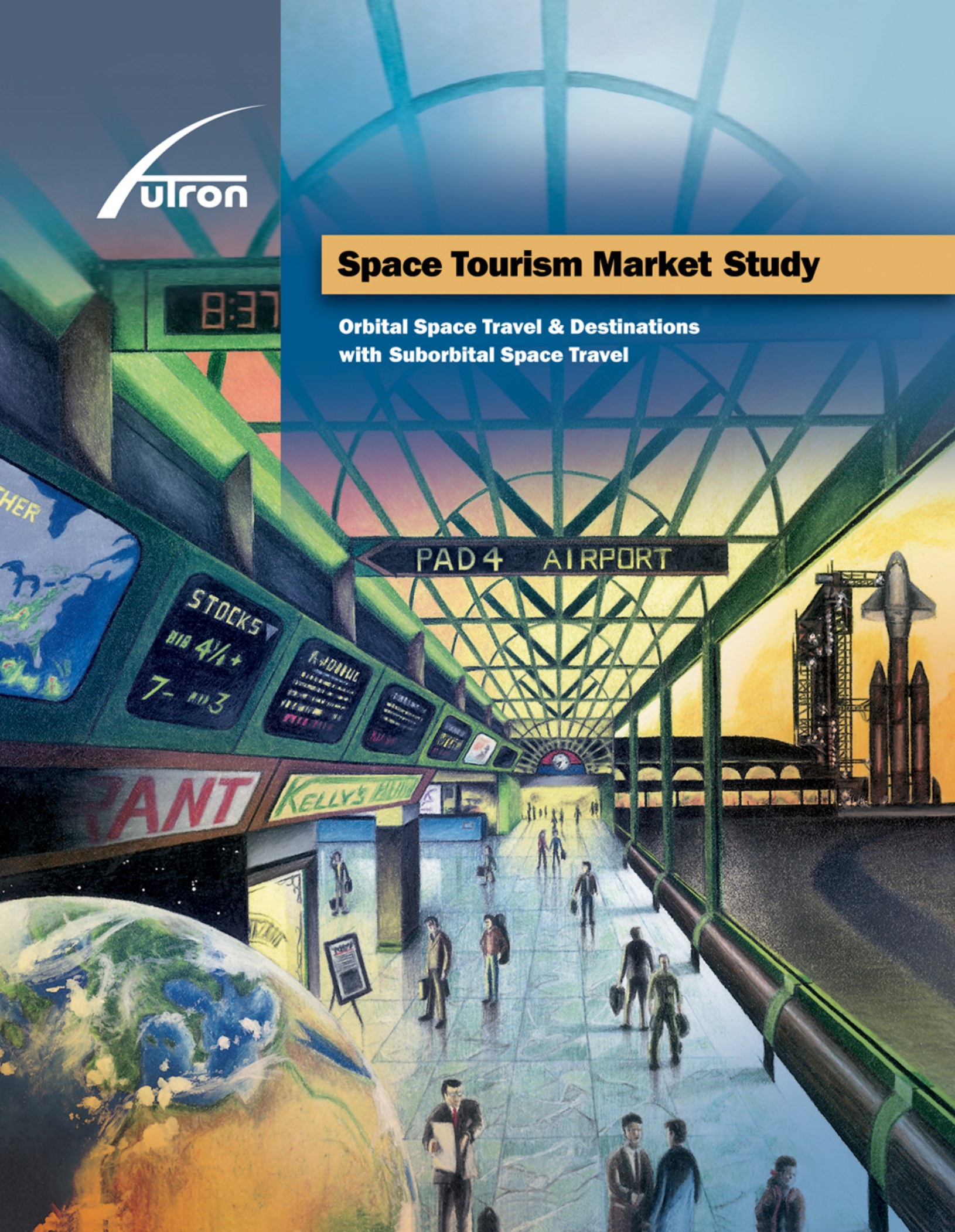


Space Tourism Market Study

Orbital Space Travel & Destinations with Suborbital Space Travel



Space Tourism Market Study

orbital space travel & destinations with suborbital space travel

october 2002

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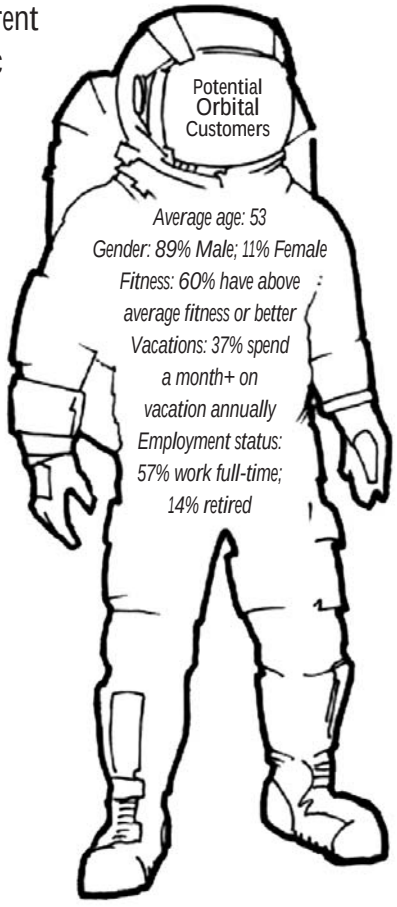
Executive Summary

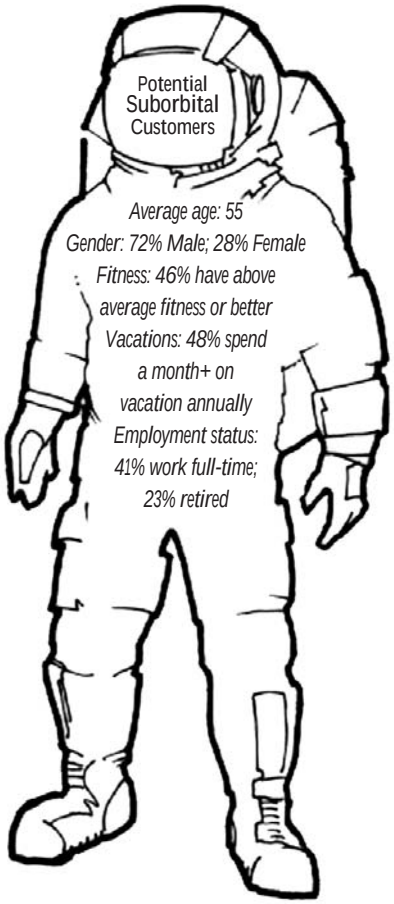
In this report, Futron Corporation, the industry leader in forecasting space-related markets, provides powerful insight into the public space travel (space tourism) market. The insight is provided via the presentation of an objective and quantitative picture of the current and future demand for both the suborbital and orbital public space travel markets.

As neither an advocate for, nor a participant in, the development of space tourism, Futron was able to maintain a balanced and objective viewpoint on the future of this industry. Consequently, Futron conducted a new survey to examine the demand for space tourism with a stronger emphasis on realism than previous surveys . The Futron/Zogby survey presented a realistic portrayal of spaceflight to its respondents and selected a respondent population that could potentially afford to pay the current and future prices for the service.

"...Futron was able to maintain a balanced and objective viewpoint on the future of this industry."

The current picture of the demand for public space travel is presented in the first part of this report (Sections 2,3, and 4) and includes a discussion of the current state of orbital and suborbital public space travel and the presentation of the results and analysis of the Futron/Zogby Survey on Public Space Travel. Highlights of part one include:





- Who are the customers? — The group of respondents interested in and willing to pay for suborbital flights is demographically distinct from the group interested in and willing to pay for orbital flights:

- There's no place like home — Of all the attractive features associated with a flight into space, viewing the Earth from space rated highest, with 63% of respondents indicating that the opportunity to do so was 'very important' as an aspect of suborbital flight.

- People just want to have fun — when asked about their discretionary spending, nearly one-third of survey respondents indicated that they spend the largest amount of their discretionary income on traveling and vacations. This was almost three times higher than the next largest item — a new car.

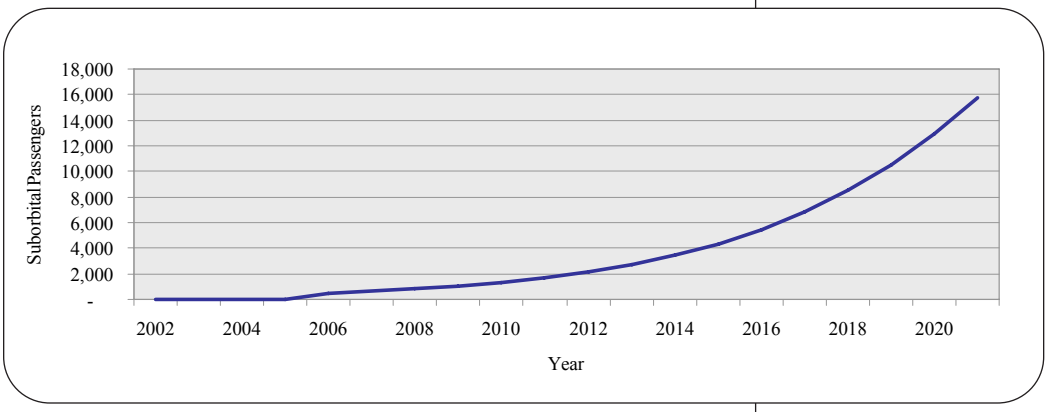
- Private or government vehicle? — People were more or less indifferent to flying on a privately developed vehicle with limited flight history, 52% said it made no difference in their decision to purchase a suborbital flight.

- Lower prices = more demand — Orbital space travel is a fairly elastic market, there are significant jumps in demand when the price drops to US$10 million and again at US$1 million.

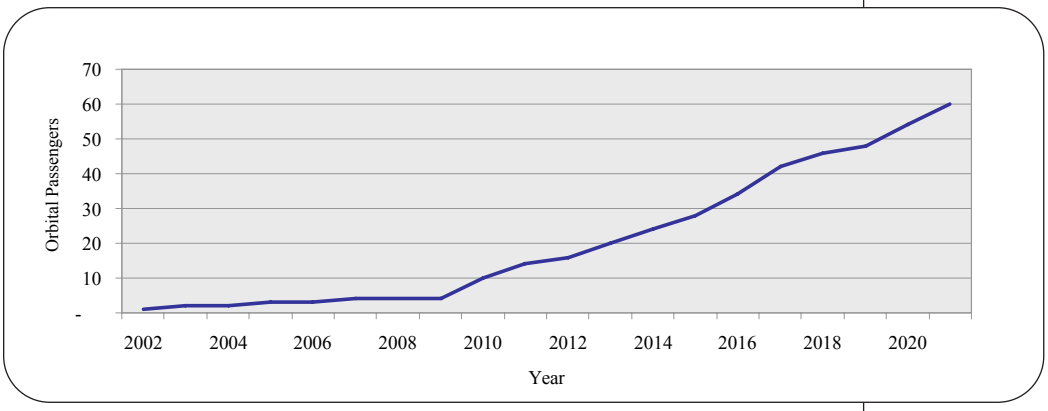
- Tough customers — 52% of those surveyed indicated that physical discomfort post-flight (e.g., dizziness, difficulty standing) made no difference in their decision to purchase an orbital flight.

The future picture of demand for public space travel is presented in the second part of the report (Sections 5 and 6) and includes Futron forecasts for both suborbital and orbital travel and a discussion of forecast methodologies. A presentation of forecasts that address various orbital destinations, training requirements, and service offerings is also included. Highlights from part two include:

- Suborbital space travel is a promising market — Futron's forecast for suborbital space travel projects that by 2021, over 15,000 passengers could be flying annually, representing revenues in excess of US$700 million.



- Orbital space travel is also a promising market — Futron's forecast for orbital space travel projects that by 2021, 60 passengers may be flying annually, representing revenues in excess of US$300 million.



- Location, location, location — The most important thing about on-orbit destinations is options. Futron estimated that an increase in demand would result from having both the ISS and a commercial on-orbit facility available, yielding a total of 553 passengers over the forecast period — a 32 percent increase over the baseline forecast with the ISS as the sole on-orbit destination option.

"The most important thing about on orbit destinations is options."



Artwork by Phil Smith.

1 Introduction

Yuri Gagarin blasted off into space and into the history books over forty years ago when he became the first person to orbit Earth. Alan Shepard followed one month later with a 15-minute suborbital Mercury ride in May 1961. Today, we are witnessing the natural evolution of those early events — space travel for members of the general public.

Despite this clear evolution, a number of factors have constrained the development of the market for public space travel. One of those constraints is the lack of knowledge about the potential market size for this emerging market. Futron Corporation, the industry leader in forecasting space-related markets, decided to address this constraint by objectively assessing the current interest in public space travel, and quantifying and forecasting the future demand for this service.

Futron earnestly endeavored to provide an accurate picture of the size and characteristics of the potential public space travel market via objective, thorough research, analysis, and Futron's extensive experience in forecasting space-related markets. Therefore, the findings of this report should be of value to those involved in: space transportation, space stations/hotels, tourism, investing, insurance, banking, as well as government policy, commerce, and regulatory organizations.

Futron's objective was to assess the potential size and characteristics of this new business. This report will give the reader an understanding of today's current demand for public space travel, as well as a 20-year forecast of the demand for both orbital and suborbital trips. Included are details on the methods used to quantify the current and future demand, accompanied by demographic insights into those people potentially demanding public space travel.

"...a number of factors have constrained the development of the market for public space travel."

2 Public Space Travel — the Current Picture

Tourists desiring unique, challenging, and fun experiences drive demand for public space travel. This desire is currently fueling a worldwide tourism industry with receipts in excess of US$450 billion.[1] Given the generous revenues associated with tourism, public space travel represents a huge potential market. It is only potentially large, however, because the technical ability to service this market is currently very limited.

Two distinct services are currently envisioned for public space travel: travel to low Earth orbit or orbital flights, and short excursions beyond Earth's atmosphere and back, or suborbital flights. Each of these markets are in different stages of development and execution as discussed below.

2.1 Orbital: We Have Lift-Off

Public space travel became a reality in April 2001 when American businessman Dennis Tito paid US$20 million to fly to space. Tito was launched on a Russian *Soyuz* spacecraft, which docked with the International Space Station (ISS) during the mission. Tito spent eight days in space, six of which he spent inside the ISS.

Tito's successful flight, carried out over the initial objections of NASA and other ISS partner nations, opened the door to further flights by paying customers. In April 2002, South African entrepreneur Mark Shuttleworth became the second commercial space tourist as a member of another *Soyuz* mission to the ISS. At the time of this writing, a number of other potential orbital passengers have been announced. Some of these passengers intend to pay their own way, while some celebrities are seeking corporate sponsorship to cover the cost of the flight.

Orbital public space travel is currently limited to one spacecraft, the Russian *Soyuz* vehicle. Twice a year, Russia launches *Soyuz* on supply flights to the ISS. Because only two cosmonauts are required to fly the *Soyuz*, a third seat on each mission is available to potential space tourists.

[1] World Tourism Organization Facts and Figures, available online at http://www.world-tourism.org/market_research/facts&figures/menu.htm.

This creates a steady number of flight opportunities for those interested in orbital space tourism. Although the *Soyuz* is currently the only option for orbital public space travel, other potential, future options exist:

Government Spacecraft/Programs
- *Space Shuttle* (U.S.)
- *Shenzhou* (China)
- Defense Advanced Research Projects Agency (DARPA) Responsive Access, Small Cargo, Affordable Launch (RASCAL) Program (U.S.)
- NASA's 2nd Generation Reusable Launch Vehicle Program (U.S.)

Commercial Spacecraft
- *K-1* (Kistler Aerospace)
- *SA-1* (Space Access)
- *Starbooster* (Starcraft Boosters, Inc.)
- *Neptune* (Interorbital Systems)

2.2 Suborbital: If You Build It, Will They Come?

While most public attention on space tourism has focused on orbital flights, suborbital space tourism holds significant promise. Space Adventures, the space tourism agency that contracted Dennis Tito's orbital flight, currently claims to have 100 reservations for suborbital flights at a price of US$98,000 each, despite the absence of a vehicle capable of offering such a flight[2]. The projected price of a suborbital flight is a small fraction of the price of orbital travel, and as such, puts space tourism within the financial means of a much larger audience.

"The projected price of a suborbital flight ... puts space tourism within the financial means of a much larger audience."

While there are currently no vehicles that can serve the suborbital space tourism market, a number of vehicles are under development. The primary forum for development is private entrepreneurial ventures competing for the X PRIZE, a competition that will award US$10 million to the first team to privately build and fly a spacecraft capable of carrying three people to 100 kilometers altitude twice in a two-week period.

[2] Space Adventures press release. "Sub-Orbital Spacecraft Prototype Unveiled In Russia," http://www.spaceadventures.com, March 14, 2002.

Approximately twenty teams have registered to date to compete for the X PRIZE, although some of those teams have subsequently dropped out of the competition. In addition to the X PRIZE participants, there are several other companies and entrepreneurs attempting to develop vehicles to serve the suborbital public space travel market. Below is a partial list of some of the suborbital vehicles under development:

Suborbital Vehicles (and developers)

- *Armadillo* (Armadillo Aerospace)
- *Ascender* (Bristol Spaceplanes)
- *Astroliner* (Kelly Space and Technology)
- *Canadian Arrow* (Canadian Arrow)
- *Cosmopolis XXI* (Myasishchev Design Bureau)
- *Millennium Express* (Third Millennium Aerospace)
- *Pathfinder* (Pioneer Rocketplane)
- *Proteus* (Scaled Composites, LLC)
- *SC-1 and SC-2* (Space Clipper International)
- *Space Cruiser* (Vela Technology Development)
- *Starchaser* (Starchaser Industries)
- *Xerus* (XCOR)

All of these ventures face a number of obstacles in their efforts to turn plans and prototypes into operational vehicles. In addition to the technical obstacles associated with any new aerospace vehicle, passenger spacecraft may face major regulatory hurdles depending on their nation of operation, in their quest to become operational, commercial providers of suborbital tourism. The biggest obstacle, however, appears to be financial, as companies struggle to raise the funding needed to build their proposed vehicles. Much of the difficulty stems from the inability to demonstrate that there is a sufficiently large market for space tourism to attract the investment needed to develop vehicles that can service this market.

3 Understanding the Current Demand for Public Space Travel: the Futron/Zogby Survey

Given the nascent state of the public space travel industry, Futron sought to understand and quantify the current interest in the service, as well as the factors that could affect the future demand for public space travel. Futron examined the current demand for public space travel via a survey of affluent households, the population segment most likely to be able to afford participation in leisure space travel. In particular, the goal of the survey was to objectively answer the most important questions facing the public space travel business:

- What is the size of the market?
- What is the growth potential of the market? and
- What are the customer characteristics for this market?

Although a number of potential public space travel scenarios can be envisioned, Futron chose to focus the study on two basic public space travel scenarios:

- A 15-minute suborbital ride to the edge of space, and
- A two-week orbital flight to an orbiting space station

The survey also addressed some future possibilities or changes to the scenarios that could occur over a 20-year period for use in forecasting the future demand for public space travel.

Futron contracted Zogby International to conduct 450 telephone interviews of "qualified" individuals in the United States. Zogby conducted the survey in January 2002. Each survey interview lasted an average of 30 minutes to ensure that the survey participants understood the concepts and questions presented. The survey margin of error was +/- 4.7%.

Futron restricted the respondent pool to people with a household income of at least US$250,000 annually, or a minimum net worth of US$1 million. These particular figures were carefully chosen as the parameters necessary to identify the proper market segment and to extrapolate the survey results. The income/net worth qualifier selected to identify the

"Futron restricted the respondent pool to people with a household income of at least US$250,000 annually, or a minimum net worth of US$1 million."

survey population was the highest-level qualifier that would enable a statistically valid sample that could be extrapolated for a global forecast.

3.1 Building a Strong Survey

Although space travel has many positive aspects, it is also fraught with realities that may limit the size of the potential market. A fundamental weakness of many previous surveys on the space tourism market is that they presented a future-oriented picture of public space travel centered on a luxurious and exciting adventure. Few, if any, references were made to the less-than-glamorous realities of the current public space travel scenario, a side of space travel that may be unknown to the prospective traveler.

In particular, three major restrictions that have generally been overlooked in the past were given a strong review and incorporated into the Futron/Zogby survey:

- *Fitness:* Space travel is not for everyone. The stresses of launch and reentry, the effects of exposure to micro gravity, and confinement inside a relatively small vehicle can challenge the health of even the fittest individual. As a result, the first step in qualifying for an orbital flight involves intense medical testing — both physical and psychological. Tourists traveling to orbit are held to the same standards as professional astronauts and cosmonauts. The intense tests of physical endurance included in the necessary training were likened to military "basic training" by the first leisure traveler, Dennis Tito. Although suborbital service is unavailable at this time, it is likely that travelers will have to meet some minimum health requirements in order to withstand the stresses of the trip.

- *Training Time:* In addition to physical and mental fitness, potential travelers must also spend a significant amount of time completing the requisite training for the trip. Currently, all orbital candidates must undergo six months of training to be fully prepared for an orbital trip aboard a Russian *Soyuz* vehicle. Futron's research into the 20-year forecast period indicates that although this training period could shrink significantly in the future, a leisure traveler should expect to complete at least three months of training before being allowed to fly.

Although preparation time for suborbital travel is expected to be significantly less, Futron estimates that a minimum of one week of training would be necessary to prepare for a suborbital trip.

- *Expense:* One of the most important points of realism that has not been addressed in previous studies remains the most limiting factor of all — the price. Futron's research indicates that the price for orbital space travel is not likely to drop below US$5 million over the 20-year forecast period, with the current price of US$20 million remaining in place for several years. Futron estimates that the current advertised price for suborbital travel, US$100,000, will likely remain in place through the first few years of full commercial service with changes occurring as the market develops.

Realities such as fitness and training requirements, the physical hardship of the trip itself, and the current price of orbital and suborbital flights are all factors that could greatly affect customers' interest in, and thus the demand for, public space travel services. Realizing that an accurate assessment of the current demand for public space travel relies on an accurate portrayal of public space travel scenarios, Futron sought to incorporate objectivity and realism into its survey by presenting a complete picture of space travel — both its glamorous and less-glamorous sides. Futron utilized all available resources to test the survey for realism, including input and review from former Space Shuttle Commander Bryan O'Connor.

In addition to portraying a realistic picture of public space travel, the Futron/Zogby survey asked questions related to respondents' fitness levels, prior training activities and spending patterns. The survey targeted a relevant population — that is, one that could potentially afford the service — by composing the respondent pool of affluent individuals. The survey also included questions related to past activities and behaviors in order to provide a "reality check" on the space travel-related responses.

The results of the survey, detailed below, demonstrate that a balanced portrayal of both the high points and hardships of the trip had a significant impact on the survey responses. A list of the questions asked in the Futron/Zogby survey can be found in the appendix.

"...a balanced portrayal of both the high points and hardships of the trip had a significant impact on the survey responses."

