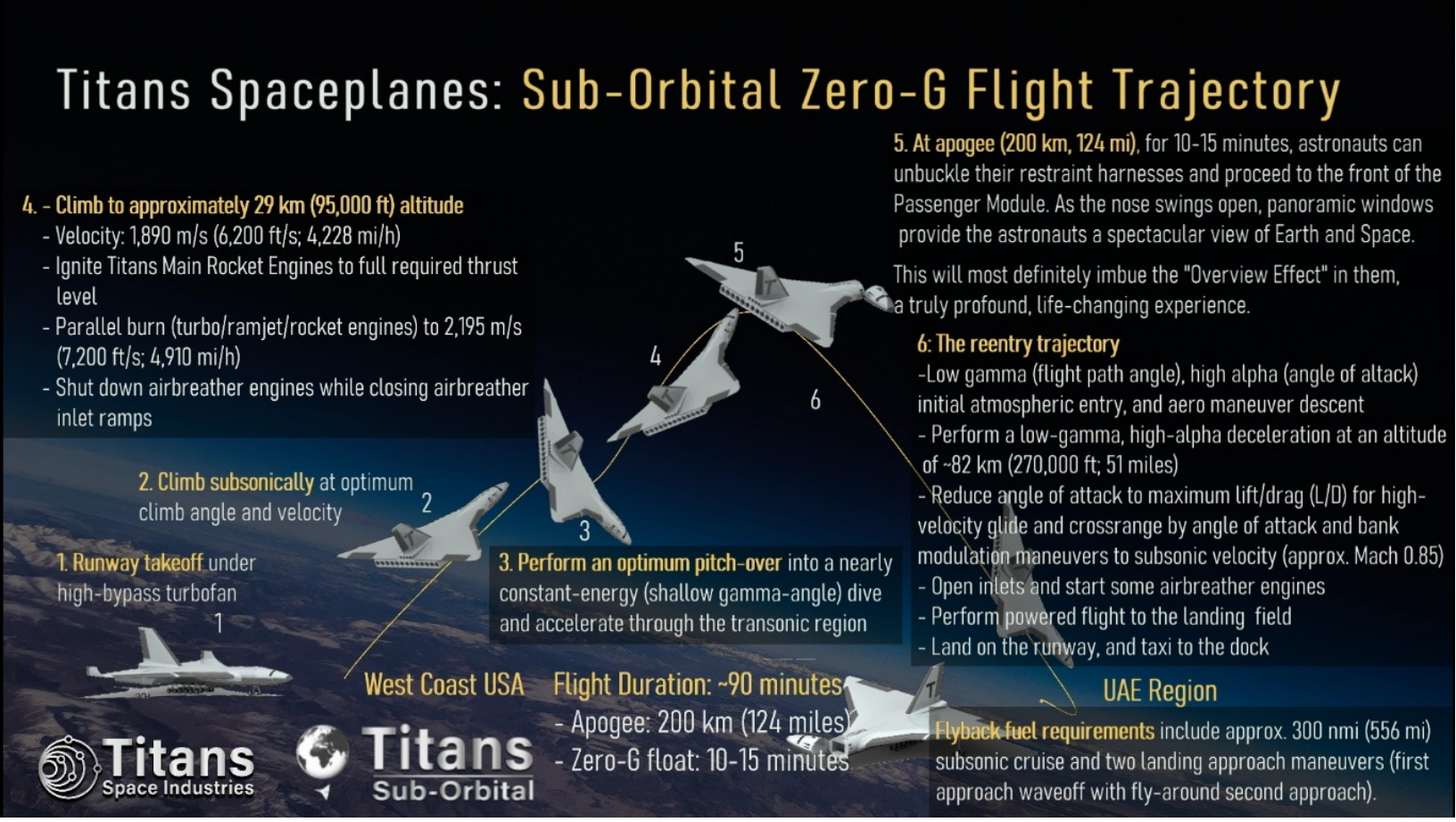

BUSINESS PLAN

Building: A $250 Space Travel Company

Introducing: The 10 Million Astronauts Initiative

Space Tourism | Ultra-Fast Travel

A Titans Space Industries Company

Table of Contents

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Introduction

Titans Sub-Orbital, a subsidiary of new Space company Titans Space Industries (TSI), is set to revolutionize space travel through innovative spaceplanes and spacecraft.

