other lives were lost during the training for the Apollo 1 mission. The secrecy of the Soviet space program has made estimating cosmonaut lives lost during training difficult.

Some critics might point to the mortality rate, compare this to other experimental vehicles, and consider this comparatively safe. However, humankind has been going into space for 50 years, and interestingly the majority of the lives lost have been in the second half of the space age thanks in part due to the comparatively large shuttle crews. If we just include those who died while on a space mission, the death rate is approximately 3.6% among astronauts to say nothing of the medical issues that they may develop as a result of their flight. Medical incidents, including injuries as well as space sickness, are common. Over 1777 separate medical events were reported during the first 89 shuttle flights, leading to an average of at least 20 medical incidents per shuttle flight (Williams, 2003). However, it is important to note that these statistics are from high-powered government-owned rockets, which in many ways are still considered “experimental vehicles.”

According to the Washington Post, although NASA stopped treating the space shuttle as experimental and started treating it as operational after only four flights, many disagreed regarding this treatment particularly in light of the Columbia disaster (<http://72.29.31.40/index.cfm?fuseaction=orbital.Clients>). The 113 flights that the shuttle made prior to the Columbia disaster was significantly less than the nearly 200 flights made by the X-15, a craft that was experimental, and is significantly less than the several hundred flights required by the FAA to certify a vehicle as operational as opposed to experimental.

Since the various spacecraft proposed for the suborbital space tourism market are currently non-existent and unproven, it is difficult to assess just how predictive the death rate of government astronauts would be for potential space tourists. However, it might provide a better comparison for medical issues since, while government astronauts are often in peak physical condition, the likely space tourists may have a variety of health issues that could potentially deteriorate during a microgravity excursion.

While space travel has long been dominated by government-trained astronauts, the budding new field of space tourism may provide a challenge to this government monopoly. Unlike astronauts and cosmonauts that are government trained and are paid to go into space, space tourists pay rather large sums of money in order to experience this form of travel whether for the thrill of a short ride to space, a longer vacation on-orbit, or potentially a point-to-point transportation system. According to the Federal Aviation Administration’s recent “Study on Informed Consent for Spaceflight Participants,” space tourism has less in common with air travel than it does with adventure travel due to the inherent dangers involved (FAA, 2008). While traditional adventure travel includes activities such as mountain biking, caving, climbing, cycling, camping, water skiing, snow skiing, mountaineering, scuba diving, and so on, the definition of adventure tourism states it “involves exploration or travel to remote or exotic destinations and/or very unique activities” (Terrel, 2008). Although the edge of space is only 100 km (~62.5 miles) away, this extreme altitude could well be considered a remote destination (<http://www.fai.org/astronautics/100km.asp>). Like any other remote destinations and adventure travel, there exists the possibility of a need for a search and rescue mission in the event of an emergency. The Outer Space Treaty does not specifically address the concept of space tourists since only government-trained astronauts existed in the 1960s. However, it is likely that the section of the treaty entitled “Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,” and later expanded in the 1968 Rescue Agreement, would likely also apply to any distressed space tourist. If this interpretation is accurate, while the space tourist would pay for the trip, any search and rescue costs would likely fall to the taxpayers just as in the event of a search and rescue for a government-funded space vehicle. (see: United Nations, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, (1967); *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, (1968)).

Starting with Dennis Tito in 2001, there have only been seven space flight participants, all of whom used the company Space Adventures to arrange flights to the International Space Station using the Russian Soyuz spacecraft (<http://72.29.31.40/index.cfm?fuseaction=orbital.Clients>). For potential space flight participants that might want to experience a shorter and more affordable alternative, there are a few companies, such as Virgin Galactic, which are currently accepting deposits for future suborbital space flights. However, with the exception of Space Adventures, none of these companies currently fly paying passengers. Companies specialising in the relatively young space tourism market have many technological, economic, regulatory, and legal barriers that they must overcome before their first commercial flights. One of the legal barriers relates to the question of what is required for informed consent.

According to the FAA’s “Study on Informed Consent for Spaceflight Participants,” any potential space flight operator...

“must inform each space flight participant in writing about the risks of the launch and reentry vehicle type. For each mission an operator must inform a space flight participant, in writing, of the known hazards and risks that could result in a serious injury, death, disability or total or partial loss of physical and mental function... [and] an operator should inform a space flight participant that there are also unknown hazards.... The operator also must disclose that participation in space flight may result in death, serious injury, or total or partial loss of physical or mental function. An operator must inform each space flight participant that the United States Government has not certified the launch vehicle and any re-entry vehicle as safe for carrying crew or space flight participants” (§ 14 CFR 460.45," 2008).