3.2 Suborbital Survey Results

The survey presented the respondents with two different descriptions of space travel: one focusing on potentially attractive aspects and the other on potentially detractive aspects. First, it gauged a respondent's interest in space travel after describing the more exciting and adventurous aspects:

> *In a suborbital space flight, you would experience what only astronauts and cosmonauts have experienced. During the 15-minute flight on a vehicle that meets government safety regulations, you will go 50 miles into space, and experience the acceleration of a rocket launch. You will also experience a few minutes of weightlessness and have the unique experience of viewing the Earth from space.*

After hearing the above description, seventeen percent of respondents said they were "definitely likely" to participate. Combining the "definitely likely" responses with the "very likely" responses yielded a total of 28 percent of the respondents being interested in suborbital flight participation. On the other hand, over 40 percent of the respondents stated that they were "not very likely" or "definitely not likely" to participate in suborbital travel.

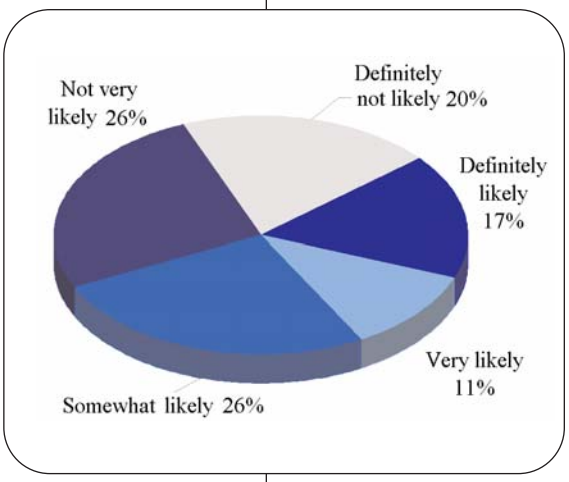


Figure 1: Interest in suborbital travel after the first description

Next, the survey presented the participants with the following description featuring the lesser-known aspects of suborbital flight, and questioned them again on their liklihood of participation:

> *Space flight is an inherently risky activity. The vehicle providing these flights will be privately developed with a limited flight history. In order to take the trip, you would have to undergo training for one week prior to the launch. Although you would experience weightlessness, you would be strapped into your seat throughout the trip.*

As expected, after hearing the second description, the respondents' answers changed. Now, only twelve percent of respondents were "definitely likely" to participate, and seven percent were "very likely." The presentation of the second description also increased the percentage of respondents that were either "not very likely" or "definitely not likely" to 57 percent.

A comparison of the responses to the first and second descriptions shows the effect that a realistic portrayal of space travel can have on interest and demand. The percentage of respondents that were "definitely likely" to participate in suborbital travel after hearing the first description dropped by five percentage points after being presented with the second description. The least amount of change between the two descriptions came from those respondents that were "somewhat likely" to participate, which decreased by three percent after the second description.

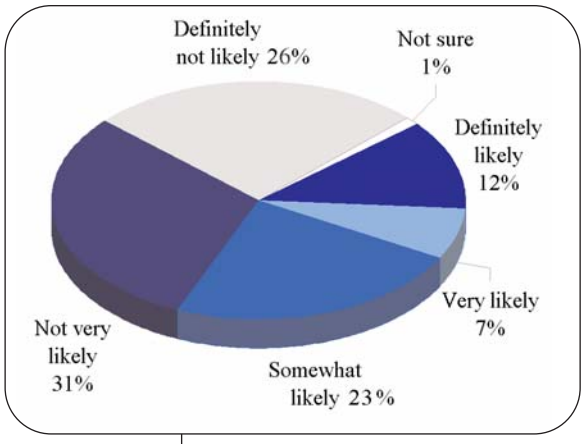


Figure 2: Interest in suborbital travel after the second description

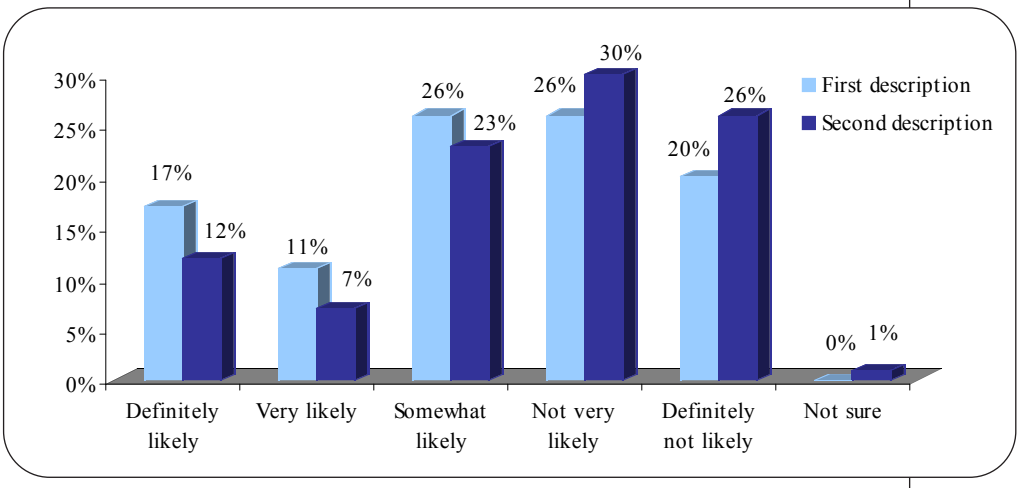


Figure 3: A comparison of responses to the first and second suborbital descriptions

3.2.1 experiences affecting interest in suborbital flight

In order to understand the attributes that attract potential public space travelers, the Futron/Zogby survey presented a list of suborbital flight experiences, pulled from the two descriptions presented above, and asked respondents to rate each attribute in terms of its importance and/or impact on their likelihood of taking a suborbital flight. The respondents rated the following experiences:

First description:

- Viewing Earth from space,
- Experiencing weightlessness

- Experiencing the acceleration of a rocket launch, and
- Experiencing what only astronauts and cosmonauts have experienced

Second description:

- Participation in a week of training
- Flying in a privately-developed vehicle, and
- Being strapped into their seats for the entirety of the flight

Of all the experiences presented from the first description, the ability to view Earth from space was by far the most important aspect, with over 60 percent of respondents rating it as "very important." The other

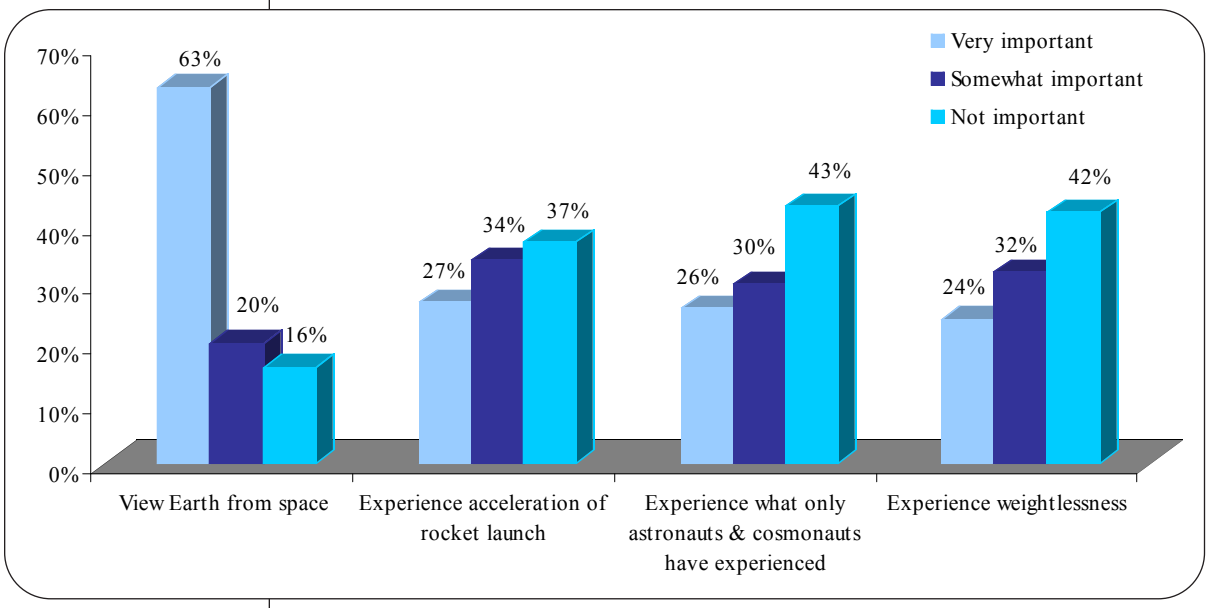


Figure 4: The importance of flight experiences taken from the first description

experiences were rated as "very important" by only one quarter of respondents. When questioned about experiences taken from the second description, 40 percent of the respondents revealed that some experiences, such as flying in a privately-developed vehicle and participating in required one-week training, would not affect their likelihood of taking a suborbital flight. The experience that yielded the most "somewhat less likely" responses — over 35 percent— was being strapped into their seat for the entirety of the flight.

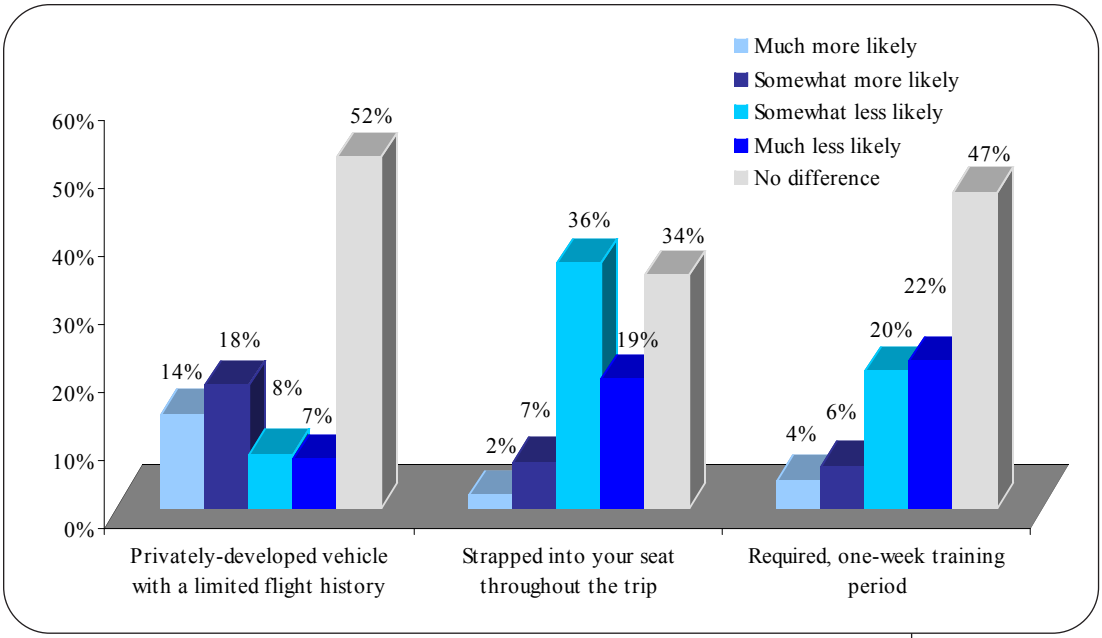


Figure 5: The impact of flight experiences taken from the second description

3.2.2 willingness to pay for suborbital space travel

Current ticket prices for suborbital space travel hover around US$100,000. However, it is unclear how the ticket price may vary once regular commercial operation of suborbital service commences. In order to test the full range of possible price points for this market now and in the future, the Futron/Zogby survey covered a range of price points from US$25,000 to US$250,000. Figure 6 represents the cumulative responses to these price points presented in descending order of price.

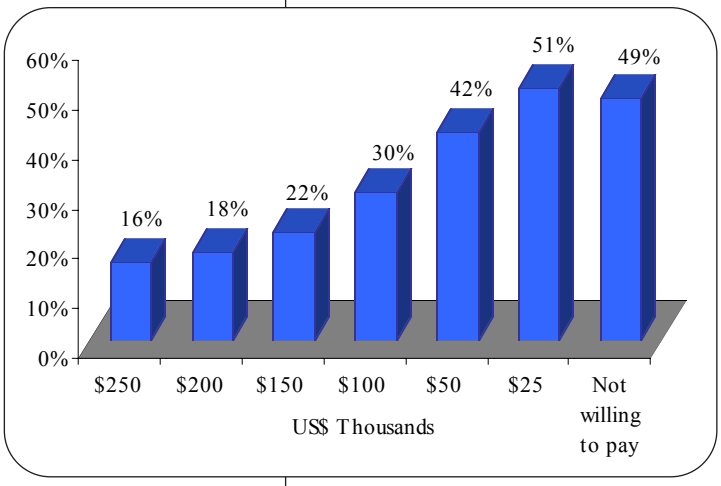


Figure 6: Willingness to pay for suborbital travel grouped by price point

The survey asked respondents about their willingness to pay ticket prices within the range mentioned above beginning with the highest price. Once an individual replied to a price, they were not asked any other price points for that scenario as it was assumed they would be willing to pay a lower price. Of the price points offered, sixteen percent of respondents immediately accepted the maximum ticket price of US$250,000 to travel on a suborbital flight.

As expected with most goods and services, interest in taking a suborbital

flight increased as the price decreased. Just over 50 percent of the survey pool expressed their willingness to pay one of the ticket prices presented in the range mentioned above.

3.2.3 potential future changes for suborbital travel

The Futron/Zogby survey was designed not only to gain an understanding of the current demand for public space travel, but also to lay a solid foundation for the forecast of demand for public space travel over the next 20 years. Although price is often the greatest factor affecting demand for a service, the Futron/Zogby survey did include some questions on non-price related scenario changes that could possibly affect the demand for suborbital travel in the future. For example, over the 20-year forecast period, the training process will likely be streamlined and a second generation of suborbital vehicles could be developed that will offer the opportunity for passengers to better experience micro-gravity during flight. In order to measure how these developments might influence demand, the survey included questions on how these changes would affect the respondents' interest in participating in suborbital travel.

Of these possible future scenarios for suborbital travel, the ability to leave your seat during flight was clearly the most important. Fifty-two percent of respondents said they would be more likely to participate in a suborbital flight if they could leave their seat. On the other hand, just over twenty percent of the respondent pool said they would be more likely to participate in suborbital travel if the training took less than a week.

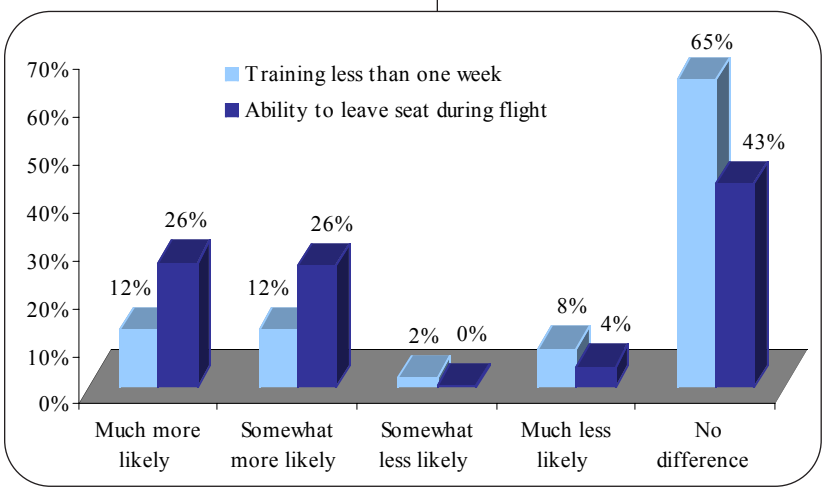


Figure 7: The impact of future suborbital scenarios on the demand for suborbital travel

3.3 Orbital Survey Results

As with the suborbital questions, the Futron/Zobgy survey tested how a realistic portrayal of orbital space travel changes potential travelers' interest in purchasing a flight. The orbital space travel portion of the survey began with a description of the most attractive attributes of the trip:

In an orbital flight, you would have the opportunity to experience what only astronauts and cosmonauts have experienced. The trip would begin with a launch aboard a thoroughly-tested rocket. You would then dock with an orbiting space station and would have the freedom to move about the facility. During your two-week stay you would be weightless. You would have the opportunity to eat, sleep, exercise and view the Earth from space.

After hearing the above description of the positive aspects of orbital space flight, 22 percent of respondents said they were "definitely likely" to participate. Combining the "definitely likely" responses with the "very likely" responses yielded a total of 35 percent of the respondents being interested in taking an orbital flight. Over 40 percent of the respondents were either "not very likely" or "definitely not likely" to participate in orbital travel.

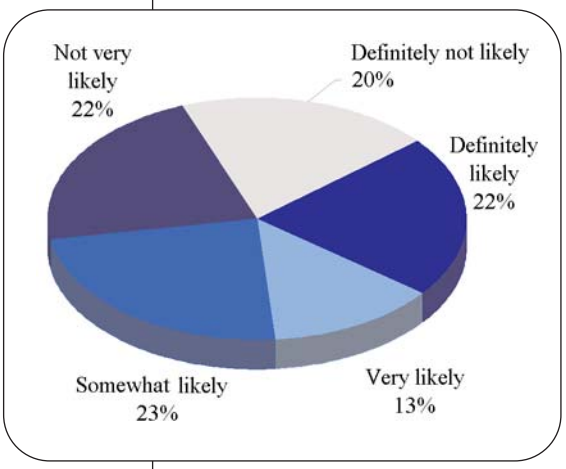


Figure 8: Interest in an orbital flight after the first description

After the respondents were read the positive aspects of orbital space travel, they were presented with the lesser-known aspects:

Space flight is an inherently risky activity. Currently, the flight is only available on a Russian vehicle. In order to take the trip, you would have to undergo intensive cosmonaut training in Russia for six months prior to the launch. During the flight you may experience headaches and lower backache. While in space, you might experience some nausea. You would be able to view the Earth through porthole-sized windows. Upon your return to Earth and to normal gravity, you might experience some dizziness for a few days and have difficulty standing.

Again, as was seen in the suborbital case, the respondents changed their answers after hearing the second description. When presented with orbital flight realities, only ten percent of respondents were still "definitely likely" to participate, while eight percent were "very likely." Likewise, the percentage of respondents that were either "not very likely" or "definitely not likely" to participate increased to 64 percent.

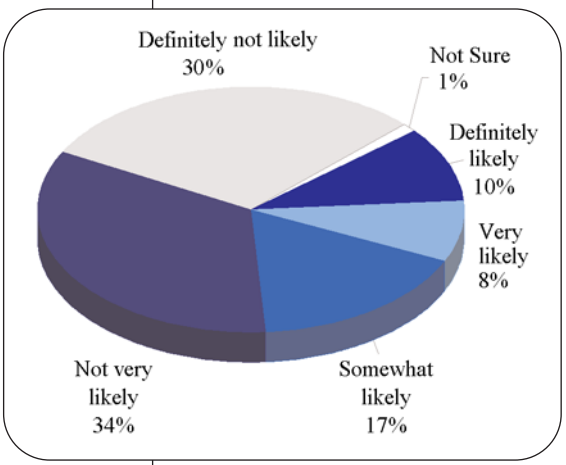


Figure 9: Interest in taking an orbital flight after the second description

A comparison of the responses to the first and second descriptions shows the effect that a realistic portrayal of space travel has on interest and demand for the service. The number of respondents who were "definitely likely" to participate after hearing the first description dropped by twelve percent after being presented with the second description. An equivalent increase

(12 percent) was also seen in those who were "not very likely" to participate in an orbital flight after hearing the second description.

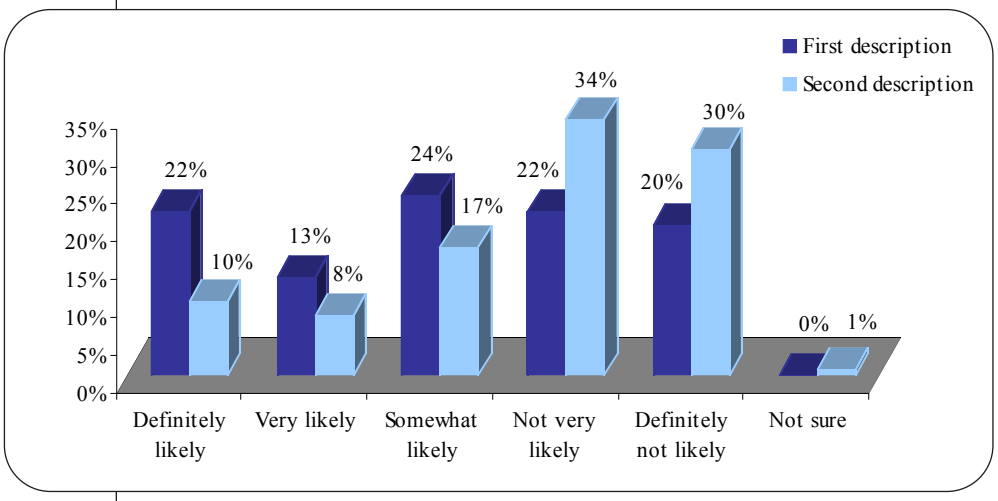


Figure 10: A comparison of responses to the first and second orbital descriptions

3.3.1 experiences affecting interest in orbital flight

To understand which aspects of space travel would most interest potential travelers, the survey asked respondents to rate a list of orbital flight experiences, taken from the first and second descriptions presented above, according to how those experiences would influence their likelihood of participating in an orbital flight. The respondents rated the following experiences:

First description

- Launching on a thoroughly-tested rocket
- Staying on a space station
- Orbiting the Earth every 90 minutes, and
- Performing normal daily activities (eating, sleeping, exercising, etc.) while in space

Second description

- Launching on a Russian vehicle
- Undergoing six months of training, and
- Possible physical difficulties that could be experienced upon return to Earth

Of all of the experiences presented in the first description, launching on a thoroughtly-tested rocket received the most favorable response with over 70 percent rating it as “very important." Another orbital flight experience rated as “very important" by 49 percent of survey respondents was the ability to perform daily activities, such as eating, sleeping and exercising in space.

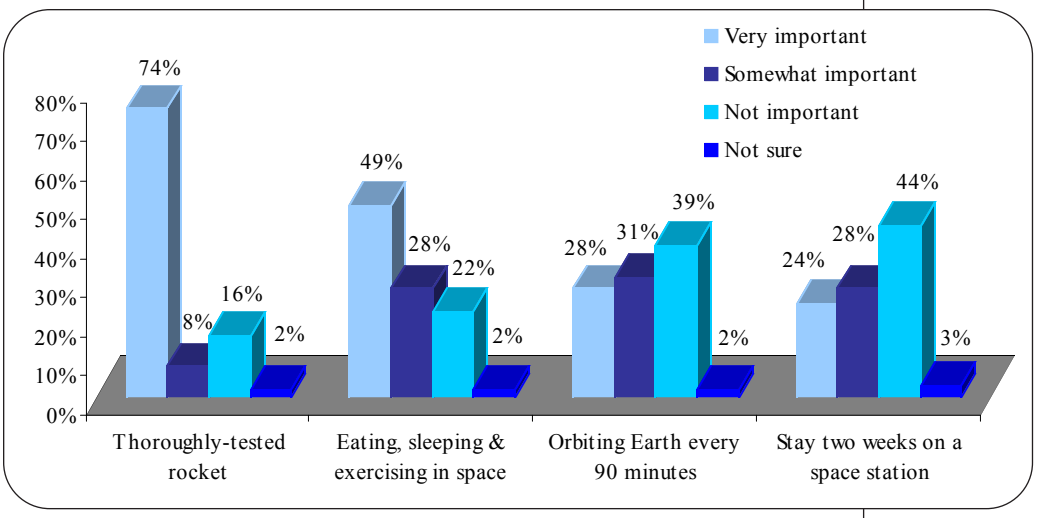


Figure 11: The importance of orbital flight experiences taken from the first description

When questioned on experiences taken from the second description, over 50 percent of respondents said that potential physical discomfort (e.g., dizziness or difficulty standing upon return to Earth) made no difference in their likelihood of participating in an orbital flight. The experiences that yielded the largest reduction in the willingness to participate were those pertaining to flying in a Russian vehicle and training in Russia.