TSI's ambitious goals include:

- **Operating Space (LEO and Lunar) Tourism:** TSI aims to become the premier operator for individuals seeking extraordinary experiences in space, both in Low Earth Orbit (LEO) and on the Moon.
- **Leading Space Real Estate Development:** TSI envisions becoming the largest property owner in space and on the Moon, paving the way for a future with diverse space and lunar infrastructure.
- **Building Lunar Commerce and Mining (post-2031):** From 2031 onward, we plan to be at the forefront of commercial activities on the Moon, including resource extraction and trade.

TSI's founding team boasts an unparalleled combination of expertise:

- A visionary Space entrepreneur in satellite broadcast and broadband technology.
- A veteran with over 40 years of experience in rocketry and aerodynamics.
- A Private Equity mastermind with over $6 billion raised and business transactions closed.
- A legendary NBA Hall-of-Famer lending his influence.
- A former Apple business development leader bringing strategic prowess.
- A multi-billion-dollar business strategist with a keen eye for growth.
- An ex-MD at KPMG NYC, advising on over 100 private equity and mergers & acquisitions transactions, contributing extensive financial expertise.
- A seasoned former CFO of a Formula One racing team and public companies, bringing experience in managing complex financial operations.
- A seasoned space entrepreneur and advocate with over 40 years of experience.

This diverse and accomplished team positions TSI for unparalleled success in shaping the future of space exploration and commerce.

This document concerns Titans Sub-Orbital (TSO), a company that transcends hypersonics by way of sub-orbital space travel, and how 10 million people could become) (sub-orbital) astronauts.

TSO pushes the boundaries of transportation by leveraging the benefits of both traditional spaceflight and suborbital space travel to achieve ultra-high-speed point-to-point (terrestrial) travel.

Sub-orbital space trajectories offer significantly faster options compared to potential terrestrial hypersonic flights, which will be constrained by airframe materials and propulsion technology at around Mach 5.

Leveraging established research from NASA, DARPA, and Rockwell International, the core of TSO's operations, the Titans Spaceplanes, utilize a hybrid propulsion system combining airbreathing technology for enhanced efficiency and rocket engines for versatile performance.

The emergence of Titans Spaceplanes marks a paradigm shift for space transport, exceeding the capabilities of rocketships as well as any upcoming supersonic and hypersonic aircraft.

The untapped potential of spaceplanes.

Beyond the capabilities of supersonic and even hypersonic, TSO promises an entirely new paradigm of ultrafast travel. Even if only a sliver of the elite business travel market adopts TSO's revolutionary sub-orbital travel services, the resulting flight demand would outstrip any other conceivable space application.

Imagine: tapping just a fraction of the vast intercontinental travel and tourist market could propel TSO a hundredfold beyond what others (think Virgin Galactic, Blue Origin, and SpaceX) alone could potentially offer.

This isn't just about luxury trips across continents in less than 90 minutes; it's a catalyst for slashing the cost of space travel itself. As such, equally large is the market for affordable space tourism.

Think: $25,000 for an unforgettable sub-orbital journey that takes you from Los Angeles to Dubai (half-way across the world) in 90 minutes, watching Earth from 200 km (124.3 mi) altitude, experiencing the Overview Effect, and the incredible feeling of floating for 10-15 minutes in Zero-G (weightlessness).

Whether you fly with TSO for the unique low-cost sub-orbital space experience or for the ultra-fast point-to-point travel, the tickets will cost the same, and the experience will also be the same. Frequent TSO flyers will even get attractive discounts and perks.

Target Market

There are 30 million High-Net-Worth Individuals in the world as of 2023. For most of them the old adage remains true: Time is money. This is one of the main reasons why Morgan Stanley predicts the hypersonic travel market to become a $800 billion (with a B) market. The problem is that hypersonic travel may be ten to fifteen years away, if it will happen at all in our lifetime, despite the grand efforts by the likes of Hermeus and Destinus.

On the other hand, sub-orbital space travel is much faster than hypersonic travel. As such, we are confident that only TSO is poised to become the primary ultra-fast travel service provider in the world and for space tourists seeking the ultimate travel experience - a journey beyond the ordinary, to space and back. (See Potential Market Size: 100+ Million Individuals in this document for details).