The situation mentioned in the final sentence regarding the certification of the vehicle is indicative of the vehicle’s “experimental” status, as its flight readiness remains unproven. Additionally, the expected failure rate of 1 in 200 and the lack of safety regulations regarding space vehicles in general, make this information particularly important to note in any informed consent document (§ 14 CFR 460.45," 2008).

Other than the status of the aircraft, another very large concern can be the medical considerations that may become relevant during a trip to space. During a suborbital or even a short orbital space flight, some medical issues that may arise include cardiovascular or respiratory anomalies due to the high g-forces upon liftoff and re-entry, space motion sickness that could lead to vomiting, other neurological disturbances, psychological effects, and likely gastrointestinal effects (FAA, 2008). On a longer term space vacation, such as to a space hotel if one is built, there could be additional effects such as the loss of bone density, decreased muscle strength, decreased blood plasma, decreased cardiovascular efficiency, increased risk of kidney stones, increased exposure to radiation, and immune system suppression (Williams, 2003).

Although the specific radiation risks for astronauts is not yet fully known due to the small sample size of career astronauts, evidence from other populations exposed to increased radiation suggests exposure could lead to radiation sickness, immediate death (in high enough dosages), and/or increased risk of the following: cancer, cataracts, hereditary effects, and neurological disorders (Cucinotta *et al.*, 2001). Although radiation sickness or immediate death from radiation is unlikely in the event of a suborbital space flight, the potential effects of those risks require monitoring for the long term (FAA, 2008). Other effects, such as the increased risk of cancer, cataracts, neurological disorders, and other maladies might not develop for several years while hereditary effects might not be noticed until the birth of the next generation.

Although microgravity only generally has an effect of 1-2% bone loss per month in an adult, it is hard to imagine what long-term effect this could have in someone who is still growing (Clement, 2005). Would it stunt their growth? Would it impact them throughout their life? It is difficult to predict. What about the 10% to 20% muscle mass which could be lost within a week if proper precautions are not followed? Would that make a difference in a youth or would he or she easily be able to regain this? Only future experiments and studies will allow scientists to discover how space flight can affect the young, although the use of human children in these experiments would raise serious ethical questions.

## **INFORMED CONSENT FOR MINORS**

Since there are many potential long-term risks in space tourism, informed consent is vital, not only for minors, but also for others who may not be able to consent fully due to other obligations. To reiterate, space travel can be quite dangerous and, in a worst case scenario, can lead to permanent long-term injury, disability, or even death. Knowing this begs the question of whether or not adults can morally sign the “release and waiver of liability” form allowing a minor to participate even when the space tourism industry becomes more mature. If one compares space tourism to adventure travel, informed consent issues might be comparable. According to Tracey Knutson, an attorney specialising in informed consent for adventure travel, while minors cannot consent for themselves nor can an adult currently provide informed consent on behalf of minors for space tourism, many states do allow adults to provide informed consent for other dangerous adventure travel destinations for their children (<http://rescommunis.wordpress.com/2008/02/14/interview-tracey-l-knutson-adventure-sports-defense-attorney-on-space-tourism-risk-and-informed-consent/>).

Like many other ethical questions, many facets of the problem require consideration. First of all, the definitions of morality and ethical standards can easily vary from culture to culture. This is called “ethical relativism” or “cultural relativism” (Pojman, 2005; Haviland, 2000). In some cultures, parents have ultimate life or death authority over their children, while in other cultures children possess nearly full rights. The issue of informed consent, and regardless of whether or not parents can morally consent for their children, could create potential difficulty.

According to Louis P. Pojman, an applied ethicist, there are ten moral principles. Of these ten, two in particular are of interest to this discussion, “respect other people’s freedom” and “do not cause unnecessary suffering.” During adventure travel of minors and providing informed consent, these two aspects, “respect other people’s freedom” and “do not cause unnecessary suffering” may come into conflict. If a minor wishes to go into space, for an adult, regardless of it is a parent, a lawyer, or space tourism operator, to prevent the minor from going into space could be considered disrespectful of the child’s freedom, particularly if the parent is supportive of the child’s wishes. According to Ayn Rand, a famous philosopher and author of “Atlas Shrugged,” humans have an “inalienable right to seek our own happiness and fulfilment, regardless of its effects on others” and she defines “rights as ‘moral principles which define and protect man’s freedom of actions’” (Pojman, 2005).