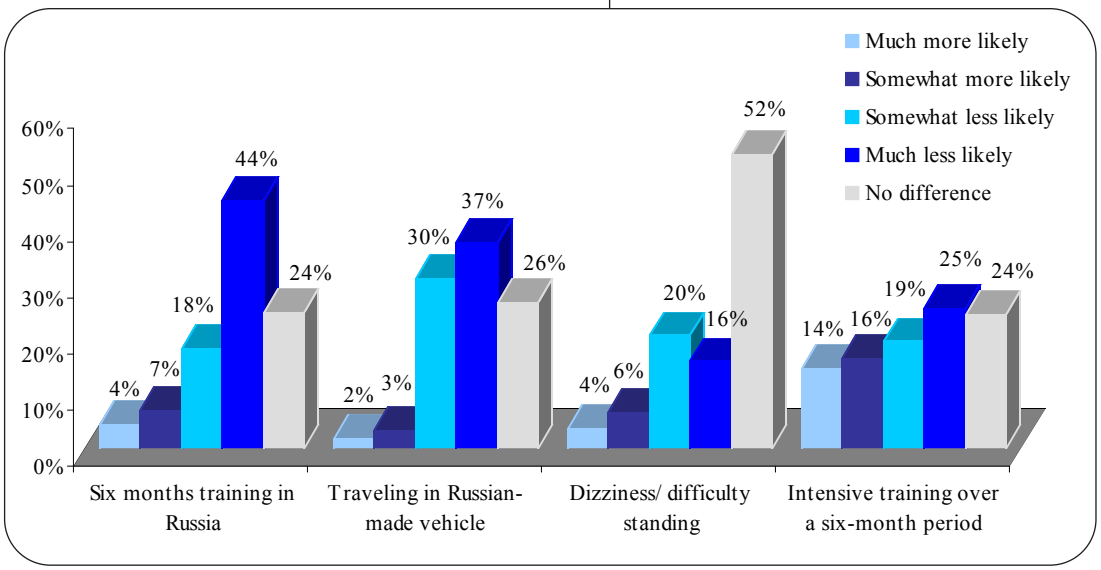


Figure 12: The importance of orbital flight experiences taken from the second description

Thirty-seven percent of those surveyed said that launching on a Russian-made vehicle would make them “much less likely" to take an orbital flight. Forty-four percent said they would be “much less likely" to participate in an orbital space flight when confronted with the reality of six months training in Russia, including learning to speak Russian.

3.3.2 willingness to pay for orbital space travel

Currently, the price of a two-week orbital space flight to the ISS is reported to be approximately US$20 million. Futron's research, including both technical and economic analysis of crew-rated vehicles, and interviews with the current providers of this service, indicates that the price for orbital travel will slowly, but steadily, decrease in the future. The Futron/Zogby survey queried respondents on a wide range of prices, from US$1 million to US$25 million, in order to gauge demand based on current prices and to allow for changes in price that may occur in the future. Figure 13 represents the cumulative responses to these price points presented in descending order of price.

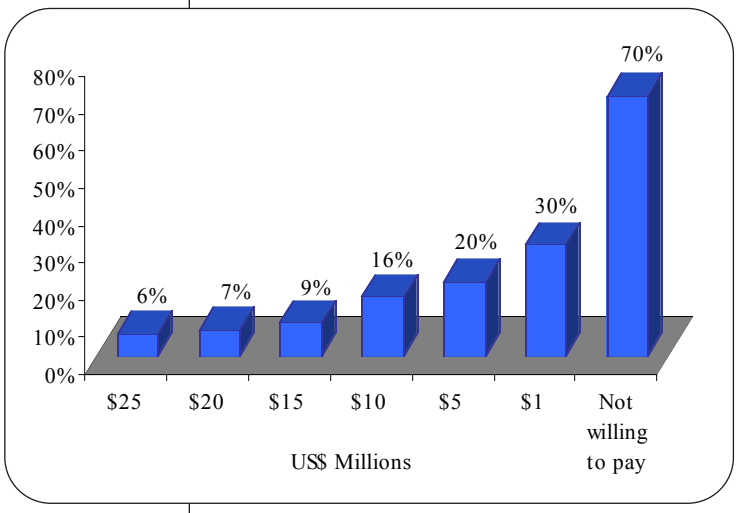


Figure 13: Willingness to pay for orbital travel grouped by price point

In the survey, respondents were asked about their willingness to pay orbital flight ticket prices from the range mentioned above beginning with the highest price. Once an individual replied to a price, they were not asked any other price points as it was assumed they would be willing to pay a lower price. Of the price points offered, six percent of respondents said they would be willing to pay the highest ticket price of US$25 million for an orbital excursion. Interestingly, only one percent more of the respondents expressed willingness to pay for orbital travel when the amount was dropped to the current ticket price of US$20 million. However, the respondents' willingness to pay increased noticeably when the price decreased to the US$10 and US$1 million marks. In all, 30 percent of respondents were willing

to pay a ticket price within the range provided by the survey.

3.3.3 potential future changes for orbital space travel

The Futron/Zogby survey was designed to reveal the current demand for public space travel, while at the same time laying a solid foundation for the forecast of demand for public space travel over the next 20 years. Although price is usually the greatest factor affecting demand for a service, Futron did include some non-price related scenarios that could possibly influence the demand for public space travel in the future. Respondents were asked whether changes in certain aspects of the trip, such as training location, the ability to take a companion, and final destination, would affect their desire to participate in an orbital flight.

"Over 60 percent of the survey pool would be more likely to participate in an orbital trip if they could train in the United States..."

Location of training and takeoff

The ability to purchase a trip from a U.S. company or to complete the training inside the United States were the potential future changes that most influenced the respondents' decision to take an orbital trip. Respondents' interest increased significantly when asked about the possibility of purchasing an orbital trip from a U.S. company: 27 percent of respondents were "much more likely" and 34 percent were "somewhat more likely" to participate in an orbital flight. Just over 30 percent of respondents said that a U.S. company offering would make "no difference" in their decision.

Survey respondents were then asked about the possiblity of training in the United States instead of Russia, the current training site. Over 60 percent of the survey pool would be more likely to participate in an orbital trip if they could train in the United States, with 36 percent of respondents revealing that they would be "much more likely", and 24 percent indicating that they would be "somewhat more likely" to participate if this option existed.

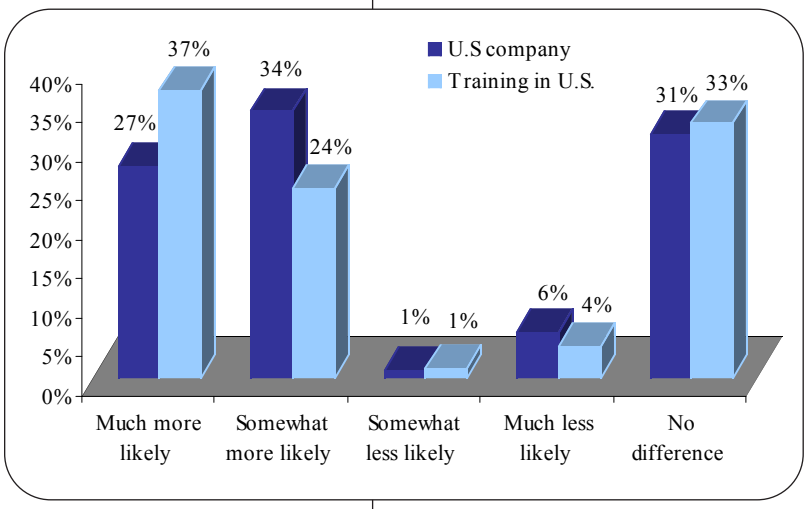


Figure 14: The impact of U.S. options on demand for orbital travel

Training time

The current six month training period for orbital flight may be reduced in the future. Respondents were asked if a shorter training period, either three months or one month, would affect their desire to take an orbital trip. Half of respondents said they would be either "much more likely" or "somewhat more likely" to participate in orbital travel if shorter training scenarios were available. For approximately 40 percent of respondents, the alternate training scenarios would make "no difference" in their decision regarding an orbital trip.

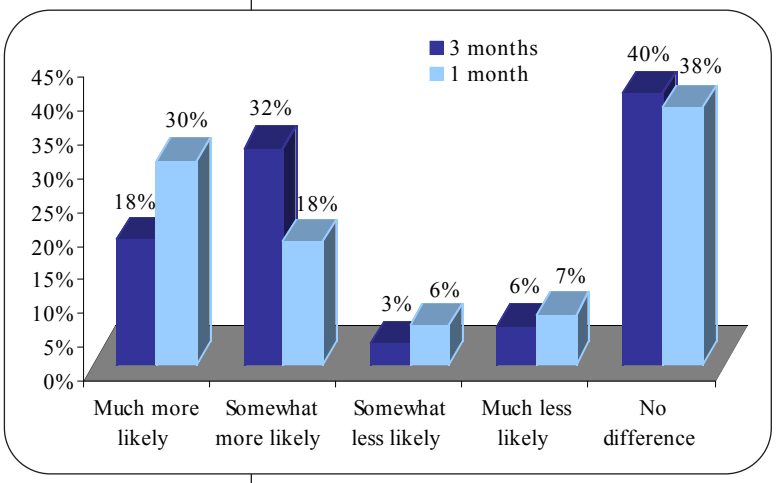


Figure 15: The impact of reduced training time on demand for orbital travel

Spacewalks

At this time, extra-vehicular activity (EVA), or a "space-walk," is currently restricted to trained professional astronauts. Participation in an EVA would be an exciting opportunity for future space tourists, but would also likely boost the ticket price while also significantly increasing training time. Futron's research indicates that at least one year of training would be necessary to prepare for an EVA.

The Futron/Zogby survey questioned respondents on whether the opportunity to experience a spacewalk would change their decision to participate in an orbital trip, knowing that this opportunity would also increase the cost. Only 22 percent said that the opportunity would make them "much more likely" to participate in an orbital trip. Forty-two percent said that such an opportunity would make "no difference" in their decision.

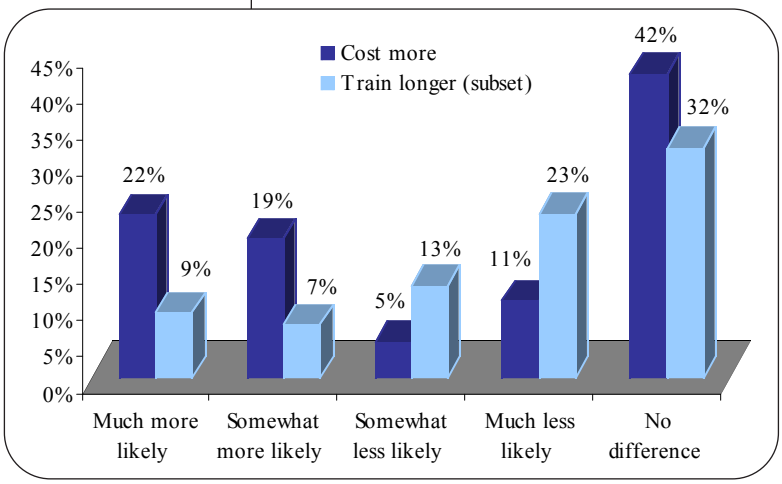


Figure 16: The impact of an EVA opportunity on demand for an orbital trip

The survey then asked the subset of respondents who replied “much more likely," “somewhat more likely," or “no difference" whether a spacewalk opportunity would influence their desire to take an orbital trip if it also meant that they would have to spend a full year in training. Of this subset, only eleven percent responded that the spacewalk opportunity, burdened with extra training time, would make them “much less likely" to participate. Thirty-two percent said that the spacewalk and additional training made “no difference" in their decision to participate in orbital flight.

Alternative destinations

The regulations and restrictions associated with traveling to the ISS could create an obstacle to the two-week orbital trip scenario presented in the Futron/Zogby survey. Two possibilities have been proposed within the space industry for mitigating the obstacles associated with tourist trips to the ISS. The first possibility offers an alternative commercial on-orbit destination, such as a commercial space station. The second is a two-day orbital trip that does not dock with an on-orbit destination. With both alternate scenarios, the customers may have to spend less time training to prepare for flight.

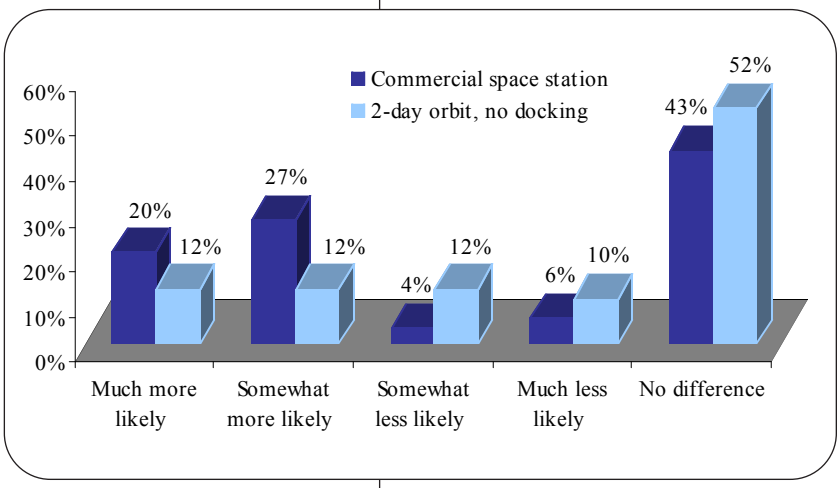


Figure 17: The impact of trip destination alternatives on demand for an orbital trip

When questioned about docking with a commercial facility, over 40 percent of respondents said that such a scenario would make “no difference" in their decision to take an orbital trip. With respect to the two-day trip alternative, over 50 percent of survey respondents said that such a scenario would make “no difference" in their decision.

Ability to take a companion

While the current orbital trip scenario allows for only one leisure passenger per *Soyuz* flight, future orbital trip scenarios could allow for two tourists. This could be accomplished through either the development of a new orbital vehicle or a policy change allowing more than one leisure passenger to travel on a *Soyuz*. Almost half of the respondents said that the ability to take a companion with them would make "no difference"

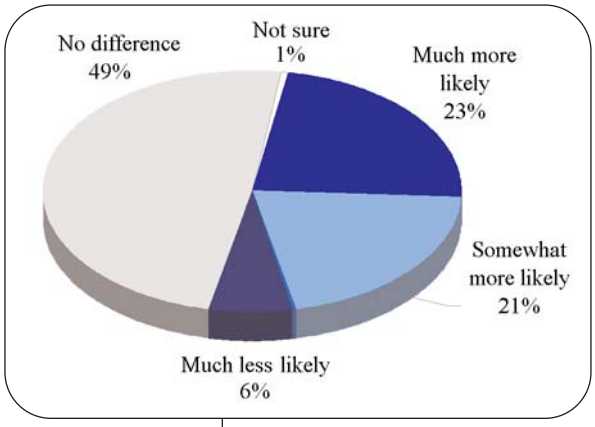


Figure 18: The impact of the ability to take a companion on demand for orbital travel

in their decision to purchase a trip. However, 44 percent of respondents indicated that this possibility would make them more likely to participate in an orbital flight.

Opportunity to finance the trip

The high price tag of space travel places it out of reach for most people. The survey queried respondents who answered that the trip was too expensive whether they would be more willing to pay for the flight if they could finance the trip. Sixty-eight percent of respondents said that the opportunity to finance either an orbital or a suborbital trip would not increase their interest.

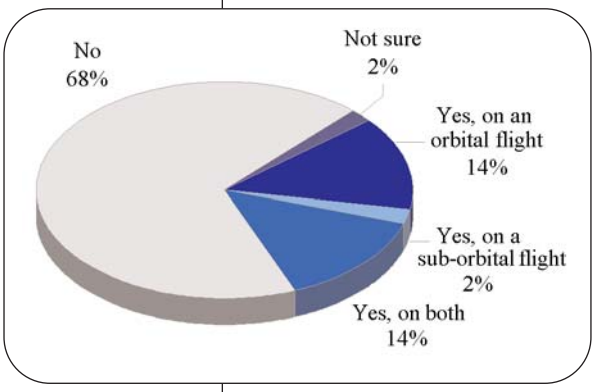


Figure 19: The impact of financing on demand for orbital or suborbital travel, based on a subset of respondents

3.4 A Full Portrait of Survey Respondents

Beyond testing interest in space travel, the Futron/Zogby survey gathered demographic and behavioral information on the respondents to enhance understanding of their preferences and past purchasing behavior.

3.4.1 demographics

In order to be qualified to participate in the Futron/Zogby survey, respondents had to have a minimum annual household income of US$250,000 or a minimum of US$1 million net worth. Income and/or wealth was selected the sole qualifier for the 450 respondents in order to obtain as wide a snapshot of the target market as possible. Survey respondents were also asked about their gender, age, education, employment status, dependent status, and marital status. Futron/Zogby used U.S. demographics, published by sources such as Internal Revenue Service (IRS), to balance the respondent pool so that it statistically reflected the demographic profile of millionaires in the United States. Tables 1 and 2 feature some of the demographic highlights of the Futron/Zogby respondent pool.

The majority of respondents qualified for the survey through their net worth rather than their income. Sixty-one percent of respondents had a household income of less than US$250,000, but had a net worth of more than US$1 million. Nearly all respondents (88 percent) fulfilled the net worth qualifier of US$1 million.

Futron research revealed that 57 is the average age for millionaires in the United States.[3] The average age of respondents was 57 years old, with more than half of respondents (58 percent) between the ages of 50 and 64 and 22 percent being 65 or older. Eighteen percent of the respondents were between the ages of 30 and 49, and only one percent was between 18 and 29.

Seventy percent of survey respondents were male and 30 percent were female, which mirrors the ratio of wealth holders in the United States, as published by the IRS.[4]

The survey also queried respondents about their dependents and found that 32 percent of respondents had children that were financially dependent on them, while 27 percent had other dependents. Nine percent of the pool had both dependent children and other dependents.

In addition to gathering demographic information on the survey respondents, the Futron/Zogby survey was designed to gather data on a wide range of other variables that might provide insight into the decision drivers of this group, and their possible motivations for purchasing public space travel services.

Net Worth	% of survey respondents
Less than $1 million	12%
Greater than $1 million	88%
Annual Income	**% of survey respondents**
Less than $250,000	61%
$250,000 to $500,000	30%
$500,000 to $1 million	7%
$1 million to $2 million	1%
$2 million or more	0.4%
Employment Status	**% of survey respondents**
Full-time	35%
Retired	29%
Self-employed	24%
Part-time	6%
Other	6%

Table 1: Net worth, income, and employment demographics of survey respondents

Table 2: Age, gender, marital status, and dependents demographics

[3] Thomas J. Stanley, William D. Danko. *The Millionaire Next Door: The Surprising Secret of America's Wealthy,* Longstreet Press, 1996, p. 8.

[4] Barry W. Johnson. "Personal Wealth, 1992-1995," *SOI Bulletin*, 1997/1998 Winter , Internal Revenue Service, p. 71.

3.4.2 perception of risk and participation in risky activities

Since space travel is an intrinsically risky activity, the Futron/Zogby survey included a series of questions designed to gauge how participation in and perception of risky physical activities might indicate the target population's attitude and desire to fly in space. Respondents were asked to provide the frequency of participation in a wide range of activities of various risk levels, provided in Figure 20, including some that Futron considered to be on the same level of danger and physical exertion as public space travel.

Respondents were asked to measure their participation in risky activities on a four-point scale, ranging from “regularly" to “never." More than three quarters of respondents stated that they participated in at least one of these activities “sometimes" or “regularly." The two activities that had the smallest number of participants in the survey pool were sky-diving and mountain climbing, in which only 18 percent of respondents “sometimes" or “regularly" participate.