TSO will capture a significant share of the growing space tourism market. Our unique combination of innovative technology (spaceplanes instead of rockets), unwavering commitment to safety and sustainability, and personalized service will set us apart from the competition.

Mission

TSO’s mission is twofold and concerns space tourism and ultra-fast travel.

We will make space tourism affordable for the average person under our 10 Million Astronauts initiative, igniting wonder and inspiring explorers through unforgettable sub-orbital flights where they get to experience the “Overview Effect” from ~200 km (124.3 miles) above Earth, feel the thrill of weightlessness, and witness our planet's breathtaking beauty.

TSO wants to become the predominant operator in the ultra-fast travel market where speed, comfort, and price meet in the most exciting way: sub-orbital point-to-point travel. One $25,000 ticket will get you from LA to Dubai or from London to New York in less than 90 minutes.

Objective

Our objective is to make the dream of space tourism a reality for ten million people. Starting mid-2027, Titans Space's 10 Million Astronauts project will bring ten million people on sub-orbital flights, offering them the unique chance to view Earth from 200 km (124.3 mi) and experience the magic of weightlessness in zero-g for 10-15 minutes.

The 10 Million Astronauts Initiative is achievable for two reasons: TSO’s sub-orbital journeys cost $25,000 and even lower after some years (up to $15,000-$20,000), and the initiative will never end.

Vision

To be the most trusted and respected sub-orbital space travel company, recognized for our exceptional service, unwavering commitment to safety, and dedication to environmental responsibility.

Key Offerings

Sub-Orbital Flights

- TSO’s fleet of four state-of-the-art spaceplanes will ensure a safe and exhilarating journey to the edge of space.
- Passengers will enjoy breathtaking views of Earth from the blackness of space during a brief yet transformative experience.

- Passengers will be weightless (float in zero-g) for 10-15 minutes.

- Passengers become astronauts when flying with TSO due to the spaceplane reaching 200 km (124.3 mile) altitude.

Customized Experiences

- Tailored packages for individuals, families, and corporate clients, offering flexibility in flight schedules, accommodations, and personalized space-themed activities.

Educational Programs

- Collaborations with educational institutions to provide unique STEM-focused programs, fostering interest in science, technology, engineering, and mathematics among students.

Technology and Safety

- Our fleet comprises advanced sub-orbital spaceplanes designed for reliability, comfort, and safety. The design is based on work from Rockwell International, the builders of the NASA Space Shuttle Orbiters, the most reliable spaceplanes ever built. (See Spaceplanes are orders of magnitude safer than rockets for an analysis).
- Continuous investment in research and development to enhance vehicle performance and passenger experience.

Stringent Safety Standards

- Adherence to the highest safety standards and regulations set by relevant aviation and space authorities.
- Regular maintenance, rigorous testing, and ongoing training for our professional flight crews.

Future Outlook

Expansion and Innovation

- Continuous expanding our sub-orbital travel services to new regions and destinations.
- Ongoing investment in research and development to enhance vehicle capabilities and introduce innovative features.

Sustainability Initiatives

- The rocket engines on Titans Spaceplanes use Liquid Hydrogen (LH2) and Liquid Oxygen (LOX) as fuel. This is 100% environmentally friendly. Furthermore, Titans Spaceplanes will use Sustainable Aviation Fuel (SAF) instead of JP-1 jet fuel. We estimate that each TSO journey will create less than 50% of the greenhouse gas emissions than any other plane on the same routes.
- Commitment to environmental responsibility through the implementation of sustainable practices and technologies.
- Collaboration with industry partners to reduce the carbon footprint of sub-orbital travel.
- Global Compact: TSO, as part of Titans Space Industries and Titans Universe/NSL & Co, is committed to the UN's Global Compact program.

Market Opportunity

Ultra-Fast Travel through Space: $800 Billion Annual Market Size

Morgan Stanley predicts that the hypersonic travel market will reach $800 billion by 2040. This timing is in line with the idea that hypersonic planes will become available somewhere in the 2030s. Luckily, Titans Sub-Orbital (TSO) doesn't depend on hypersonics and will start operations before year-end 2027.