However, the principle of “do not cause unnecessary suffering” can conflict with one’s happiness. As we have seen, space tourism can potentially lead to death or injury. Injury is certainly easy to consider part of suffering, but while death would be the end of suffering to the individual, it could be only the beginning of suffering for family and friends. One must also take into account those individuals not yet born, such as future children of future female space flight participants. If we are to consider unnecessary suffering, what about those egg cells that were exposed to higher than normal amounts of radiation during space flight and could result in genetic mutations? Even though many of these eggs are unlikely to be fertilized, the few that are destined to become future children are travelling into space and these “potential future children” are being subjected to the hazards of space flight without their own consent. This leads to the question of whether or not adults have an obligation towards their future children and to their future grandchildren at the expense of their own happiness.

Since the legal age of majority varies from country to country, and maturity varies from person to person, should some self-aware older teenage minors be allowed to give consent or be allowed to have their parents consent for them assuming they are capable of making their own decision? It is difficult to know whether in this case it is any more moral or immoral than if they simply waited until the appropriate age. However, in medicine, where the informed consent law originated, there are many situations in which “mature minors” are able to consent to certain aspects of their own medical treatment. Research shows that many minors from the age of 14 and up are capable of realising and understanding the risks involved (Sanci *et al.*, 2004). Would it be possible to not only allow teenagers to go to space, but also allow them to consent for themselves about whether or not this trip is worth the ultimate price? The future resolutions to such questions remain quite uncertain.

## **OTHER INFORMED CONSENT ISSUES**

While this paper primarily focused on potential space flight participants who are under the age of majority, it is important to realise that this is not the only category of individuals that may have difficulty in providing informed consent to these space tourism operators. During Tracey Knutson’s March 7, 2008 appearance on “The Space Show,” an internet-based radio program, there was a discussion on how the release and liability form affects the potential space flight participant’s family and whether the family has rights if something went wrong assuming they did not consent to the journey. Would a space operator have any obligations to the suffering they inflicted on the family? According to Ms. Knutson, the contracts are often written in such a way that any non-signers of the agreement automatically consent when the prospective space flight participant signs, even though they really may not wish their spouse or parent to go on this journey. Most state laws side against the non-signers and give them no legal recourse for the suffering they might experience if their relative perishes or receives grave injuries(<http://www.thespaceshow.com/detail.asp?q=904>). The happiness of the one individual, in this case, appears to outweigh any suffering of the family in the legal sense.

Additionally, some adults who might otherwise be fully capable of going on one of these journeys cannot do so due to their employers. With CEOs and other key employees, some corporations require an employment contract, which includes a clause preventing the employee from doing things that could put their life in danger (<http://www.thespaceshow.com/detail.asp?q=904>). Unfortunately, this is likely to occur regarding space tourism. In this case, the potential suffering of the company outweighs the happiness of the individual.

## **CONCLUSION**

The moral repercussions about whether parents have the right to ethically, morally, and legally consent for their children, or whether mature minors might be able to eventually consent for themselves remain uncertain. While space tourism provides some extensive risks up to and including potential death, disfigurement, or disability due

to the dangers involved, legal and moral concerns appear to be in conflict. Currently, parents are allowed to provide informed consent for their children to partake in many other high risk adventure activities, such as skiing, SCUBA, and rock climbing, with space travel being a notable exception.

Space travel and other high risk adventure sports all carry medical risks. Yet parents can allow their children to participate in SCUBA diving or rock climbing, but not in space travel. While some of the risks are different, many are comparable.

Death, disfigurement, and medical problems can occur regardless and some of the details of the direct cause (ie whether something is caused by one adventure activity versus another) may not matter. If one experiences hypoxia at the top of Mount Everest is that really much safer than experiencing hypoxia in a space vehicle? Also, what of “ethical relativism” or “cultural relativism?” Different cultures may either not consider certain things to have the same risk, plus different cultures offer parents different degrees of control over their children. If ethically, we have to respect other people’s freedom and decisions, and a minor wishes to go into space and the parents agree, but the space operator does not, then this could potentially be disrespectful and even more so because it is disrupting the potential space tourist’s desire for happiness. How can one state whether the happiness of one individual, or respecting one’s freedom, is worth potential suffering, which may or may not happen? This, like so many other issues in ethics, is debatable and will need to be further discussed in order to come to a basic consensus.

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