In addition to questions about participation in risky activities, the survey included questions intended to gauge the respondents' perception of

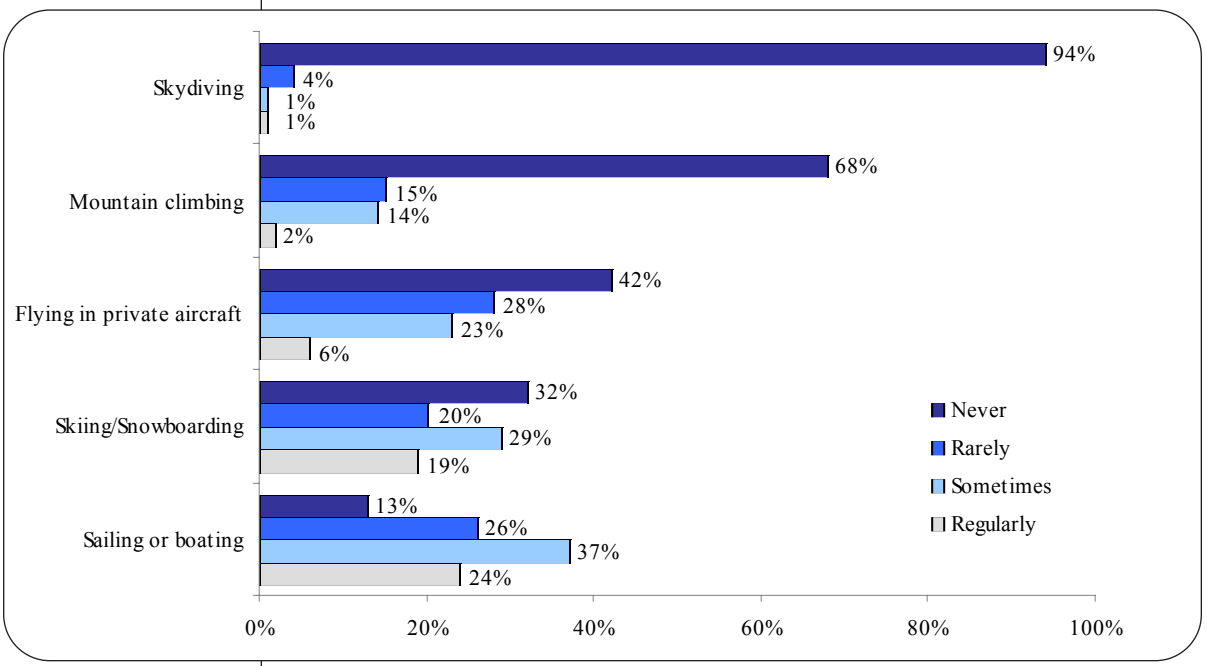


Figure 20: The survey respondents' participation in risky activities

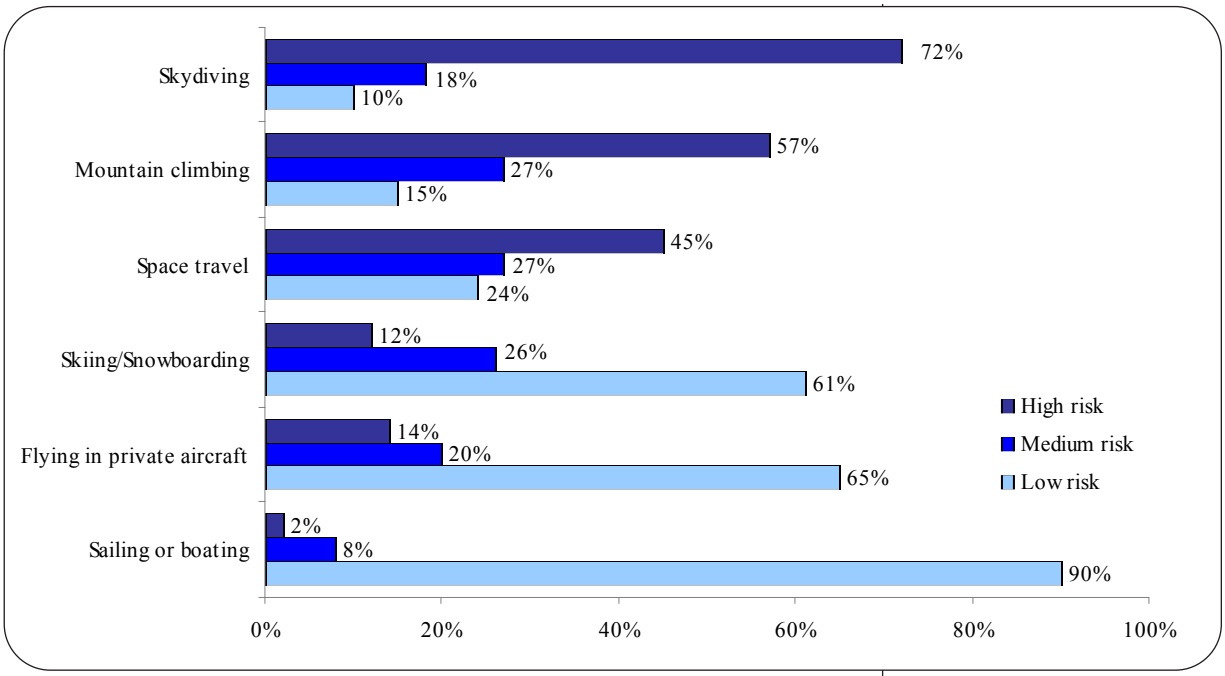


Figure 21: Respondents' perceived level of risk for a selection of risky activities

the risks associated with a range of activities, including spaceflight. Respondents were asked to rate each of the activities, including space travel, on a five-point scale, ranging from "not at all risky" to "extremely risky." The survey pool's rankings indicated that they felt that space travel was the third-riskiest activity, after skydiving and mountain climbing. Space travel received an average rating of 3.0 on the five-point scale, while both skydiving and mountain climbing received a significantly higher average rating of 4.0. Broadly, these results portray a realistic appreciation of the relative risks of each activity.

3.4.3 discretionary income patterns

In order to gain insight into spending patterns of respondents, the Futron/Zogby survey asked respondents to identify the item or activity on which they spent the most discretionary income last year, as well as how much was spent. This series of questions helped to illuminate how respondents typically spend large sums of money, whether on experiences like traveling and vacations, or by investing the money in something more stable like a new home.

Nearly one-third of respondents indicated that they spent the largest amount of their discretionary income on experiential purchases, such as traveling and vacations. Twelve percent of respondents spent the most discretionary income on the second-most popular purchase, a new vehicle.

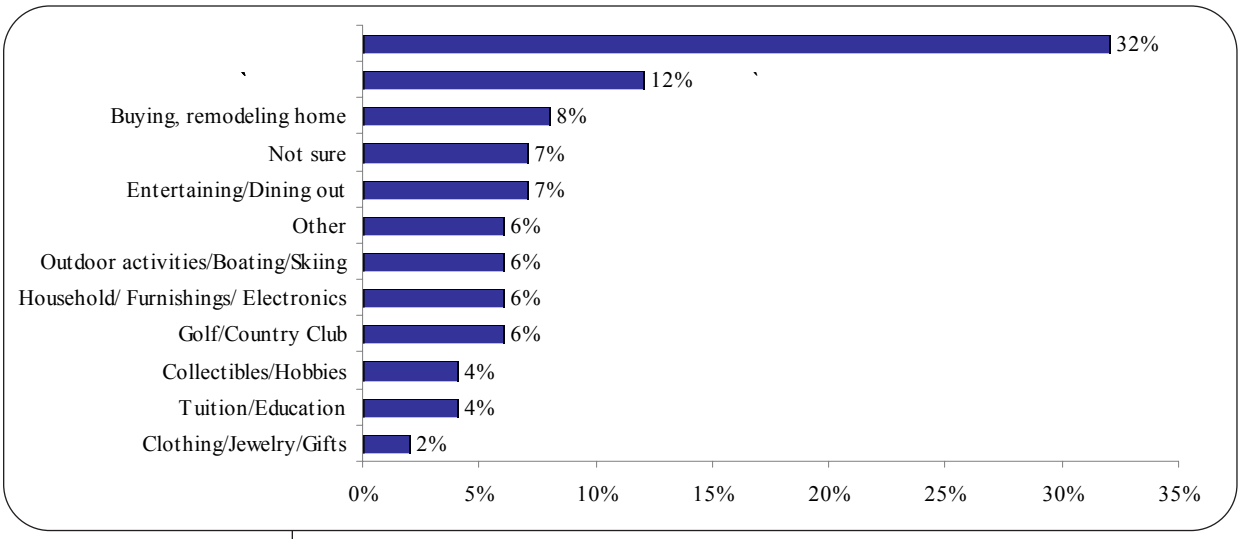


Figure 22: The respondents' discretionary income spending habits

Twenty-four percent of respondents said they spent less than US$5,000 on their largest discretionary purchase in 2001. Twenty-five percent spent between US$5,000 and US$10,000. Yet another 24 percent spent between US$10,000 and US$25,000. Respondents spending in excess of US$25,000 tended to focus on material purchases. More than half (58 percent) of those spending US$25,000 to US$50,000 in discretionary income purchased a vehicle and one-third (35 percent) of those spending more than US$50,000 in discretionary income did so on a new home or home improvements.

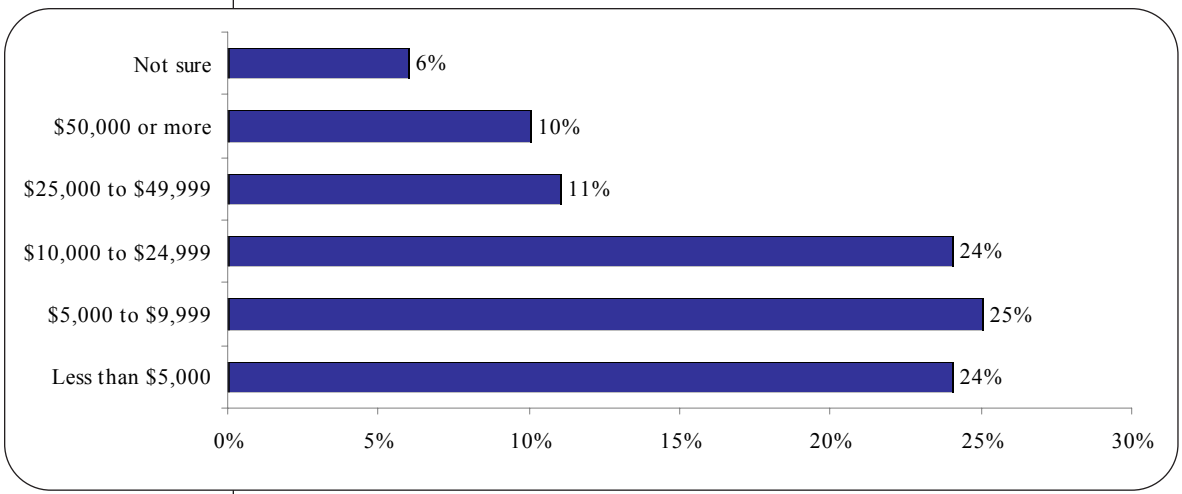


Figure 23: The amount spent by respondents on their largest discretionary purchase in 2001

3.4.4 public space travel vs. other expenditures

As another insight into the spending patterns of the respondent pool, the Futron/Zogby survey posed a situation in which the respondents had a specified amount of discretionary income to be spent on one thing. Respondents were given a list of options on which they could spend US$100,000, including suborbital space flight, with an opportunity to offer an open-ended answer. Fifty-six percent of the respondents said that they would invest the US$100,000; eighteen percent stated they would choose to purchase a dream vacation, while only twelve percent said they would spend it on a suborbital flight. (At this point in the survey, respondents had not been told the current price for a suborbital flight is approximately US$100,000.)

"...twelve percent said they would spend it on a suborbital flight."

When asked how they would spend US$5 million dollars of discretionary income, 45 percent of the respondents still preferred to invest. The second most popular option, chosen by 22 percent of the respondents, was to purchase a home in an exotic location. Orbital flight came up third with 17 percent. (At this point in the survey, respondents had not been told the current price for an orbital flight is US$20 million.)

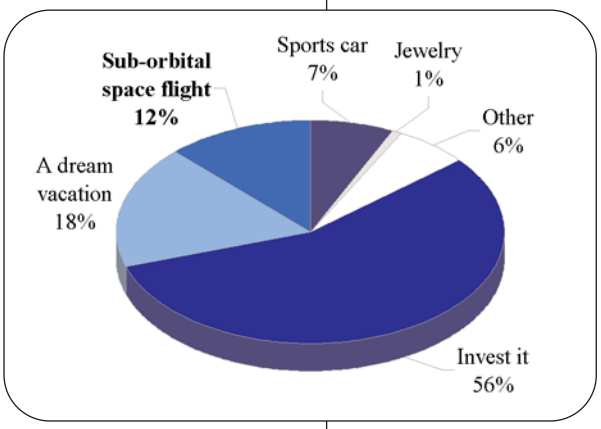


Figure 24: How survey respondents would choose to use US$100,000

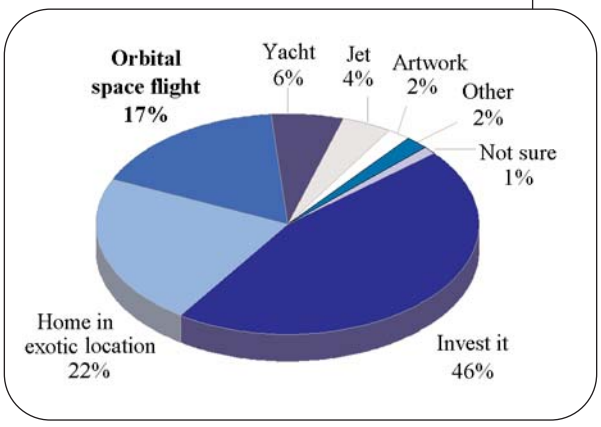


Figure 25: How survey respondents would choose to use US$5 million

3.4.5 vacation and leisure patterns

Public space travel could be viewed as the ultimate extension of the travel and tourism market. As such, the Futron/Zogby survey gathered data on respondents' vacation and spending patterns and used this data to analyze behavior in regard to public space travel.

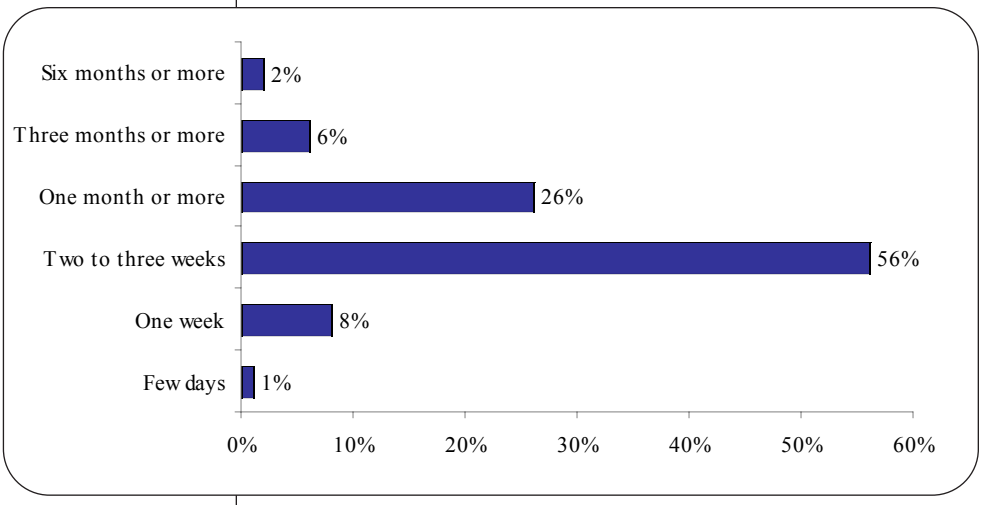


Figure 26: Most time ever spent on vacation

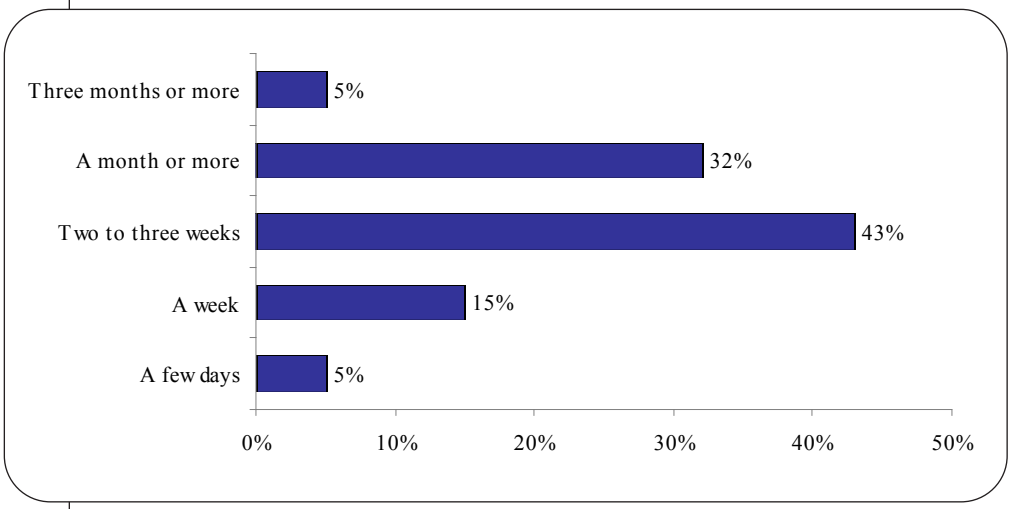


Figure 27: The amount of time respondents spent on vacation per year

The survey asked respondents to indicate both the longest time that they had ever spent on a vacation and their average annual vacation length. The majority of respondents (56 percent) revealed that their longest vacation was two to three weeks. In contrast, only two percent said they had spent six months or more on vacation. Only five percent

of the respondents spent more than three months on an average annual vacation. Forty-three percent spent an average of two to three weeks on vacation per year.

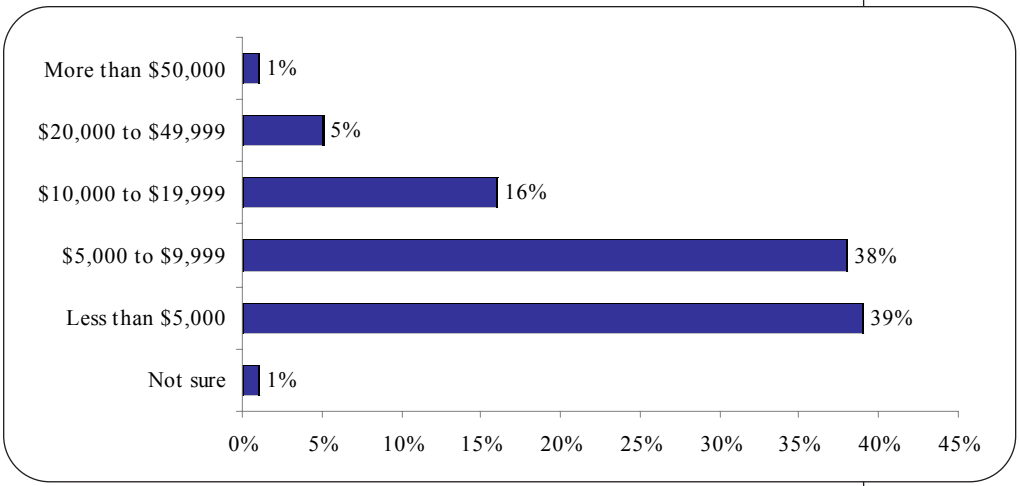


Figure 28: The amount of money (US$) respondents spent on annual vacation

In terms of annual vacation spending, 77 percent of respondents said they spent less than US$10,000 a year on vacation travel. In contrast, only one percent of respondents claimed to spend more than US$50,000 on annual vacations.

3.4.6 fitness and training

Given the current realities of preparing for space travel, Futron deemed it necessary to gain insight into the respondent pool's fitness and training habits. As with the questions on vacation habits, the data on the respondents' current fitness and training habits provided a basis of analysis for their potential willingness and ability to undergo training for public space travel. Thirty-six percent of respondents rated themselves as having "above average fitness" and eleven percent rated themselves as "extremely fit." Fourteen percent indicated that they possessed "below average fitness" or were "not at all fit." The remaining 39 percent rated themselves as having "average fitness."

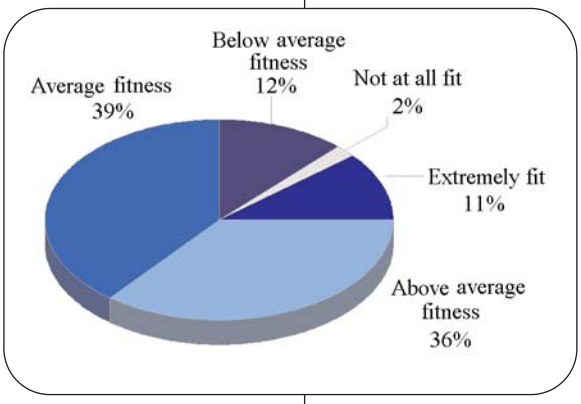


Figure 29: Stated fitness levels of respondents

When asked about prior training experiences, 25 percent of respondents said they had spent “several months" in training for a single activity, while eight percent had spent six months in preparation, and 17 percent had spent a full year or more physically preparing for one activity. However, nearly half (46 percent) had spent only three weeks or less in preparation for a single activity.

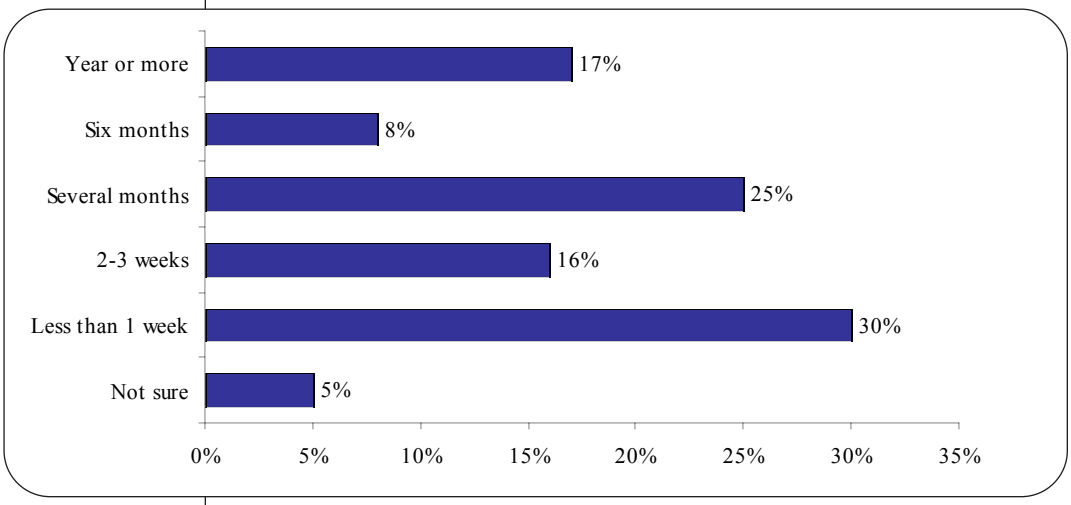


Figure 30: The longest amount of time respondents have spent training for a single activity

3.4.7 interest in space

As a proxy for determining the respondents' level of “space enthusiasm," and to ascertain any possible relationship between the demand for public space travel and general interest in space, the Futron/Zogby

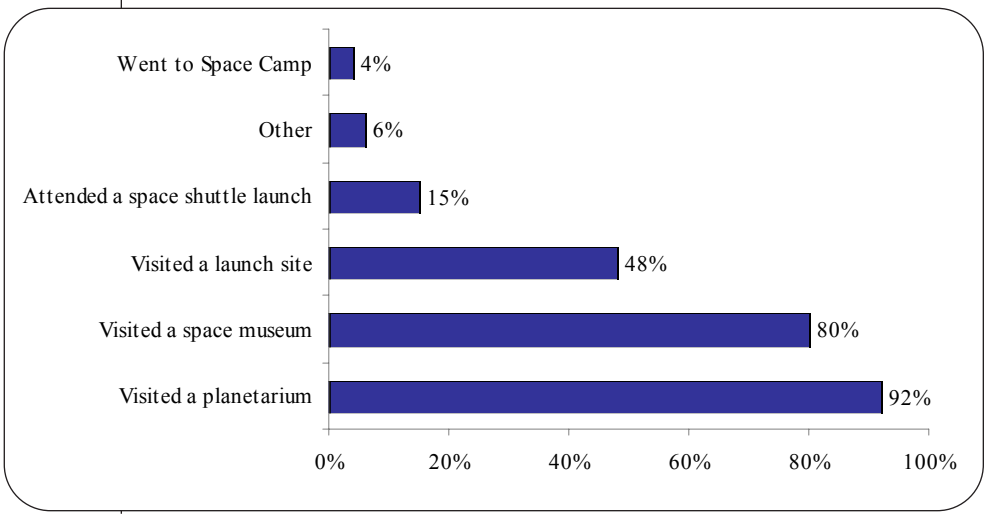


Figure 31: The respondents' participation in terrestrial space-related activities

survey questioned respondents on their past participation in terrestrial space-related activities. Respondents were asked if they had ever visited a space museum, a launch site, or a planetarium, and whether they had ever attended a space shuttle launch or participated in space camp. The number of these activities that respondents have engaged in was used to gauge their interest in space.