As stated before, TSO transcends hypersonics by way of sub-orbital space travel. TSO pushes the boundaries of transportation by leveraging the benefits of both traditional spaceflight and sub-orbital space travel to achieve ultra-high-speed point-to-point (terrestrial) travel.

By flying above the atmosphere for the majority of the flight, we avoid the heating problems of staying within the atmosphere and cruising at hypersonic speeds. We only have to deal with the aerothermal heating problems of the hypersonic regime in the relatively brief period during reentry.

This will revolutionize commercial Space travel, offering unparalleled sub-orbital experiences to individuals and businesses that will also redefine the air travel industry forever.

Travel is no longer confined to the limitations of airplanes; TSO will operate four Titans Spaceplanes, starting before year-end 2027. With a commitment to safety, innovation, and customer satisfaction, and operating the only commercial spaceplanes available on the sub-orbital travel market, TSO is determined to become the leader in the long-distance sub-orbital travel sector, providing an experience that transcends the boundaries of ordinary travel.

Since TSO flies in a sub-orbital arc route, safe, efficient, and thrilling sub-orbital flights will make the dream of space travel a reality for a broader audience. (See Sub-Orbital Space Travel: Route Planning for an indication of TSO's initial routes).

Growing Demand

- A rising interest in space tourism and exploration presents a significant market opportunity.
- Increasing awareness and a desire for unique and transformative travel experiences.

Diverse Customer Base

- Appeal to a broad demographic, including:
    - Adventure enthusiasts
    - Corporate clients seeking unique incentives
    - Busy people who believe that "Time is money"
    - Wealthy people who need shorter travel times: Celebrities, Sports teams, Business Executives
    - Those with a keen interest in space tourism.

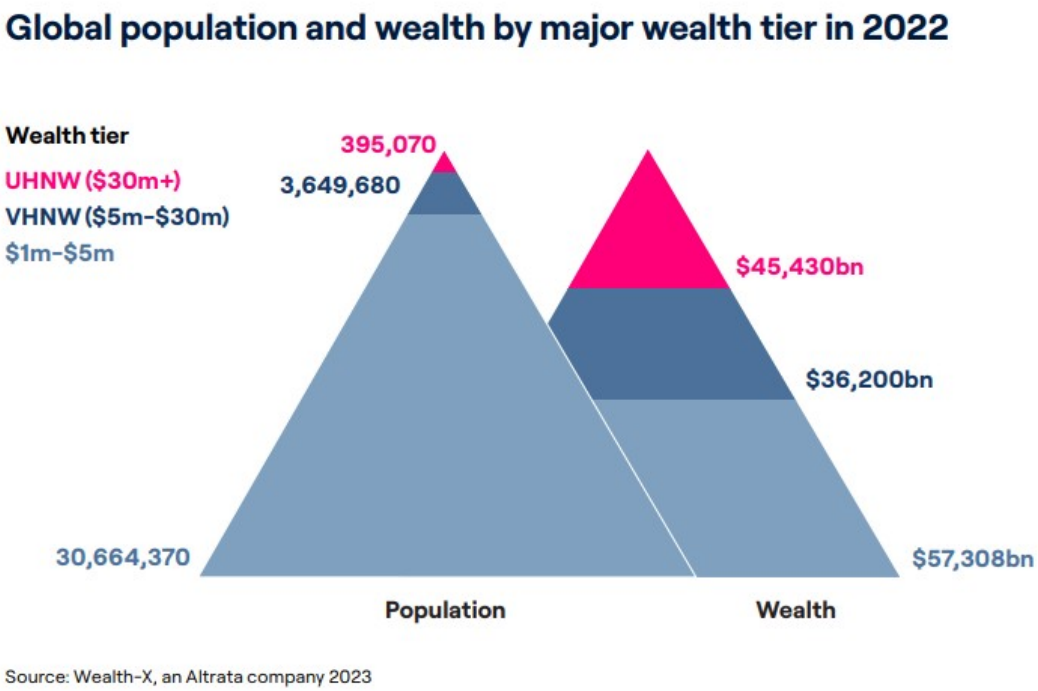
TSO is poised to redefine the travel industry by offering an extraordinary journey beyond the confines of Earth. With a commitment to safety, innovation, and customer satisfaction, we anticipate becoming a pioneer and leader in the sub-orbital travel sector, providing an experience that transcends the boundaries of ordinary travel.

Potential Market Size: 100+ Million Individuals

As stated before, Morgan Stanley has predicted that the hypersonic travel market is expected to reach $800 billion. TSO tickets will cost on average $25,000 per flight, which last around 90 minutes (e.g. Los Angeles to Dubai, a flight that would otherwise take 15-16 hours).

The number of people who can easily afford a $25,000 ticket is staggeringly high:

- 395,000 Ultra-High-Net-Worth Individuals (UHNWIs) with a wealth of $30+ million
- 3.65 million Very-High-Net-Worth Individuals (VHNWIs with $5m-$30m
- ~31 million High-Net-Worth Individuals (HWNIs) with $1m-$5m



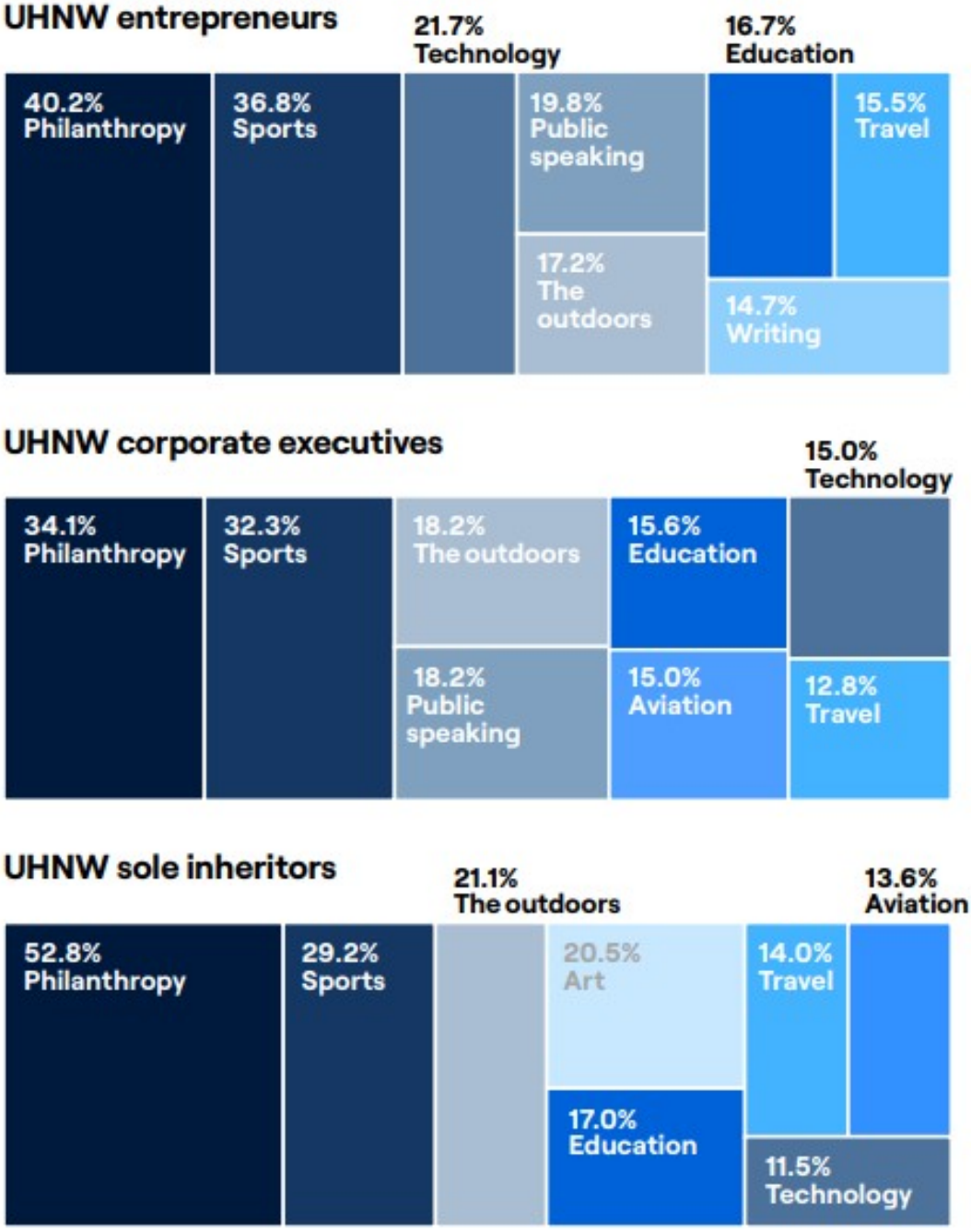
Travel and Aviation consistently ranks high among UHNWI's interests, passion, and hobbies.