Of all the space-related activity options presented, the greatest percentage of respondents (92 percent) had visited a planetarium, with visiting a space museum close behind at 80 percent. More than one-third of respondents (34 percent) had participated in two activities, and an additional 34 percent had participated in three activities. Three percent of respondents demonstrated a clear interest in space having taken part in all five terrestrial space-related activities.

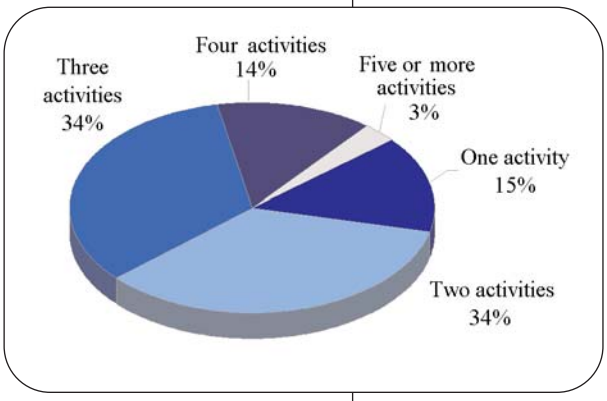


Figure 32: The number of terrestrial space-related activities in which respondents had participated

3.4.8 reasons for space travel

In order to gain additional insight, respondents were asked to identify the most important and second-most important reasons as to why they would have an interest in traveling to space.

	Most important reason	Second-most important reason
Pioneer	24%	14%
See Earth from space	15%	24%
Lifelong dream	9%	13%
Space enthusiasm	7%	9%
Other	25%	40%
Not interested	20%	N/A

Table 3: Reasons for interest space travel

"Three percent of respondents demonstrated a clear interest in space..."

Although responses varied greatly, the most important reason that gathered the largest percentage of responses was the opportunity to be a pioneer or to do something that only a few have done before. The ability to view Earth from space was rated as the most important reason for traveling into space by fifteen percent of respondents. Twenty percent had no interest in space travel at all.

3.4.9 reasons for not participating in public space travel

Individuals that repeatedly expressed no interest in space travel were asked for the reason why they were not interested. For both scenarios, survey respondents most often cited that the trip was too expensive. This was supported by the fact that almost one-half of survey respondents indicated that they were unwilling to pay at least US$25,000 for a suborbital flight and 70 percent said they were unwilling to pay at least US$1 million for an orbital trip.

	Not interested in suborbital	Not interested in orbital
Too expensive	21%	32%
Interested in other things	15%	11%
Too dangerous	11%	11%
Not interested in space	9%	10%
Other	44%	36%

Table 4: Reasons why respondent subset was not interested in space travel

4 Survey Analysis — Cross-tabulation of Survey Data

The Futron/Zogby survey results presented above highlight some of the straightforward responses to the questions posed. Cross-tabulation of responses from one or more questions, however, often reveals unexpected relationships between variables. Certain survey data were cross-tabulated to augment understanding of buyer preferences and to increase the fidelity of Futron's analysis and forecasting of the public space travel market.

"...nineteen percent of respondents said they were interested in participating in suborbital space travel..."

4.1 Interest in Suborbital Flight

Approximately nineteen percent of respondents said they were interested in participating in suborbital space travel, as shown in Figure 2 above. An analysis of the answers of this subset of respondents to other survey questions yielded insight into the characteristics and behaviors of these potential suborbital customers.

4.1.1 risky activities

The subset of respondents who expressed an interest in participating in suborbital travel also indicated that they participated in other risky activities. (See Figure 20 for the responses of all survey respondents.) Just under one-third of these respondents participated in one or both of the two activities deemed riskiest — sky-diving and mountain climbing — which is almost double the relative participation rate of all survey respondents.

Other risky activities: Suborbital	Participation	Risk perception (on a five -point scale)
Skydiving	7%	3.7
Mountain climbing	25%	3.6
Space travel	N/A	3.0
Skiing/snowboarding	55%	2.2
Flying in a private jet	44%	1.9
Sailing or boating	68%	1.4

Table 5: Suborbital subset's interest in other risky activities

The respondent subset gave space travel a 3.0 rating on a five-point scale of perceived risk, where 1 was not at all risky and 5 was extremely risky. For the same group, the average risk perception for mountain climbing was 3.6 and sky-diving was 3.7, indicating that they deemed space travel less risky than those two activities. (Figure 21 shows ratings of perceived risk for all survey participants.)

4.1.2 reasons for space travel

For 45 percent of those interested in a suborbital trip, doing something that only a few people have done before, or being a "pioneer," was either the most or second-most important reason for taking the trip. Forty-two percent of those interested in suborbital space travel responded that seeing Earth from space is either the most or second-most important reason for taking the trip. Fulfilling a lifelong dream was a driver for 30 percent of those interested.

Reasons: Suborbital	Most important reason	Second -most important reason
Pioneer	32%	13%
Lifelong dream	18%	12%
See Earth from space	16%	26%
Space enthusiasm	9%	14%
Other	25%	35%

Table 6: Suborbital subset's reasons for interest in space travel

4.1.3 willingness to pay

Of the Futron/Zogby survey participants, ten percent were both interested in suborbital space flight and willing to pay at least the current list price for the trip. That is, a majority (54 percent) of the subset would be willing to pay between US$100,000 and US$250,000 for the experience.

Overall, the subset interested in suborbital travel were demographically similar to all survey respondents. The demographic profile of these respondents as compared to the demgraphic profile of the survey sample as a whole is illustrated in Table 7.

Demographic	Interested and Willing to Pay Current Price for Suborbital Flight	All Survey Respondents
Average age	56	57
Employed full-time	39%	35%
Self-employed	24%	24%
Retired	26%	29%
Have dependent children	33%	32%
Have other dependents	37%	27%
Married	87%	86%
Male	72%	70%
Female	28%	30%

Table 7: Demographics for suborbital subset and all respondents

Surprisingly, the subset's past participation in terrestrial space-related activities did not a play a major role in their interest in suborbital flight. Their participation in terrestrial space-related activities did not differ significantly from that of all survey respondents. Among the subset, 92 percent had participated in two activities or more, compared to 86 percent of all respondents. There is a slightly larger difference for those who have participated in three activities or more: 60 percent of the subset as opposed to only 51 percent of all respondents.

Participation in Space - related Activities	Interested in Suborbital	All Survey Respondents
One activity	8%	15%
Two activities	32%	35%
Three activities	44%	34%
Four activities	13%	14%
Five or more activities	3%	3%

Table 8: Participation in terrestrial space-related activities, suborbital subset and all respondents

4.2 Interest in Orbital Flight

Just over eighteen percent of the respondents were interested in participating in orbital space travel, as shown above in Figure 9. Analysis of the answers from this subset of respondents to other survey questions provided insight into the characteristics and behaviors of the potential customers for orbital public space travel.

4.2.1 risky activities

As with those interested in suborbital travel, more than one-third of the orbital subset participated in one or both of the activities deemed riskiest among all respondents — sky-diving and mountain climbing. The orbital subset ranked space travel as a 2.9 on a five-point scale of perceived riskiness, where 1 meant not not at all risky and 5 was extremely risky. They ranked mountain climbing at 3.4 and sky-diving at 3.9, respectively.

Other risky activities: Orbital	Participation	Risk perception (on a five -point scale)
Skydiving	6%	3.9
Mountain climbing	29%	3.4
Space travel	N/A	2.9
Skiing/snowboarding	60%	2.2
Flying in a private jet	35%	2.1
Sailing or boating	60%	1.7

Table 9: Orbital subset's interest in other risky activities

"...eighteen percent of the respondents were interested in participating in orbital space travel..."

4.2.2 Reasons for space travel

For 41 percent of the subset interested in an orbital trip, seeing the Earth from space was either the most or second-most important reason for taking the trip. Thirty-five percent responded that doing something that only a few people have done before, or being a "pioneer," was either the most or second-most important reason. For 29 percent of the subset, the trip would fulfill a lifelong dream.

Reasons: Orbital	Most important reason	Second -most important reason
Pioneer	25%	10%
See Earth from space	16%	25%
Lifelong dream	12%	17%
Space enthusiasm	12%	11%
Other	35%	37%

Table 10: Orbital subset's reasons for interest in space travel

4.2.3 willingness to pay

Of all Futron/Zogby survey respondents, four percent were both interested in orbital space flight and willing to pay the current price for the trip. That is, of the 18 percent that were interested in orbital space flight, 22 percent of that subset would be willing to pay US$20 million or US$25 million for the experience. The interested subset was slightly younger than the survey sample as a whole, with a significantly higher portion of males and individuals who were employed full-time. The demographic profile of this subset is illustrated in Table 11.

"...four percent were both interested in orbital space flight and willing to pay the current price for the trip."

Demographic	Interested and Willing to Pay Current Price for Orbital Flight	All Survey Respondents
Average age	54	57
Employed full-time	61%	35%
Self-employed	22%	24%
Retired	17%	29%
Have dependent children	28%	32%
Have other dependents	39%	27%
Married	100%	86%
Male	94%	70%
Female	6%	30%

Table 11: Demographic profile for orbital subset and all respondents

Compared with the suborbital cross-tabular analysis on participation in space-related activities, there is a stronger correlation between the orbital subset's general interest in space and their interest in, and willingness to pay for an orbital space flight. Whereas only 51 percent of all survey respondents had participated in three or more terrestrial space-related activities, 60 percent of those interested in and willing to pay for orbital travel had participated in three or more activities. The amount of subset respondents that had participated in four or more activities was similar to the total respondent pool.

Participation in Space - related Activities	Interested in Orbital	All Survey Respondents
One activity	11%	15%
Two activities	29%	35%
Three activities	43%	34%
Four activities	13%	14%
Five or more activities	4%	3%

Table 12: Participation in terrestrial space-related activities, orbital subset and all respondents

4.3 Interest in Orbital and/or Suborbital Travel

In order to understand the potential customer differentiation for both the suborbital and orbital markets, Futron analyzed and compared the two subsets of interested respondents for similarities in responses and behaviors. As indicated in Figure 1 and Figure 8 above, 27 percent of all survey respondents answered that they were interested in suborbital space travel after hearing the first suborbital description, and 34 percent of respondents were interested in orbital travel after the hearing the first orbital flight description. The left circle of the Venn diagram in Figure 33 represents the respondents interested in orbital travel and the right circle represents those interested in suborbital travel. Overall, twenty percent of respondents expressed interest in both suborbital and orbital travel after hearing the first flight description, represented by the overlap between the two circles in Figure 33. Seventy-two percent of the respondents interested in subor-bital flight were also interested in orbital flight and 58 percent of those interested in orbital flight were also interested in suborbital flight, as labeled in the overlap between the circles. Twenty-eight percent of respondents interested in suborbital travel had no interest in orbital, and 42 percent of those interested in orbital had no interest in suborbital travel.

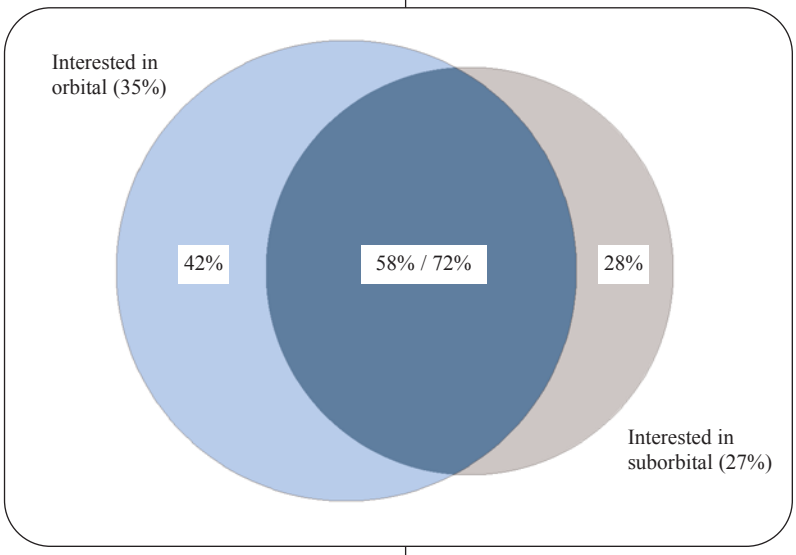


Figure 33: Overlapping interest for orbital and suborbital travel after hearing the first description

After the second, less-glamorous flight descriptions, the number of respondents interested in orbital travel dropped to eighteen percent and those interested in suborbital travel dropped to nineteen percent. These subsets of interested respondents are represented by the left and right circles of the Venn diagram in Figure 34. Eight percent of the total survey pool expressed interest in both suborbital and orbital travel, as represented by the overlap between the circles in Figure 34. Approximately 45 percent of the orbital subset expressed interest in suborbital travel and vice versa, as labeled in the overlap. More than half of the respondents interested in either orbital or suborbital travel had no interest in the other form of flight.

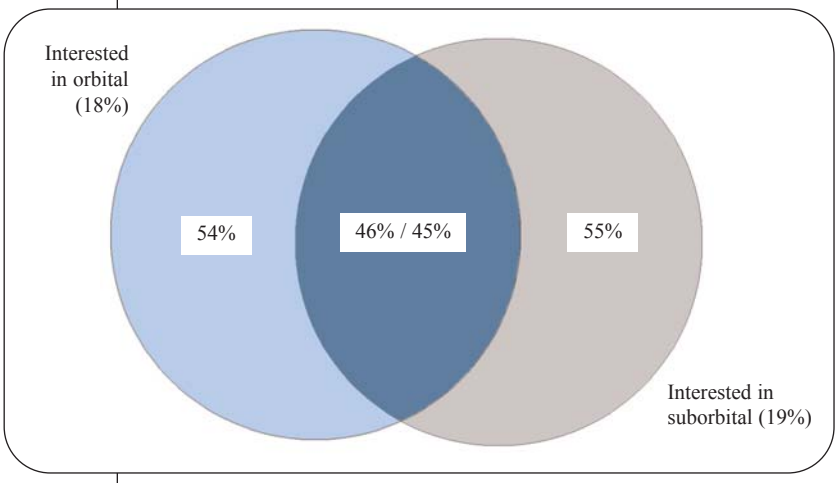


Figure 34: Overlapping interest for orbital and suborbital travel after hearing the second description

Therefore, after hearing a more detailed and realistic description of the trips, respondents were more likely to decide on one trip or the other, rather than maintain interest in both.

4.4 Willingness to Pay for Orbital and/or Suborbital Travel

The pool of potential travelers can be further limited to respondents who remained interested after hearing the second description and are willing to pay the current price or more. Between these two subsets, there is still a strong overlap. Two-thirds of the respondents who were interested in and willing to pay for orbital travel were also interested in and willing to pay for suborbital travel. Twenty-six percent of those interested in and willing to pay for suborbital travel were also interested in and willing to pay for orbital travel.

Those respondents who were interested in and willing to pay for both types of travel were also more likely to respond to a higher price point for both types of travel than the relative proportion of all respondents. More than half of the respondents that were willing to pay the highest price point for orbital — US$25 million — were also willing to pay the highest price point — US$250,000 — for suborbital travel, as represented by the overlap between the circles in Venn diagram in Figure 35. This "big spending" propensity could be attributed to a number of factors including, but not limited to, a great desire to take the trip, lack of market knowledge about current price points of public space travel, or differences in the relative wealth of respondents.

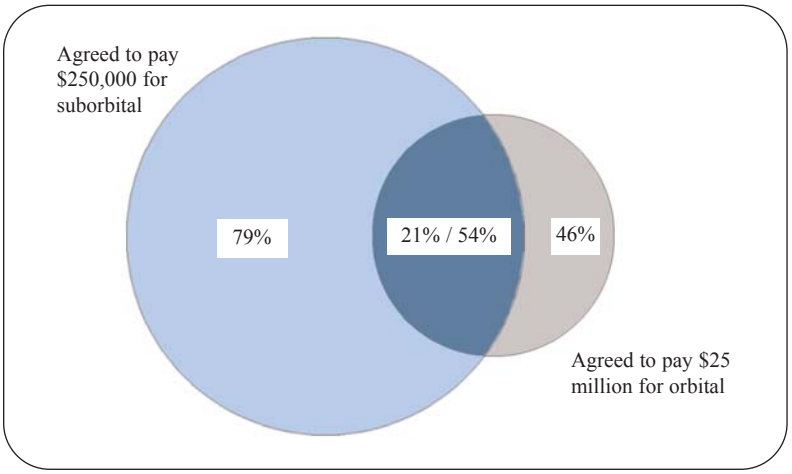


Figure 35: The big spender

The ten percent of the respondents who were interested in and willing to pay the current price, US$100,000, for suborbital travel showed some demographic differences from the four percent who were interested in and willing to pay the current price, US$20 million, for orbital travel. A demographic comparison of the subgroups mentioned above against the three percent interested in and willing to pay for both trips as well as among all respondents is provided in Table 13. This comparison reveals some differentiation in the potential customers for each service.

Although the demographics for the suborbital subset closely resemble the survey sample as a whole, the orbital subset differs significantly in some categories. Most notably, the percentage of respondents in the orbital subset with a full-time job is almost double the relative percentage of all

"More than half of the respondents that were willing to pay the highest price point for orbital — US$25 million — were also willing to pay the highest price point — US$250,000 for suborbital travel."

Demographics	Interested and Willing to Pay Current Price for Suborbital Travel	Interested and Willing to Pay Current Price for Orbital Travel	Interested and Willing to Pay Current Price for Both Scenarios	All Survey Respondents
Average age	56	54	52	57
Employed full-time	39%	61%	67%	35%
Self-employed	24%	22%	25%	24%
Retired	26%	17%	8%	29%
Dependent children	33%	28%	35%	32%
Other dependents	37%	39%	58%	27%
Married	87%	100%	100%	86%
Male	72%	94%	92%	70%
Female	28%	6%	8%	30%

Table 13: Demographics for suborbital, orbital, both scenario subsets and all respondents

respondents. There is also a much stronger skew towards being male, married, and having dependents other than children for those in the orbital subset. Examination of the statistics for the roughly three percent of respondents who were interested in and willing to pay for both trips, reveals that the major differences occur in the average age, employment and other dependent categories.

4.5 Reality Checks

Futron performed cross-tabular analysis on the vacation expenditures, discretionary income spending and liklihood of available training time for the orbital and suborbital respondent subsets mentioned above in order to provide a "reality check" on their responses and their potential for participation in spaceflight.

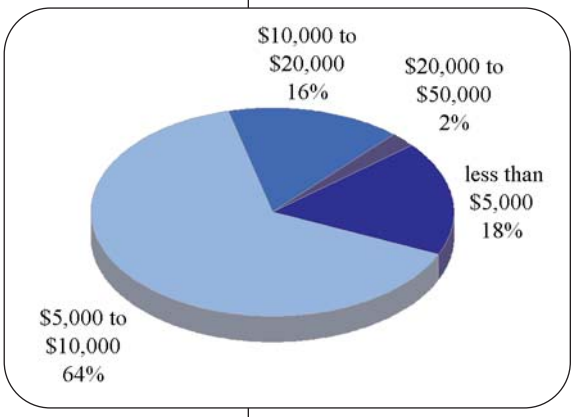


Figure 36: Annual vacation spending of suborbital subset

4.5.1 annual vacation expenditures

Futron compared the annual vacation expenditures of those people who indicated they were interested in and willing to pay for suborbital flight. Only eighteen percent of this subset spent more than US$10,000 annually on vacations, while the majority (64 percent) tended to spend between US$5,000 and US$10,000.

A similar reality check was performed for those respondents that indicated an interest and willingness to pay for orbital flight. Of this subset, only six percent spent in excess of US$50,000 annually on vacations. Overall, less than one-quarter of the entire respondent pool spent more than US$10,000 annually on vacations.

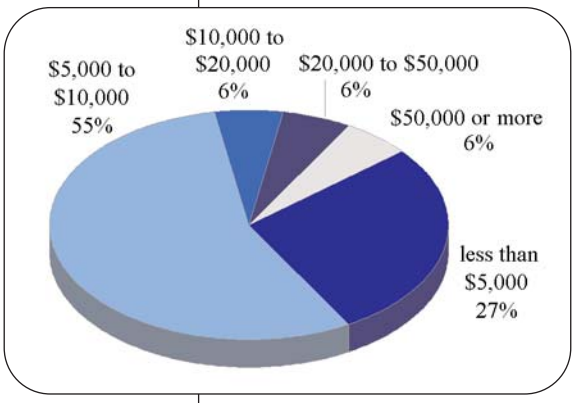


Figure 37: Annual vacation expenditures of orbital subset

4.5.2 discretionary income spending

Much like the reality checks performed for vacation expenditures, a discretionary spending reality check was performed on the responses of those people that indicated that they were both interested and willing to pay for suborbital travel. Only 14 percent of those interested in and willing to pay for suborbital travel spent more than US$50,000 annually of their discretionary income on a single purchase.

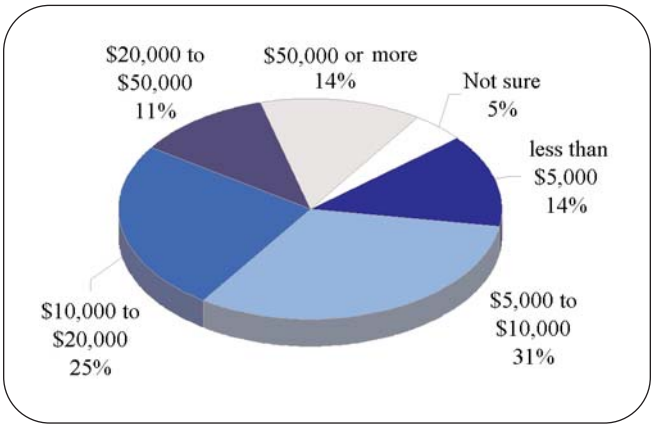


Figure 38: Discretionary income spending of suborbital subset

Of those interested in and willing to pay for orbital flight, only six percent spent in excess of US$50,000 of their discretionary income for a single purchase. An additional eleven percent spent between US$20,000 and US$50,000 in discretionary income.

"...less than one-quarter of the entire respondent pool spent more than US$10,000 annually on vacations."

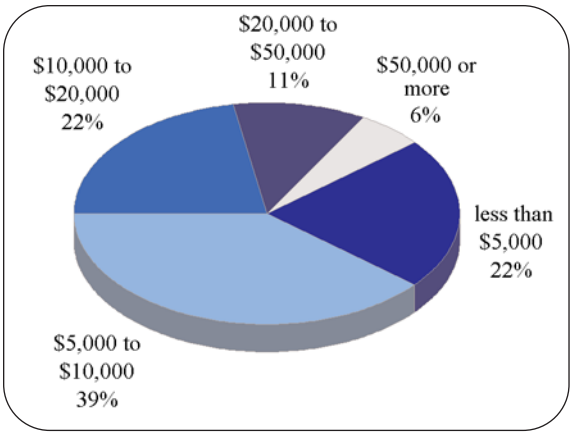


Figure 39: Discretionary income expenditures of orbital subset

A comparison between these two subsets reveals that those respondents interested in and willing to pay for suborbital travel tended to spend larger amounts of discretionary income on one purchase than those interested in and willing to pay for orbital travel, as shown in Figure 40.

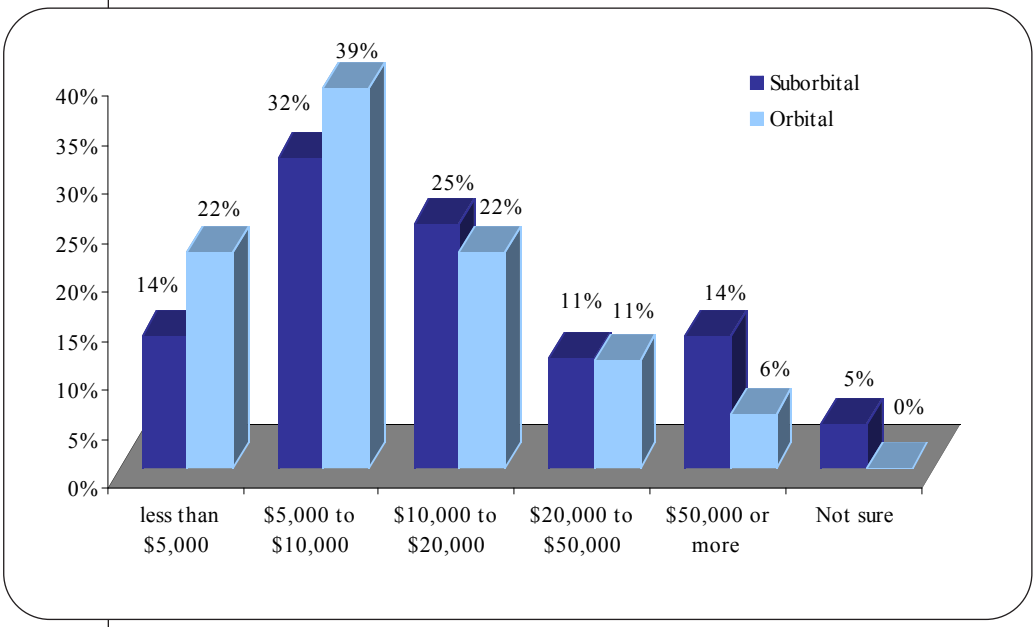


Figure 40: Comparison of discretionary spending patterns for the orbital and suborbital subsets

4.5.3 enough time for orbital travel

Currently, all orbital space travelers must undergo six months of intensive training in Russia. Since the ability to undergo this training is essential in determining an individual's ability to go into space, the Futron/Zogby survey questioned respondents on the likelihood of having six months available for the training process.

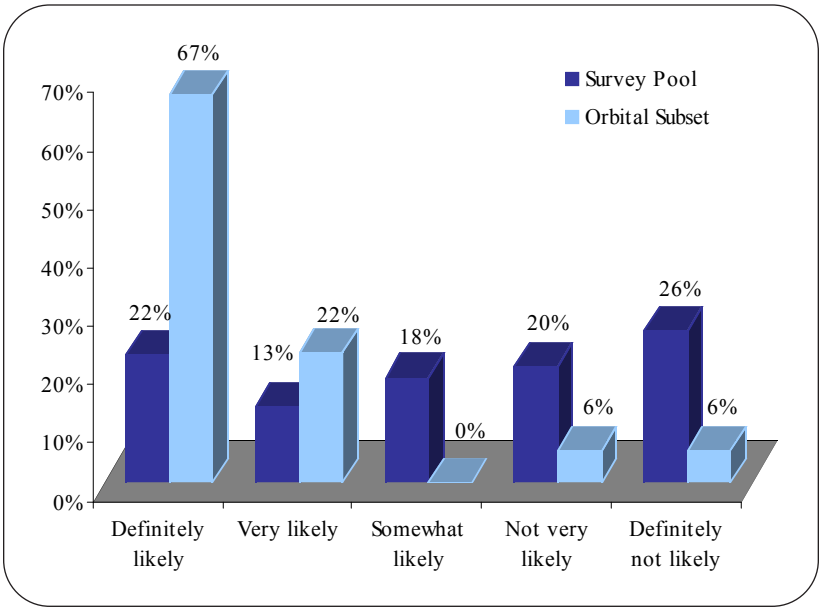


Figure 41: Likelihood of having six months available for orbital flight training, orbital subset and survey pool

Thirty-five percent of all respondents said they were either "definitely likely" or "very likely" to have six months available to prepare for space travel. In contrast, 89 percent of the subset of respondents that were interested and willing to pay current prices for orbital flight said that they were likely to have the six months available for training.

Futron then compared these responses to the amount of time the subset respondents had spent on vacations or preparing for other activities in the past. Of the orbital subset respondents who indicated that they would likely have six months available for training, 56 percent have spent three or more months on training or physical preparation for any single activity, though only 25 percent have spent several months on vacation.

"Thirty-five percent of all respondents said...they would have six months available to prepare for space travel."

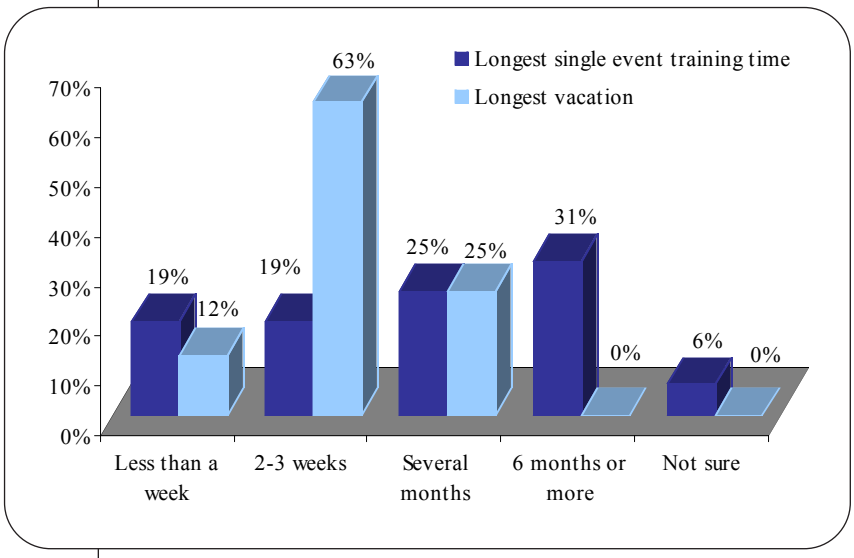


Figure 42: The amount of time spent on past single event training or vacation by the orbital subset

5 Suborbital Forecast

5.1 Methodology

Futron commissioned the Futron/Zogby survey to obtain an accurate portrayal of the current market for public space travel. The survey lays a solid foundation for a twenty-year forecast of market demand. The results of the survey are crucial elements in the forecasts for public space travel. Futron/Zogby survey results were used in conjunction with additional data and analysis to determine the number of passengers per year for the next twenty years for suborbital public space travel. A summary of the methodology used to formulate the forecast is shown in Figure 43, with detailed descriptions in the following subsections.

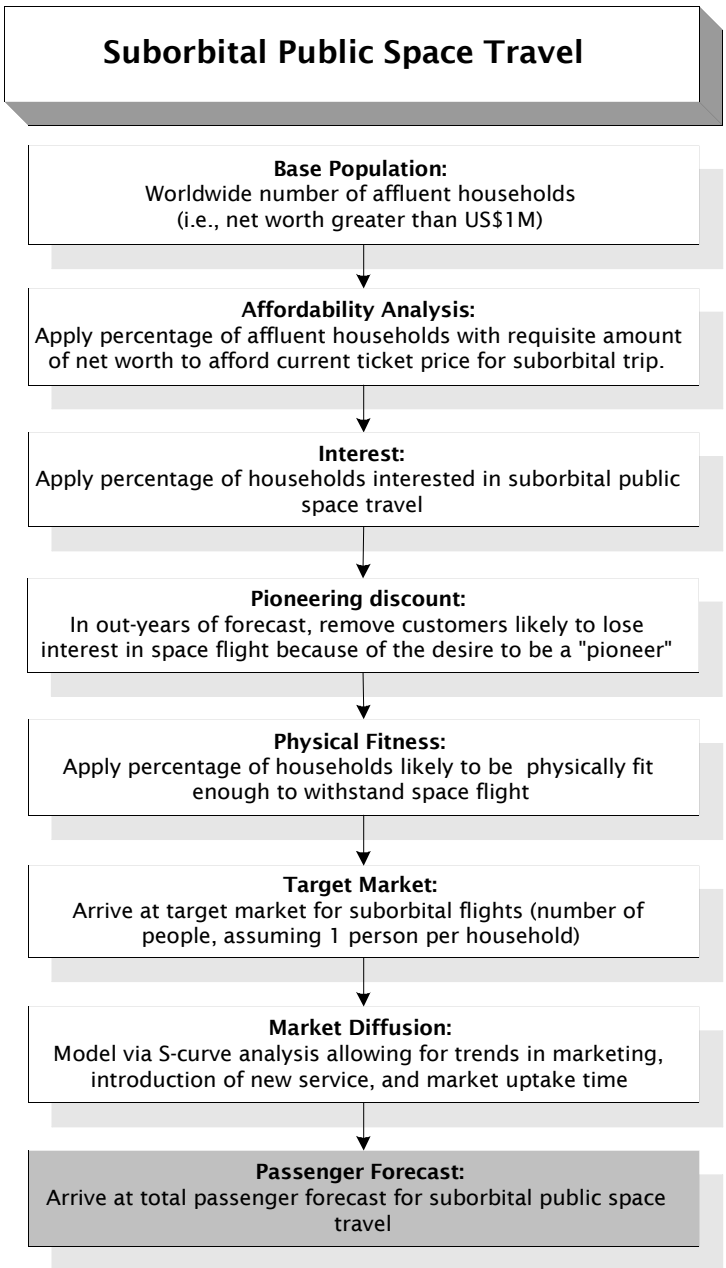


Figure 43: A summary of the suborbital travel forecast methodology

5.1.1 estimating the potential market

Futron bases its suborbital travel forecast on the potential pool of customers for the service. Although a great portion of the general population may be interested in suborbital travel, the price tag prevents many from becoming viable customers for this service.

To extrapolate a global forecast from the results of the survey for suborbital travel, Futron estimated the number of high-net-worth individuals—those people with at least US$1 million in financial asset wealth—on a regional and global basis using publicly available data from the 2002 Merrill Lynch/Cap Gemini Ernst & Young's World Wealth Report. Futron assumed that one qualifying individual is equal to one household.

Analysis of the vacation and discretionary income spending habits taken from the Futron/Zogby survey results indicated that an individual is willing to spend about 1.5 percent of their net worth on a single, large discretionary purchase (see Figure 22 and Figure 23, above). With a suborbital trip ticket currently priced at US$100,000, the minimum net worth required for a potential customer is nearly US$7 million. Therefore, the potential market of suborbital travelers is the proportion of the global population with a net worth in excess of US$7 million.

Futron further narrowed the potential market to a target market for suborbital space travel by applying limiting factors, such as interest in suborbital travel (see Section 3.2), willingness to pay current prices (see Section 3.2.2), reasons for interest in space flight (see Section 3.4.8), and physical fitness (see Section 3.4.6). Specifically, Futron gauged interest based on individuals who responded "definitely likely" and "very likely" to questions pertaining to participation in suborbital space travel, after having been presented with both the positive and less attractive aspects of suborbital flight. Their responses were then analyzed in conjunction with their responses to the range of suborbital price points given in the survey. Overall, this analysis revealed that ten percent of the survey respondents were both interested in the flight and willing to pay at least the current price, while 14 percent were interested at the assumed 2021 price of US$50,000. Futron applied these percentages to the total global potential market to arrive at a global baseline demand for suborbital space travel from 2002 to 2021.

5.1.2 pioneering reduction

Customers' interest in new products and services can change quickly and vary for any number of reasons. The respondents' reasons for interest in space travel included fulfilling a lifelong dream, wanting to see Earth from space, and experiencing weightlessness. However, more than 20 percent of the respondents who were interested in and willing to pay for suborbital travel indicated that the primary reason for interest was to do something that few people had done before — in other words, to be a pioneer. This reasoning presents a potential threat to interest levels as service becomes regular. Thus, to account for this likely drop-off in interest due to the loss of "pioneers," Futron introduced a pioneering reduction into the forecast. This reduction begins during

the third year of service for the suborbital travel market, with complete removal of the pioneers occurring within ten years.

5.1.3 physical fitness

At this time, affordability and interest in suborbital travel are the primary constraints on demand for suborbital travel. However, suborbital space flight is an inherently risky activity and will require a certain level of physical fitness in order to withstand the physical stresses of the flight, at least until the vehicles have undergone substantial change that would reduce stresses. Therefore, interested customers who can afford a ticket may be prevented from suborbital flight on the basis of physical fitness.

Respondents were asked to assess their physical fitness (see Figure 29). Futron considered respondents who rated themselves at least "above average," if they were below 65 years old, and "extremely fit," if 65 and older, as being viable candidates for suborbital flight. Futron then applied that percentage to the global target market population that had already been identified via wealth and interest levels.

5.1.4 modeling market diffusion

For suborbital public space travel, Futron assumed a market start date of 2006 and a timeline of 40 years to full market maturity. Futron selected a 40-year market maturity on the basis of terrestrial analogs (e.g., 20th century aviation evolution from barnstorming to commercial passenger travel) and the current state of the public space travel industry and infrastructure.

Market experience has shown that the adoption of new technological services typically follows an established pattern popularly known as an "S" curve, characterized by slow absorption as the market becomes familiar with the product, followed by a period of accelerated adoption as the market embraces the product, and culminating with a deceleration in adoption as the market nears a saturation point. To model this phenomenon in commercial space travel, Futron applied a Fisher-Pry curve to the total potential demand pool for suborbital service. The Fisher-Pry curve is a typical algebraic formulation that translates known market saturation and build-out time into an "S" curve forecast.

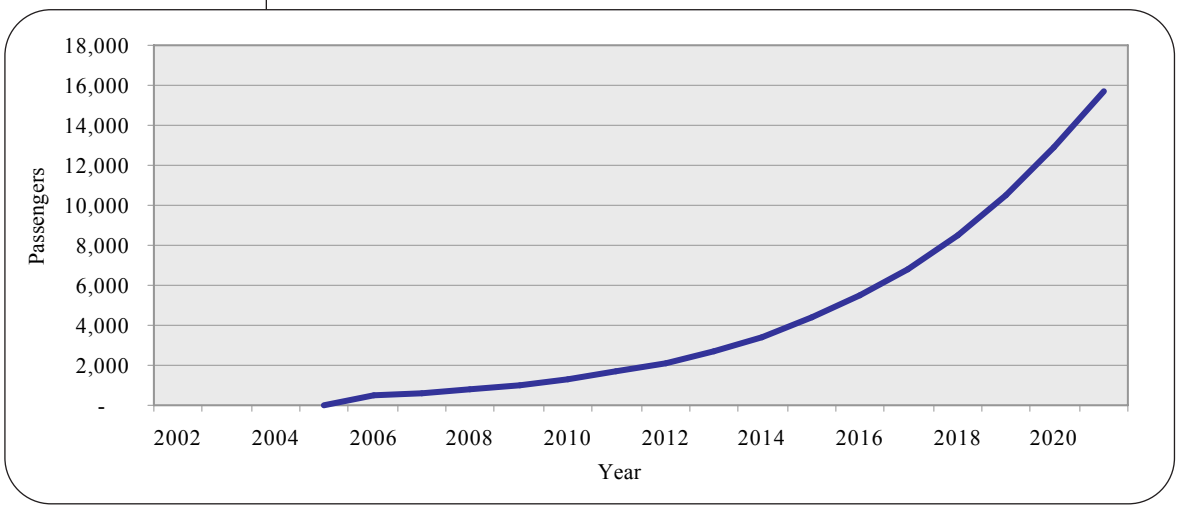
"...the adoption of new technological services typically follows an established pattern popularly known as an "S" curve..."

5.2 Forecasts

5.2.1 baseline suborbital forecast

The baseline forecast for suborbital public space travel assumes a 15-minute trip on a suborbital trajectory, preceded by a week of training. Although it is likely that at some point in the future, suborbital vehicles could expand to serve other market niches, such as remote sensing, rapid package delivery, and point-to-point passenger transport, it is not clear when expansion into these applications is likely to occur. Therefore, the Futron suborbital forecast focuses solely on the suborbital scenario described above and does not reflect changes in demand that could result from expansion into other market niches.

The base service price (US$100,000) is maintained for the first five years of service, and then experiences linear reduction over the following decade to US$50,000 by 2021. Figure 44 illustrates the number of passengers likely to demand suborbital public space travel service over the forecast period. This forecast does not assume any supply constraints after service launch, as the service capacity and technical details of potential vehicles are not established at this time. However, demand is constrained until service is assumed to begin in 2006, at which point



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Passengers	503	642	820	1,045	1,330	1,692	2,150	2,726	3,448	4,350	5,468	6,842	8,517	10,532	12,923	15,712

Figure 44: Baseline suborbital forecast

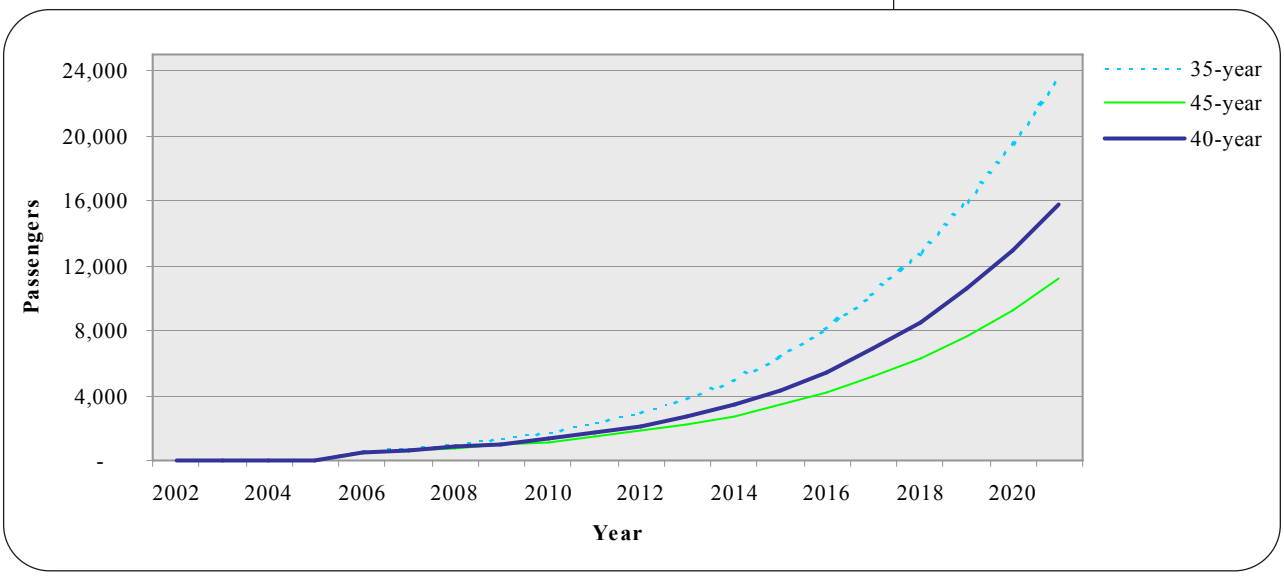
demand would rise from 503 passengers in 2006, when regular service is assumed to begin, to over 15,700 passengers in 2021.

5.2.2 forecast ranges

The Futron suborbital travel forecast methodology contains sensitivities that could affect the forecasted market. The forecast exhibits the greatest sensitivity when changing the estimated period to full market saturation, or market maturity (40 years at baseline). The shape of the Fisher-Pry curve applied to model the rate of saturation has a significant impact on forecasted market demand, especially in the near term. In order to display the effects that market maturity can have on the forecast results, Futron ran a series of forecasts with varying market maturity dates. This exercise was intended to give a range of the results for each forecast.

"Futron ran a series of forecasts with varying market maturity dates."

Futron developed the forecast range for this market by producing two additional forecasts with varied market maturity dates while holding all other forecast inputs constant. The alternative market maturity dates



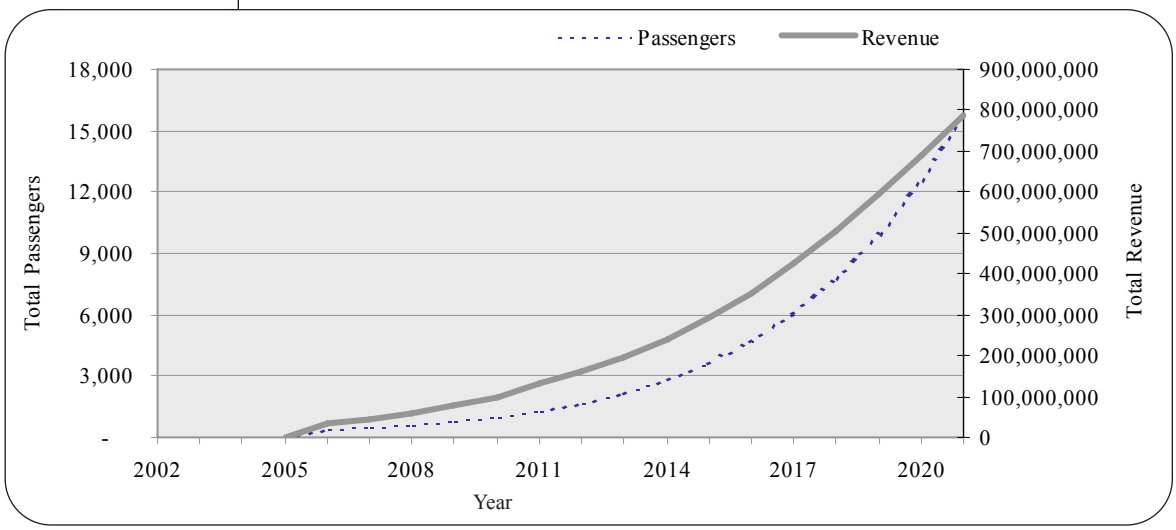
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Baseline (40-year)	503	642	820	1,045	1,330	1,692	2,150	2,726	3,448	4,350	5,468	6,842	8,517	10,532	12,923	15,712
35-year	611	798	1,042	1,358	1,768	2,298	2,980	3,853	4,962	6,359	8,100	10,241	12,829	15,895	19,443	23,437
45-year	489	608	756	939	1,166	1,447	1,794	2,222	2,747	3,390	4,174	5,125	6,273	7,646	9,277	11,192

Figure 45: Suborbital forecast ranges using a Fisher-Pry model

were 35 and 45 years. The robust forecast that assumes a 35-year time to market maturity reveals a demand of over 23,000 passengers in 2021; this nearly doubles the baseline forecast results for total demand over the forecast period. The constrained forecast, with a 45-year time to market maturity, reveals a demand of more than 11,000 passengers in 2021, a 29 percent drop off from the baseline suborbital forecast from 2006 through 2021.

5.2.3 suborbital revenue forecast

The revenue forecast for the suborbital travel market demonstrates the potential revenue that can be realized if all of the demand for flights could be satisfied. Figure 46 shows the annual revenue forecast for suborbital travel.