It goes without saying that the wealthy and many millions of people from all walks of life will want to experience sub-orbital space travel at least once in their lifetime.

If the HNWIs would take at least two others with them, you're looking at an addressable life-time market of 100 million persons among the HNWIs and their circle.

Top eight interests, passions and hobbies by UHNW archetype

Proportion of individuals (at a minimum)



Note: More than one interest, passion or hobby is possible, so the numbers do not add up to 100%.

Source: Wealth-X, an Altrata company 2023

Interest in Space Tourism keeps Growing

The 2019 UBS Global Wealth Management report titled "Luxury: Beyond the Brink" examined various luxury trends, including the nascent space tourism industry.

Survey details

- Target audience: 2,500 high-net-worth individuals (HNWIs) with net investable assets of $1 million or more from across 14 countries, including the US, China, Germany, and the UK.

Key findings on space tourism

- 20% of HNWIs expressed interest in space tourism, with interest highest among younger individuals and those in Asia.
- Safety and comfort were top concerns, along with the environmental impact of space travel.
- Luxury experiences were highly desired, with respondents interested in unique offerings like space weddings or gourmet dining in orbit.

Additional takeaways

- The survey highlighted the potential for space tourism as a growing luxury market, though significant challenges remain in terms of affordability, accessibility, and safety.
- The findings suggested that wealthy individuals are increasingly interested in experiential luxury and are willing to pay a premium for unique and exclusive experiences.
- UBS expressed optimism about the future of space tourism, predicting that the market could reach $3 billion by 2030.

However, a later survey, reported by CNBC, found that 39 percent of people with a net worth of more than $5 million are interested in paying at least $250,000 for a Virgin Galactic flight to the edge of space.

39% of HNWIs Willing to Pay $250,000 for Sub-Orbital Space Tourism

In a 2021 CNBC video segment titled "Why SpaceX, Virgin Galactic, and Blue Origin are Betting on Space Tourism", the presenter states:

> "A recent survey found that about 39 percent of people with the net worth of more

than $5 million are interested in paying at least $250,000 for a Virgin Galactic flight to the edge of space.

The firm estimates that Virgin Galactic's suborbital flights have a total addressable market of about 2.4 million people who have a net worth of more than $5M."

It's important to note the following:

- Virgin Galactic sub-orbital journeys cost anywhere between $250,000 to $450,000
- The VG plane reaches only 58.7 miles (97.5 km) altitude
- The plane flies a short horizontal trajectory, staying close to the launch site
- Weightlessness (floating in zero-g) for 4-6 minutes

TSO's sub-orbital journeys will take you half-way across the world.

- TSO tickets cost $25,000
- TSO reaches 200 km altitude (124.3 miles)
- Passengers will see more of the world with TSO
- Weightlessness (floating in zero-g) for 10-15 minutes
- Multiple departure and destination choices (e.g. LA to Dubai, London to New York, etc.)

See section Space Tourism: Comparative Analysis for further information.

Official Space Tourism Revenue Forecast

In this section, we provide an overview of official forecasts. Please note:

- The industry is poised to grow to potentially $9 billion by 2030
- The forecasts are mostly based on expensive space tourism tickets
- The journey would mostly begin with a liftoff on top of a rocket

Titans Sub-Orbital (TSO) would dramatically change the space tourism industry in terms of revenue potential and market size, and as such TSO's future revenue estimates cannot be based on the industry forecasts.

We believe that due to the low cost of $25,000 per ticket, the addressable market instantly becomes much bigger, to the tune of 100 million persons in the next 30 years. As such, the below information cannot be relied upon when taking into consideration the Black Swan Event impact TSO will have on the space tourism ultra-fast travel industry.

Nevertheless, the current space tourism revenue forecast is quite exciting, with estimates predicting significant growth in the coming years.