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Passengers	356	455	591	769	999	1,298	1,685	2,186	2,830	3,656	4,711	6,048	7,770	9,916	12,545	15,712
Price (US$ K)	100	100	100	100	100	100	95	90	85	80	75	70	65	60	55	50
Rev. (US$ M)	36	46	59	77	100	130	160	197	241	293	353	423	505	595	690	786

Figure 46: Suborbital revenue forecast

The annual revenue forecast is based on the baseline suborbital forecast, which includes a decreasing ticket price over the forecast period. The forecast assumes an initial price of US$100,000 for the first five years of service, decreasing to US$50,000 by 2021. The forecast for 2021 reveals a potential demand — without supply constraints — of 15,700 passengers, and yielding potential revenue of US$786 million within the year. It should be noted that supply constraints on the market could significantly lower the potential number of passengers and, therefore, revenue.

6 Orbital Forecast

6.1 Methodology

As with the suborbital forecast, Futron incorporated the results of the Futron/Zogby survey with additional data and analysis tailored to the orbital market to develop a forecast of demand for orbital space travel. A summary of the methodology used to formulate the forecast is shown in Figure 47, with detailed descriptions in the following subsections.

6.1.1 estimating the potential market

Given the current ticket price of US$20 million per person, affordability is the major barrier to becoming a viable customer for orbital space travel. Combined analysis of the ticket price, the net worth ratio of past space tourists Dennis Tito and Mark Shuttleworth, and the vacation and discretionary income spending habits of the Futron/Zogby survey results indicate that the ticket price should be no more than ten percent of an individual's net worth for that individual to be considered a viable customer. Thus, at a current ticket price of US$20 million for an orbital trip, the potential customer's minimum net worth would have to be US$200 million. The fundamental difference between the suborbital and orbital experiences accounts for this appreciably higher ratio than the 1.5 percent maximum for suborbital. An orbital trip incorporates several once-in-a-lifetime experiences, and therefore, garners a higher relative expenditure than a suborbital flight.

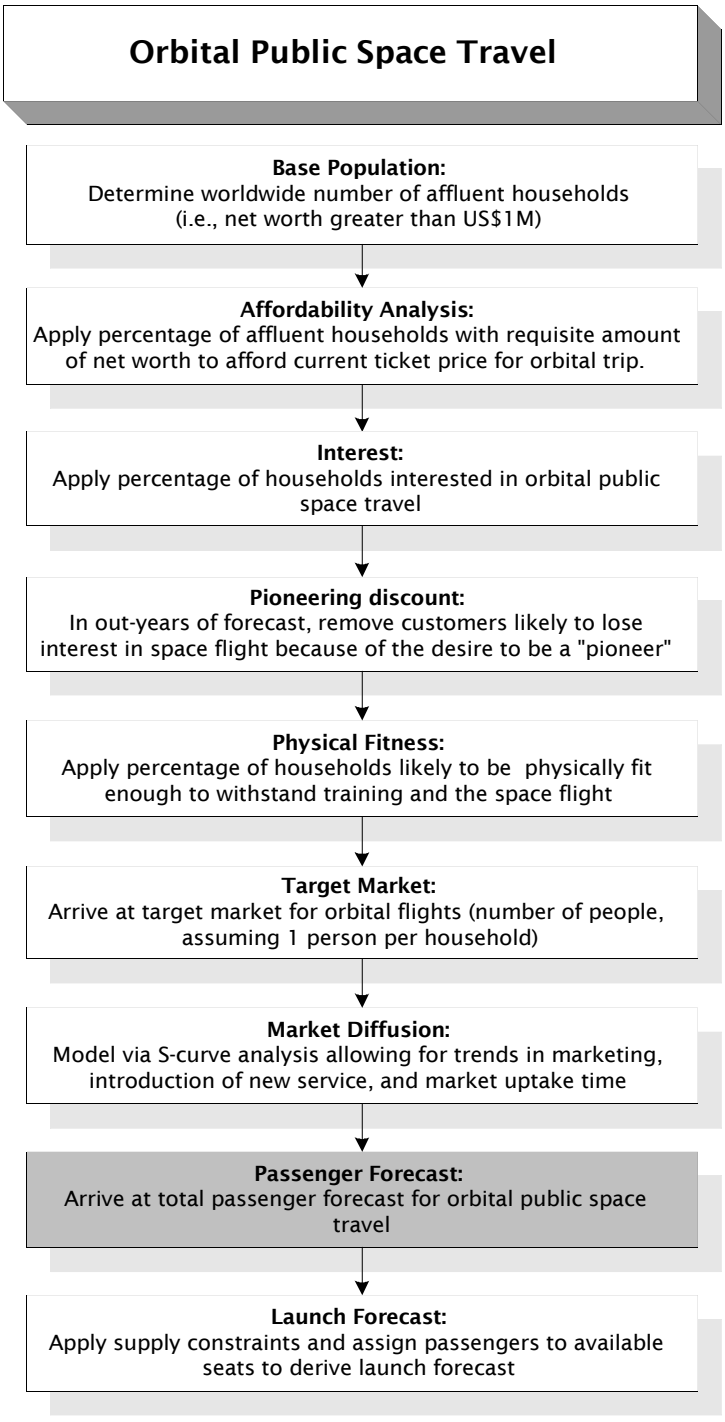


Figure 47: A summary of orbital travel forecast methodology

Individuals with an average net worth of US$200 million are a rare group who are more likely to share lifestyles with other "super-affluent" individuals from around the world than they are to share lifestyles with their fellow citizens. Futron used this assumption, together with data on wealth of affluent populations, to extrapolate the survey responses from the Futron/Zogby survey into a global demand forecast for orbital public space travel.

Futron accessed publicly available data (United States Internal Revenue Service data, Forbes 2002 Billionaires list, and Merrill Lynch/Cap Gemini Ernst & Young's 2002 World Wealth Report) to identify the percentage of "super-affluent" individuals/households with a net worth in excess of US$200 million to arrive at the number of households that could potentially afford an orbital space flight at current prices. These individuals serve as the population of potential customers for orbital public space travel.

From the base pool of potential customers, Futron identified the target market of customers by using limiting factors, such as interest in orbital travel (see Section 3.3 and Figure 9), willingness to pay current prices (see Section 3.3.2 and Figure 13), reasons for interest in space flight (see Section 3.4.8), and physical fitness (see Section 3.4.6).

The survey measured interest in orbital public space travel via questions on interest and participation throughout the survey. This multi-pronged approach allowed Futron to assess the variations that resulted from different responses to similar questions. Specifically, Futron gauged interest based on individuals who responded "definitely likely" or "very likely" to questions pertaining to participation in orbital travel, after having been presented with both the positive and less attractive aspects of orbital space flight. The individuals' responses were then analyzed in conjunction with their responses to the range of orbital price points given in the survey. Overall, this analysis revealed that four percent of the survey respondents were both interested in the flight and willing to pay the current price of US$20 million, while eight percent of respondents would be willing to pay US$5 million, the price projected for the forecast end-year of 2021.

Futron applied the percentage of people interested in and willing to pay the price of the flight estimated for each year to the total global target market to arrive at a global baseline demand for orbital public space travel from 2002 to 2021.

6.1.2 pioneering reduction

The respondents' reasons for wanting to participate in orbital travel included fulfilling a lifelong dream, wanting to see Earth from space, and experiencing weightlessness. Nearly seventeen percent of the respondents indicated that their primary reason was to do something that few had done before, i.e. to be a pioneer. This reasoning presents a potential threat to interest levels as service becomes regular. To account for this likely drop-off in interest due to the loss of "pioneers," Futron introduced a pioneering reduction into the forecast. The reduction is applied starting in 2012 and continues to slowly erode the interest in orbital flights until the full erosion of pioneers occurs in the final year of the forecast, 2021.

"Nearly seventeen percent...indicated that their primary reason was to do something that few had done before..."

6.1.3 physical fitness

At this time, affordability and interest in orbital travel are the major factors in determining viable customers for orbital travel. However, orbital space flight is an inherently risky activity and currently requires thorough medical certification and up to six months of extensive training. Even though potential customers may be interested in taking an orbital trip and are able to afford the ticket price, they may be prevented from doing so on the basis of physical fitness.

Respondents were asked to assess their physical fitness (see Figure 29). Futron applied the percentage that rated themselves as having "above average" fitness, if they were below 65 years old, and "extremely fit," if 65 years of age and older, to the target market population that had already been identified via their wealth and interest levels.

6.1.4 modeling market diffusion

Futron applied the Fisher-Pry model ("S" curve) to the target market for orbital travel (i.e., those interested individuals who could potentially afford the service and met physical fitness requirements) to mimic the

behavior in market penetration typically associated with new technology products and innovations. The Fisher-Pry curve is dependent on a few key variables: the market saturation point, the start year of the service, and the time to market maturity.

For orbital public space travel, Futron forecasted market diffusion in the 2002 to 2021 timeframe, assuming 40 years to full market maturity. The selection of a 40-year market maturity date was determined via Futron analysis of terrestrial analogs (e.g., 20th century aviation evolution from barnstorming to commercial passenger travel) and the current state of the public space travel industry and infrastructure.

6.1.5 conversion to launches

Currently, the only vehicle providing orbital public space travel flights is the Russian *Soyuz*. This reality places a rigid supply constraint on orbital public space travel launches. Futron applied key factors — the existence of an orbital market and vehicle to provide the service, combined with known supply constraints — to the passenger forecast in order to arrive at a launch forecast for the period from 2002 to 2021.

Using the passenger demand statistics, Futron assigned passengers to extra seats on *Soyuz* capsules that were flying on ISS supply missions in the initial years of the forecast. Futron assumed that *Soyuz* flights to the ISS would continue at the current rate of two per year until 2004, when the ISS construction nears completion. From 2005 until the end of the forecast, four *Soyuz* flights per year are assumed to accommodate the number of crewmembers required for full operational capability of the ISS and to provide escape capacity for the crew in the absence of a crew-return vehicle.

Futron assumed that the trend of having two professional cosmonauts/astronauts and one space tourist per *Soyuz* flight will continue until 2010. However, the current standard is subject to change and there has been some mention of flying missions with only one pilot and two passengers. Futron assumed that this change would occur in 2010 and would continue for the remainder of the forecast.

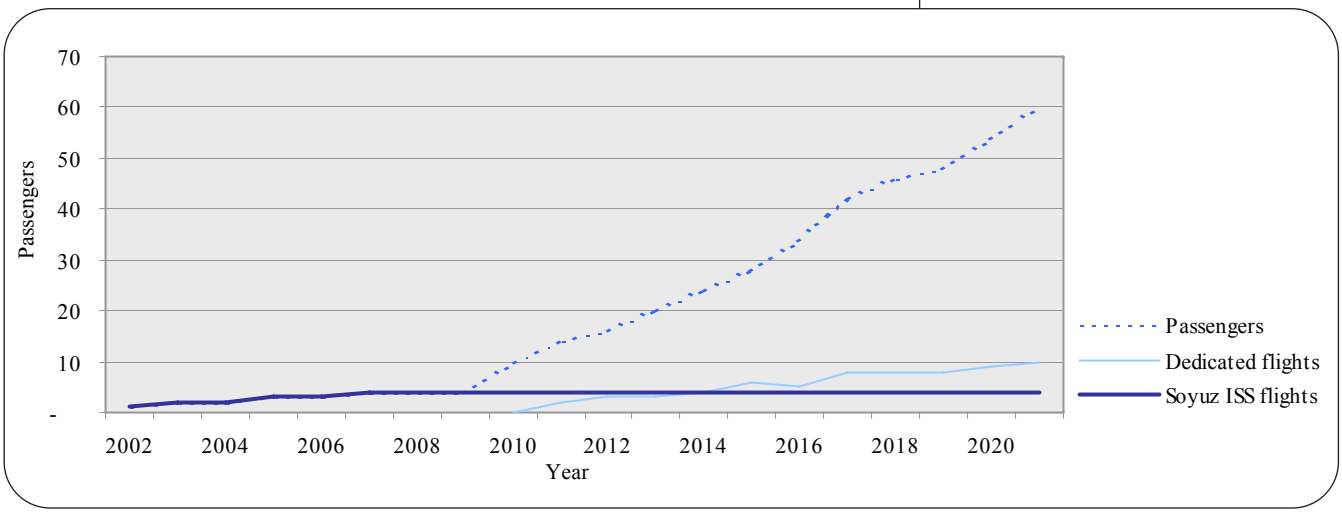
Futron performed additional analysis to determine the minimum number of passengers demanding service that would result in dedicated launches. Dedicated launches are assumed to begin in 2010 and would continue throughout the forecast period. This assumes that *Soyuz* launch vehicle and capsule production would be increased to meet the demand.

6.2 Forecasts

6.2.1 baseline orbital forecast

The baseline forecast for orbital public space travel assumes the same trip scenario highlighted in the Futron/Zogby survey — a two-week orbital trip preceded by six month's of training. The baseline forecast assumes the current ticket price of US$20 million at the beginning of the forecast, linearly decreasing to US$10 million in 2012, and further declining to US$5 million by 2021. The baseline forecast for orbital public space travel results in a cumulative total of 419 passengers over the entire forecast period, with 60 of those flying in 2021.

"The baseline forecast...results in a cumulative total of 419 passengers..."

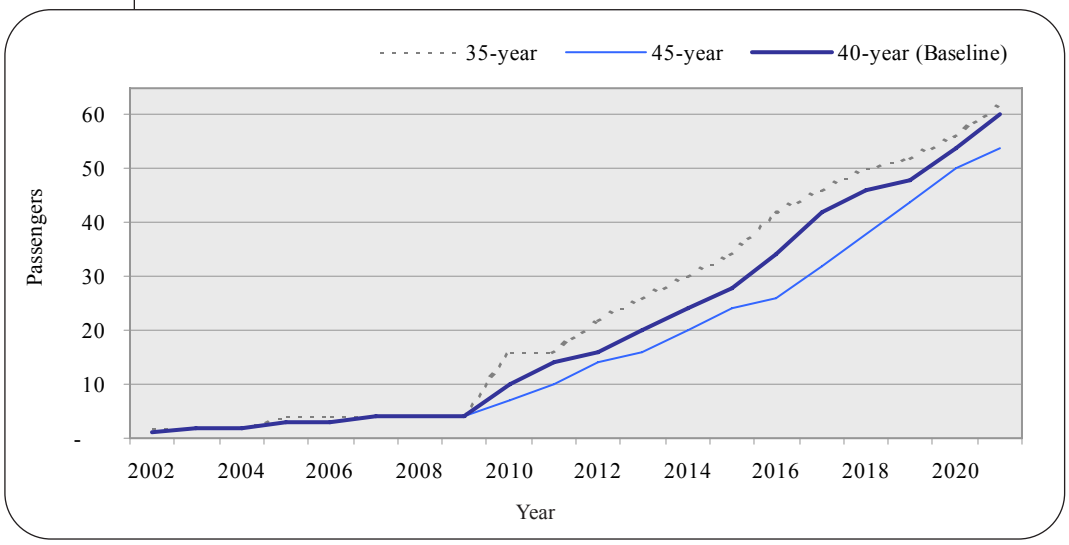


	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Passengers	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
Dedicated flights	-	-	-	-	-	-	-	-	1	3	4	6	8	10	13	17	19	20	23	26
Soyuz ISS flights	1	2	2	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Figure 48: Baseline orbital forecast

6.2.2 forecast ranges

Futron examined sensitivities that could potentially affect the number of passengers demanding orbital service over the forecast period and developed a series of additional forecasts to display the range of results from the change in sensitive forecast components. The component that creates the greatest change in the final results of the demand forecast model is linked to the application of a Fisher-Pry curve to simulate market penetration and saturation. In order to display the effects that market maturity can have on the forecast results, Futron generated forecasts with varying market maturity dates. Results of these forecasts can be seen in Figure 49 below.



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Baseline	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
35-year	2	2	2	4	4	4	4	4	16	16	22	26	30	34	42	46	50	52	56	62
45-year	1	2	2	3	3	4	4	4	7	10	14	16	20	24	26	32	38	44	50	54

Figure 49: Orbital forecast ranges

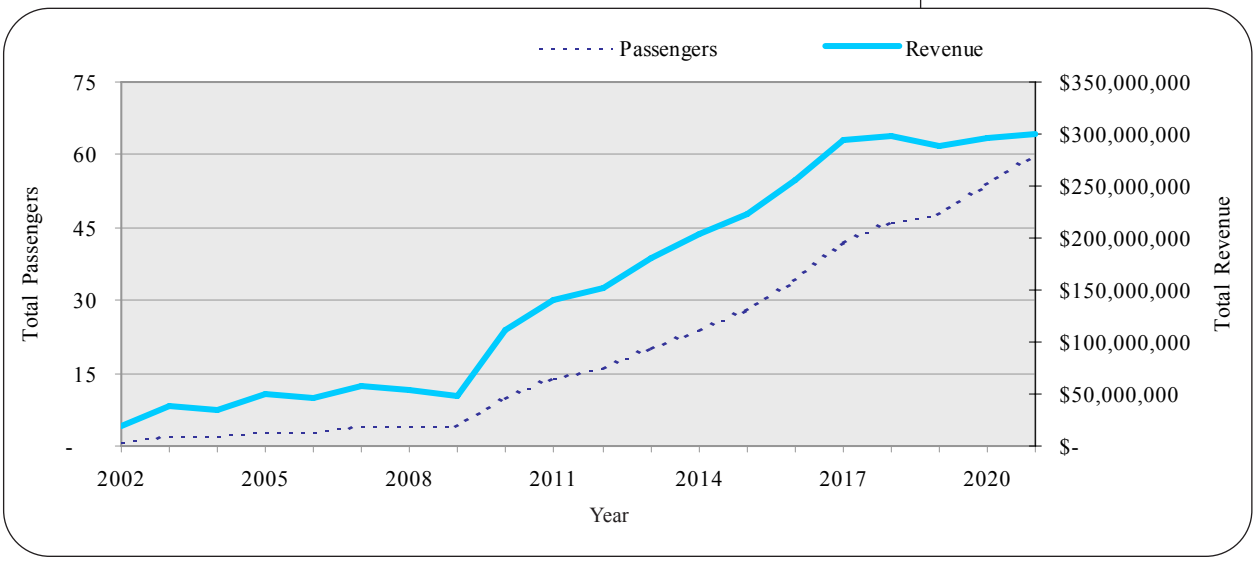
As with the suborbital market, the baseline orbital forecast assumes a market maturity of 40 years. Using this market maturity length, 60 passengers and 26 flights are forecast for the year 2021, with a total of 419 passengers flying over the forecast period. Futron determined a range for this forecast by producing additional forecasts with market maturity dates varied five years above and below the baseline, holding all other forecast

inputs constant. The robust forecast that assumes 35 years to market maturity reveals a demand for 478 passengers over the forecast period. This results in a fourteen percent increase over the baseline forecast results. The constrained forecast that assumes 45 years to market maturity generates a demand for only 358 passengers over the forecast period, a 15 percent drop from the baseline.

6.2.3 orbital revenue forecast

The revenue forecast for orbital public space travel is intended to illustrate the potential market revenues that are achievable if demand for orbital flights can be fully satisfied after supply constraints are removed in 2010. Figure 50 displays the revenue forecast for orbital public space travel flights. The revenue forecast is based on the forecast for orbital flights. If the market generates 60 passengers in 2021, the revenues from the orbital market in that year could be approximately US$300 million.

"...the revenues from the orbital market in that year could be approximately US$300 million."



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Passengers	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
Price (US$ M)	20.0	18.9	17.8	16.7	15.6	14.4	13.3	12.2	11.1	10.0	9.5	9.0	8.5	8.0	7.5	7.0	6.5	6.0	5.5	5.0
Revenue (US$ M)	20	38	36	50	47	58	53	49	111	140	152	180	204	224	255	294	299	288	297	300

Figure 50: Orbital revenue forecast

6.2.4 orbital destinations

Currently, the only existing orbital destination for space travelers is the ISS. Given its science-oriented mission and the fact that it is currently configured to house only three crewmembers, the ISS is hardly an ideal tourist destination. As mentioned above in Section 3.3.3, the Futron/Zogby survey questioned respondents about two possible changes to the orbital scenario, taking a trip to an on-orbit commercial facility or making a two-day orbit around Earth without stopping at an on-orbit destination. Those results were analyzed to generate two additional forecasts of orbital travel with alternative destination scenarios.

Trip to on-orbit commercial facility

There have been several proposals to develop commercial orbital facilities, either as ISS modules or free-flying spacecraft, which could serve as alternative destinations for space tourists. However, these facilities have been unable to move beyond the conceptual stage due to limited knowledge about the potential size of the orbital space tourism market. This impedes a venture company's ability to obtain the necessary funding — hundreds of millions of dollars — to develop and launch these facilities. The most recent concepts for a commercial facility in space include the following:

- SPACEHAB and RSC Energia announced plans in December 1999 to develop Enterprise, a commercial module for the ISS that would serve a variety of purposes, including (possibly) hosting space tourists. While the companies are still planning to develop the module, they are presently focusing on commercial markets other than tourism.[5]

- In July 2000, Boeing and Khrunichev State Research and Production Space Center announced plans to study the commercialization of FGB-2, a backup of the ISS's *Zarya* module that could be used to support space tourism. However, by September 2002, Boeing was backing away from any commercial use of FGB-2, citing a lack of market opportunities.[6]

- The space tourism company MirCorp announced in September 2001 that it had reached an agreement with the Russian Aviation and Space Agency (Rosaviakosmos) and Energia to build Mini Station 1, an orbital facility that could handle three people for up to 20 days at a

5 SPACEHAB press release. "SPACEHAB to build first commercial habitat in orbit," http://www.spacehab.com, December 10, 1999.

6 Boeing Corporation press release. "Boeing, Khrunichev Propose Commercial Space Module," http://www.boeing.com, July 27, 2000.

Space News. "Boeing Wants Out of FGB-2 Commercialization Deal," September 9, 2002, p. 4.