Overall market size

- Current size: The global space tourism market is estimated to have reached $815.7 million in 2023.
- Growth rate: Different sources offer varying CAGR (Compound Annual Growth Rate) predictions, ranging from 19.8% to 40.2% over the next decade.
- Projected size: By 2030, the market is expected to reach anywhere between $5,191.7 million and $9,064.19 million.

Factors driving the growth

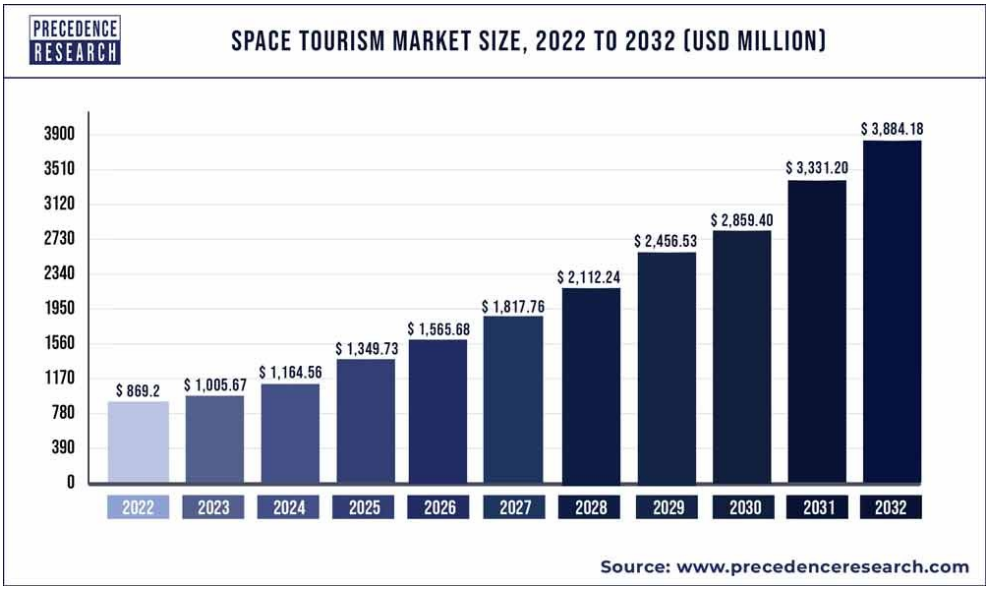
- Increasing interest in space exploration and adventure.
- Technological advancements making space travel more affordable and accessible.
- Growing disposable income among high-net-worth individuals.

Overall, the space tourism market is poised for significant growth in the coming years. Considering the addressable market and the affordable price per ticket for TSO journeys, we believe that the market could exceed several million tickets per year.

Another Source: Precedence Research

Presence Research states:

- The global space tourism market size was estimated at USD 869.20 million in 2022 and is projected to surpass around USD 3,884.18 million by 2032, poised to grow at a registered CAGR of 16.20% from 2023 to 2032.
- By type, the sub-orbital segment accounted highest revenue share of 51% in 2022 with a CAGR of 36% from 2023 to 2032.



Sales Strategy: Covering a Multi-Tier Market

Titans Sub-Orbital will operate at least four Titans Spaceplanes and possibly as many as ten, depending on USA and market regulations, requirements, and agreements.

Despite the media hype surrounding rockets like SpaceX's Starship, routine space transportation, including human space travel, by means of rockets will not reach large numbers, basically due to the inherent risks and limitations of such vehicles.

For large scale space tourism and travel to reach efficiency and safety levels like air travel/air cargo, the vehicles we use must operate like airplanes.

Titans Spaceplanes are the holy grail of aerospace; they are designed as a revolutionary space transportation system that eliminates the need for expensive launch facilities, vehicle assembly buildings, and (expendable or reusable) all-rocket boosters.

Titans Spaceplanes can operate from any (partnered) large airport, and it can carry up to 330 astronauts or a 90-100 ton payload into any 555-km (300 nmi, 344 mi) orbit; they use multi-cycle airbreather propulsion to reach the top of the troposphere and then ignite the rocket engines to reach Low-Earth Orbit.

TSO will work closely with Titans Space Industries to reach three tiers of customers, which are by definition astronauts-to be.