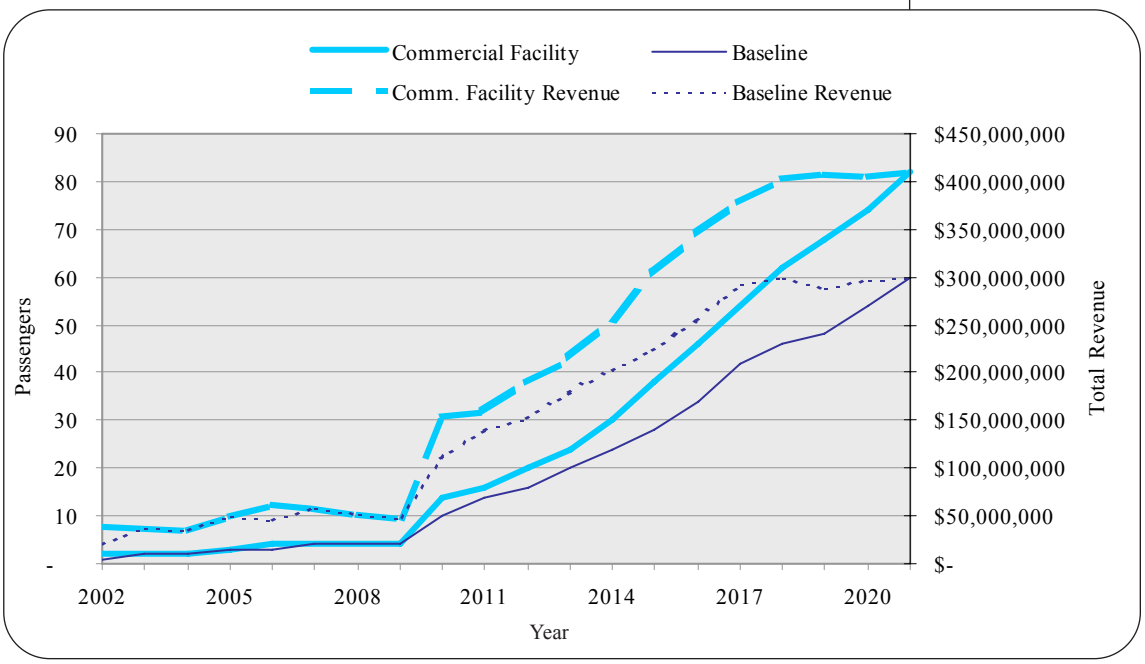
7 MirCorp press release. "MirCorp Reaches Agreement for Development of the World's First Private Space Station," http://www.mir-corp.com, September 4, 2001.

time. Since that date, however, there have been no further announcements about the status of the project.[7]

- Bigelow Aerospace, a company founded in 1999 by hotelier Robert Bigelow, has announced plans to build an orbiting hotel within 15 years, but has made little public progress on that venture to date.

"...the ISS is hardly an ideal tourist destination."

The portion of the Futron/Zogby survey that focused on the orbital market included some questions intended to test respondents' reaction to an alteration of the baseline scenario, whether an alternate destination, in this case, a commercial on-orbit facility designed for tourists, would increase their likelihood to participate in orbital space travel. Forty-seven percent of respondents responded affirmatively to this question (see Figure 17).



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Com. Facility Scenario Passengers	2	2	2	3	4	4	4	4	14	16	20	24	30	38	46	54	62	68	74	82
Baseline Passengers	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
Price (US$ M)	20	18.9	17.8	16.7	15.6	14.4	13.3	12.2	11.1	10	9.5	9	8.5	8	7.5	7	6.5	6	5.5	5
Com. Facility Scenario Rev. (US$M)	40	38	36	50	62	58	53	49	156	160	190	216	255	304	345	378	403	408	407	410
Baseline Revenue (US$ M)	20	38	36	50	47	58	53	49	111	140	152	180	204	224	255	294	299	288	297	300

Figure 51: Orbital demand forecast with commercial facility option

"...increase in demand would result from having both the option to travel to the ISS and the two-day trip option available."

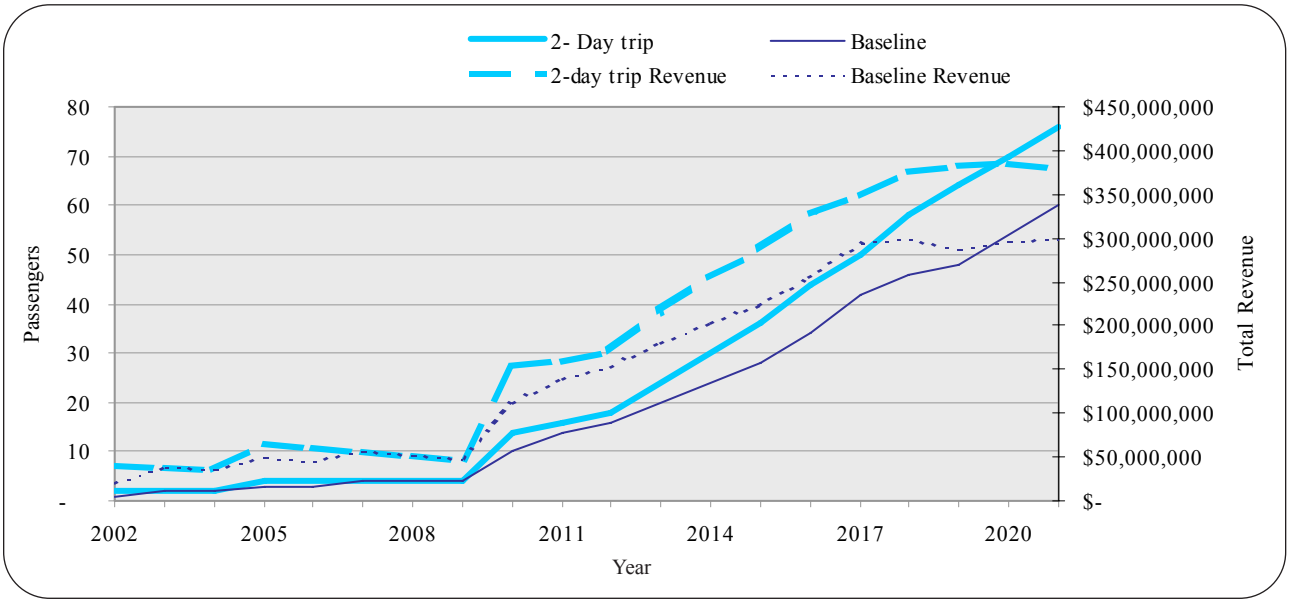
However, when Futron performed additional analysis on the responses, the data revealed that only a small portion of the respondents that met the necessary criteria to be a viable customer would be more likely to partake in space travel if an alternative commercial destination were available. Additionally, an equivalent drop in demand occurs among those only interested in traveling to the ISS, if only a commercial facility destination was available.

Futron estimated that an increase in demand would result from having both the ISS and a commercial on-orbit facility available, yielding a total of 553 passengers over the forecast period — a 32 percent increase over the baseline. Figure 51 shows how the addition of a commercial facility as an orbital destination option would affect demand and revenue for orbital space travel.

Trip without destination

Futron also queried respondents on the possibility of an alternative trip scenario wherein the passengers would not dock with a space station, but would instead be confined to the capsule they launched in for two-days (see Figure 17). Futron analyzed the impact of this change in the orbital scenario on demand. Similar to the results for the commercial facility option, Futron estimated that there would be a small increase in demand among those likely to purchase a two-day orbital flight, with a corresponding decrease in demand among those only interested in traveling to the ISS.

Futron estimated that an increase in demand would result from having both the option to travel to the ISS and the two-day trip option available, producing a total of 526 passengers that would potentially demand service — an increase of more than 25 percent over the forecast. Figure 52 depicts the resulting increase in demand and revenue from the offering of the two-day orbital option.



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2-Day trip Passengers	2	2	2	4	4	4	4	4	14	16	18	24	30	36	44	50	58	64	70	76
Baseline Passengers	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
Price (US$ M)	20	18.9	17.8	16.7	15.6	14.4	13.3	12.2	11.1	10	9.5	9	8.5	8	7.5	7	6.5	6.0	5.5	5
2-day trip Rev. (US$ M)	40	38	36	67	62	58	53	49	156	160	171	216	255	288	330	350	377	384	385	380
Baseline Rev. (US$ M)	20	38	36	50	47	58	53	49	111	140	152	180	204	224	255	294	299	288	297	300

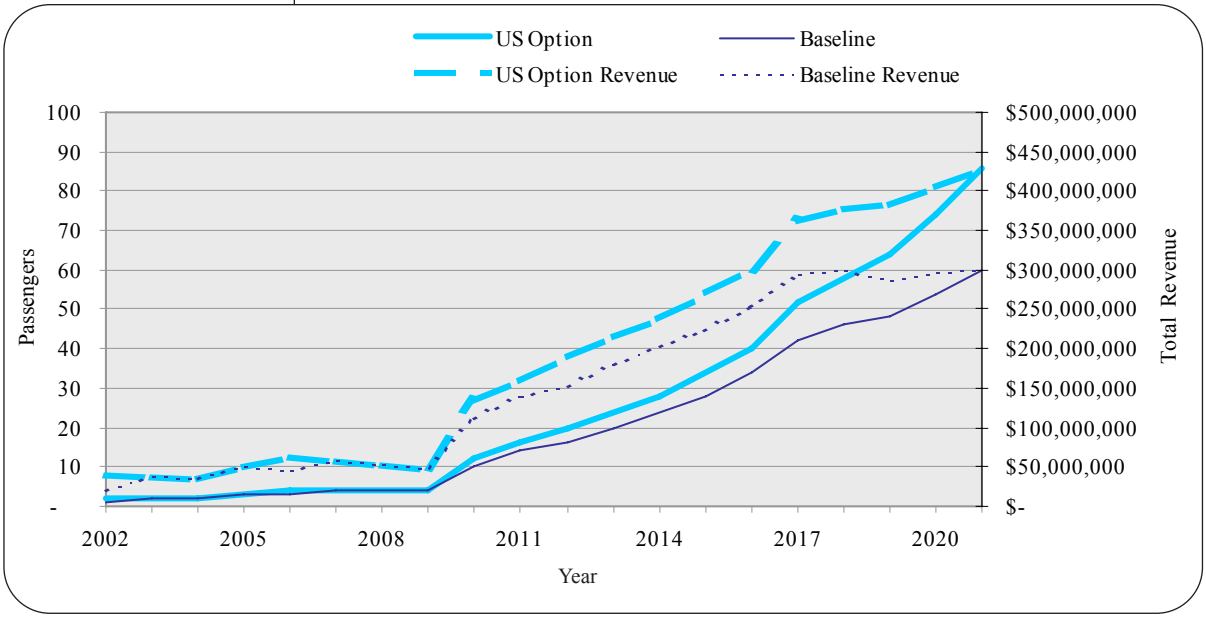
Figure 52: Orbital demand forecast with a two-day trip option, without a stay at an orbital facility

6.2.5 u.s.-offered service and training

The Futron/Zogby survey and the above orbital forecast focused on the currently-offered trip scenario of riding on a Russian *Soyuz* vehicle and completing most of the training period in Russia. However, the survey also addressed the potential changes in demand if the trip was offered by a U.S. company and/or the training could be completed in the United States. Almost two-thirds of all survey respondents indicated an increase in interest if the U.S. options were available (see Figure 14). Several respondents who were "somewhat interested" in orbital space travel and willing to pay for a trip would be significantly more interested if a U.S. option were available.

"Almost two-thirds of all survey respondents indicated an increase in interest if the U.S. options were available."

Figure 53 illustrates the change in demand generated by the alternative U.S. option as compared to the baseline results of the Russian trip scenario based on the same price scenario in the above revenue forecast. Since the Futron/Zogby survey was conducted in the United States, it is assumed that there would be a significant bias towards interest in participating in the U.S. option. Therefore, in quantifying the total increase in demand created if the trip were available in the United States, the increased interest was only applied to the North American pool of potential travelers, assuming demand in the rest of the world would not be significantly affected by this alternative. The demand among North American passengers more than doubled with this alternative, pushing



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
US Option Passengers	2	2	2	3	4	4	4	4	12	16	20	24	28	34	40	52	58	64	74	86
Baseline Passengers	1	2	2	3	3	4	4	4	10	14	16	20	24	28	34	42	46	48	54	60
Price (US$ M)	20	19	18	17	16	14	13	12	11	10	10	9	9	8	8	7	7	6	6	5
US Option Rev. (US$ M)	40	38	36	50	62	58	53	49	133	160	190	216	238	272	300	364	377	384	407	430
Baseline Rev. (US$ M)	20	38	36	50	47	58	53	49	111	140	152	180	204	224	255	294	299	288	297	300

Figure 53: Orbital demand forecast based on U.S. option

total demand to 86 passengers in 2021 from the baseline of 60, and revenues to US$430 million from the baseline of US$300 million. Overall, U.S.-based options increase the demand for orbital public space travel by more than 30 percent over the forecast period.

"...demand among North American passengers more than doubled with this alternative..."

7 Possibilities for Further Analysis

This report provides a solid foundation for understanding the realistic market for public space travel. For anyone with an interest in public space travel, Futron can provide customized consulting services for a wide range of technical, regulatory, and market questions. Some examples of possible analyses are highlighted below.

7.1 Effect of New Vehicles on Demand for Orbital Travel

The orbital survey results and forecast were generated with one underlying assumption: public space travel is currently available only via a Russian Soyuz vehicle. Expanding analysis to include other vehicles would impact the target market and associated forecast. Several variables merit examination in the context of new vehicles providing public space travel:

- Passenger capacity,
- Flight frequency,
- Ability to dock with the ISS or other potential orbiting platforms,
- Country of ownership and flight operations,
- Training time and location,
- Programmatic risk,
- Economic cost modeling,
- Safety, and
- Regulatory environment.

7.2 Future Suborbital Markets

The suborbital forecasts in this study only address the suborbital market in the context of space tourism. However, it is likely that suborbital vehicles will expand to serve other market niches, maybe including rapid package delivery and point-to-point passenger transport. These markets could have a significant impact on the cost and trip profile for the suborbital tourist, eventually even supplanting the initial market offering.

7.3 On-Orbit Destinations

What is the threshold required to support and sustain a commercially developed space hotel? Can a business case be made for an independent orbital platform based on public space travel alone, or would it be a mixed-use facility? What is the optimal configuration and operational model for such a business? Financial analysis, cost modeling, programmatic risk, and safety can all be applied to answer a range of customized questions concerning various system architectures and business models.

7.4 The Whole Space Experience

The survey data suggested that some people actually preferred the physical and mental challenge of a rigorous training routine, while others preferred to stay closer to home, finding a shorter training time more appealing. Analyses further segmenting the market pool could reveal the importance and range of preferences for all aspects of the space flight experience. Aspects to consider include the following:

- The primary motivation for interest in a space flight experience;
- Sensitivities to various service alternatives;
- Amenities and other specialty services;
- In-flight activities; and
- Programs that would include family and friends.

7.5 Economic Impact

What is the potential impact of public space travel on the aerospace industry, the tourism and hospitality industries, and the communities where public space travel organizations may locate? By studying the range of support services, personnel, and other factors generated by this new industry, Futron can quantify the economic benefits and identify ways to stimulate economic development.



Futron's headquarters in Bethesda, Maryland

Futron Overview

Futron applies analytically-rigorous decision-support methods to transform data into information. We collaborate closely with clients to relate decisions to future outcomes and measures of value. Our aerospace consulting services include market and industry analyses, safety and risk management, remote sensing, and communications and information management. Futron's vision and commitment to innovation, quality and excellence results in a higher performing future for clients.

summary of capabilities

Futron's Space and Telecommunications Division is the industry leader in researching, analyzing, and forecasting space and telecommunications markets and programs. Futron offers our commercial and government clients a suite of proprietary, leading-edge analytical methodologies. Our world-class team of market and policy analysts, economists, and engineers bring unparalleled skills and expertise to each account.

- Futron has surveyed hundreds of aerospace firms to develop unique revenue, employment, and productivity profiles of the industry.
- Futron has developed country-by-country models of demand for satellite telecommunication services that aggregate a global forecast from the individual household PC or business network level; these models have accurately predicted future launch levels and business changes in the satellite industry.
- Futron's database on satellite transponder pricing includes more than 4,000 price points from around the world, including actual deal pricing and terms.
- Futron's Electronic Library of Space Activity (ELSA) is a searchable, interactive database of every launch since 1957. The database also acts as a dynamic source of information on satellite activity; keeping track of the status and operational activity (including transponder coverage and carriage) of every satellite in orbit.
- Futron generates bottoms up, parametric, and analogous cost estimates for commercial satellite and launch vehicle programs.
- Futron provides a subscription-based service providing information on every FCC satellite application filed since 1990. Futron's FCCFilings.com is the only source for competitive intelligence and business data contained in FCC satellite licensing documents.

Appendix: The Futron/Zogby Survey

We would like to ask you about your vacation and travel preferences.

1. About how much money would you say you spend annually on vacation travel?
2. Which of the following best represents your household income last year before taxes?
3. Which of the following best describes your net worth?
4. What is the longest time you have ever spent on vacation?
5. On average, how much time each year do you typically spend on a vacation?
6. On what activity or item did you spend the most discretionary income last year?
7. Approximately how much did you spend on this activity or item?
8. On what activity or item did you spend the second most discretionary income last year?
9. Approximately how much did you spend on this activity or item?
10. Overall, on a scale of one to five with one being extremely fit and five being not at all fit, how physically fit would you rate yourself
11. Considering all the activities in which you participate, what is the most amount of time you have ever spent on training or physical preparation for any single activity?
12. If you had US$100,000 of discretionary income and could only spend it on one thing, which one of the following would you purchase?
    · A sports car · A dream vacation · A designer outfit · Jewelry · A sub-orbital space flight · Invest it · Other
13. If you had US$5 million of discretionary income and could only spend it on one thing, which one of the following would you purchase?
    · A home in some exotic location · A piece of artwork · An orbital space flight · A yacht · A jet · Invest it · Other
14. Now I am going to read to you a list of activities. For each, please tell me if you participate in the activity regularly, sometimes, rarely, or never?
    · Mountain climbing? · Flying in a private aircraft? · Skydiving? · Skiing (on snow or water)/Snowboarding?
    · Sailing or boating?
15. Now, using a scale of 1 to 5 where 1 is not at all risky and 5 is extremely risky, please rate for me the risk of each of the following activities.
    · Mountain climbing? · Flying in a private aircraft? · Space travel? · Skydiving? · Skiing/Snowboarding?
    · Sailing or boating?
16. Have you ever participated in any of the following space tourism activities?

Now I am going to ask you some questions about space flight.

In a sub-orbital space flight, you would experience what only astronauts and cosmonauts have experienced. During the 15-minute flight on a vehicle that meets government safety regulations, you will go 50 miles into space, and experience the acceleration of a rocket launch. You will also experience a few minutes of weightlessness and have the unique experience of viewing the Earth from space.

17. How likely would you be to participate in a sub-orbital space flight?

Now we want to tell you about other aspects of sub-orbital space flight.

Space flight is an inherently risky activity. The vehicle providing these flights will be privately developed with a limited flight history. In order to take the trip, you would have to undergo training for one week prior to the launch. Although you would experience weightlessness, you would be strapped into your seat throughout the trip.

18. Knowing what you know now, how likely would you be to participate in a sub-orbital space flight?

Please rate the following on their importance to you as an aspect of a sub-orbital space flight.

19. You would be able to view the Earth from space?
20. You would experience weightlessness?
21. You would experience the acceleration of a rocket launch?
22. You experience what only astronauts and cosmonauts have experienced.
23. Now I am going to ask you about certain aspects of the flight. Please rate each on your likelihood to participate in a sub-orbital space flight.
24. There is a required, one-week training period. Would this make you...?
25. Knowing that the vehicle would be privately developed with a limited flight history. Would this make you...?
26. You would be strapped into your seat throughout the trip. Would this make you...?
27. Now some questions about the prices of sub-orbital space travel.
28. Would you be willing to pay US$250,000 for a sub-orbital flight?
29. Would you be willing to pay US$200,000 for a sub-orbital flight?
30. Would you be willing to pay US$150,000 for a sub-orbital flight?
31. Would you be willing to pay US$100,000 for a sub-orbital flight?
32. Would you be willing to pay US$50,000 for a sub-orbital flight?
33. Would you be willing to pay US$25,000 for a sub-orbital flight?
34. What is the most important reason why you are not interested in a sub-orbital flight?
35. The conditions I just outlined could change in the future and affect the demand for sub-orbital space travel. If certain conditions change, how likely would you be to participate in space travel? For instance if...
36. The training would take less than one week?
37. You would have the ability to leave your seat during a flight?

Now I have some questions about another type of space flight.

In an orbital flight, you would have the opportunity to experience what only astronauts and cosmonauts have experienced. The trip would begin with a launch aboard a thoroughly tested rocket. You would then dock with an orbiting space station and would have the freedom to move about the facility. During your two-week stay you would be weightless. You would have the opportunity to eat, sleep, exercise and view the Earth from space.

38. How likely would you be to participate in an orbital space flight?

Now we want to tell you about other aspects of orbital space flight.

Space flight is an inherently risky activity. Currently, the flight is only available on a Russian vehicle. In order to take the trip, you would have to undergo intensive cosmonaut training in Russia for six months prior to the launch. During the flight you may experience headaches and lower backache. While in space, you might experience some nausea. You would be able to view the Earth through porthole-sized windows. Upon your return to Earth and to normal gravity, you might experience some dizziness for a few days and have difficulty standing.

39. Knowing what you know now, how likely would you be to participate in an orbital space flight...?

Please rate the following on their importance to you as an aspect of an orbital space flight.

40. You would stay two weeks on a space station?
41. Orbiting the earth every 90 minutes?
42. Eating, sleeping and exercising in space, with the freedom to move about in a large space station?
43. Going into space in a thoroughly tested rocket?

Now I am going to ask you about certain aspects of the flight. Please rate each on your likelihood to participate in an orbital space flight.

44. You would undergo intensive physical and mental training over a six-month period. Would you be...?
45. Two weeks of weightlessness might cause you to experience dizziness/difficulty standing for a few days upon returning to Earth. Would you be...?
46. Going into space in a Russian-made vehicle. Would you be...?
47. Currently, the orbital trip is only available in Russia. Would six months of training in Russia, including learning to speak Russian make you...?

Now some questions about the prices of orbital space travel.

48. Would you be willing to pay US$25 million for an orbital space flight?
49. Would you be willing to pay US$20 million for an orbital space flight?
50. Would you be willing to pay US$10 million for an orbital space flight?
51. Would you be willing to pay US$5 million for an orbital space flight?
52. Would you be willing to pay US$2.5 million for an orbital space flight?
53. Would you be willing to pay for an orbital space flight if it cost US$1 million?
54. What is the most important reason why you are not interested in orbital flight?
55. What is the likelihood you would have six months available to prepare for space travel?
56. The conditions I outlined could change in the future and affect the demand for orbital space travel. If certain conditions change, how likely would you be to participate in orbital space travel? For instance...
57. If the orbital trip were available from a U.S. company, would you be...?
58. If you could train for a shorter period of time, perhaps three months, would you be...?
59. If you could train for only one month, would you be...?
60. If you could train in the United States, would you be...?

61. Currently, the only destination in orbit is the International Space Station. Would the possibility of visiting a commercial facility designed for tourists (with increased comforts) make you...?
62. How would the opportunity to take a spacewalk outside the vehicle -- even if it would cost more -- affect your likelihood of taking an orbital trip?
63. How about the opportunity to take a spacewalk, even if it meant a year's worth of training?
64. If you could take a companion with you on an orbital space flight, how would it affect your likelihood of participating?
65. If you could not travel to a space station, would you be much more likely, somewhat more likely, somewhat less likely, or much less likely to take a two-day orbital trip in which you would remain inside the vehicle, or would it make no difference?
66. If you could finance an orbital or sub-orbital flight, would you be interested in going?
67. What is the most important reason why you would have any interest in traveling into space?
68. What is the second most important reason why you would have any interest in traveling into space?
69. What is your age?
70. Which of the following best describes your highest level of education?
71. Which of the following best describes your employment status?
72. Are you a parent or guardian of a dependent child who is living at home?
73. Do you have any dependents other than children?
74. Which of the following best describes your marital status?