Titans Space Tourism	Launch Method	Altitude/ Apogee (estimate)	Full Duration (estimate)	Zero-G experience (estimate)	Sunsets Sunrises p/d	Persons Capacity	Full Price p/p (estimate)	Launch Frequency (estimate)
Titans Orbital Cruises	Spaceplane	300 km 186.4 mi	5 hours	3 hours	2 Sunrises 2 Sunsets	15 to 330	$200K (Diamond) $300K (Platinum) $500K (VIP)	1/day available for groups: H2-2027 available for individuals: 2031
Titans Sub-Orbital Zero-G	Spaceplane	200 km 124.2 mi	90 minutes	10-15 minutes	N/A	15 to 330	$25K (Diamond) $40K (Platinum) $100K (VIP)	Frequent available for groups: H2-2027 available for individuals: 2031

Launching Astronauts

Launching Astronauts are the first 500 individual Space tourists and Space Travelers who book an Orbital Cruise or Sub-Orbital Zero-G flight. They are the only individuals (besides Titans and Guest Astronauts) who can book cruises and flights until 2031 – bookings are otherwise reserved for groups (of ten or more persons) only.

Launching Astronauts booking an Orbital Cruise will also receive a corresponding Sub-Orbital Zero-G booking. For example, a Platinum Orbital Cruise booking will include a Platinum Sub-Orbital Zero-G flight.

The Launching Astronauts offer is valid until December 2024 or until the first 500 Launching Astronauts are booked, whichever comes first.

Titans Space Industries (TSI) operates Orbital Cruises, and Titans Sub-Orbital (TSO) operates the Sub-Orbital tourism and travel flights.

Launching Astronauts are automatically enrolled in a future Titans Sub-Orbital company Stock Options offering, making them co-owners of TSO.

The Launching Astronauts program is managed by Titans Space Industries.

For more information: https://titansspace.com/launching-astronauts/

Guest Astronauts

Guest Astronauts are Space tourists who pay a minimum of US$2.5 million for six VIP orbital cruises and six VIP sub-orbital zero-g flights.

The Guest Astronauts program is managed by Titans Space Industries.

For more information: https://titansspace.com/guest-astronauts/

Titans Astronauts

Titans Astronauts are in a league of their own, being anchor customers and among the first investors behind Titans Space.

Titans Astronauts receive space industry privileges from the day they join – in anticipation of their space travels from 2027 onward.

The Titans Astronauts program is managed by Titans Space Industries.

For more information: https://titansspace.com/titans-astronauts/

Titans Sub-Orbital Fleet: Four Titans Spaceplanes

Who designed the Titans Spaceplane?

Inspired by Rockwell, the NASA Space Shuttle builders

In the 1970s, the US government and NASA had incredibly ambitious plans to build an equatorial network of 60 solar power systems in Low-Earth Orbit from where solar energy would be beamed to Earth. It would require around 30 years to complete the entire network – with the use of a feet of ultra-safe, ultra-efficient, and fully reusable spaceplanes.

NASA's Rationale for a Spaceplane

Such a spaceplane would operate like an airplane, with the major difference that it would be able to reach Space, Low-Earth Orbit in this case, something that airplanes cannot achieve.

Rockwell's Star-Raker design: Simplicity is genius

Rockwell International, the builders of the NASA Space Shuttle orbiter, came up with the Star-Raker, a huge wet-wing, horizontal take-off and landing spaceplane that would be able to carry large payloads to LEO, and return safely to Earth – thanks to its 95-meters wide tri-delta wings.

Rockwell conducted multiple in-depth studies, from Critical Design Review, to aerodynamics and computer testing, up to final analysis, showing the Star-Raker's high Technology Readiness Level (TRL). However, due to politics and the oil crisis changing course, the new Reagan administration decided not to pursue the program, which was initiated by the Carter administration.

Rockwell's design became Titans Space's Inspiration

Rockwell's Star-Raker and its original purpose became the inspiration for the first generation of the Titans Spaceplanes. Titans Space's design is an updated, modernized version of the Star-Raker.

Titans Space Industries is at the Final Analysis and Design Phase

After more than 1.5 years, the Titans Spaceplane's Critical Design Review was completed in July 2023; the project has now entered the Final Analysis and Final Design phase.

The Titans Space team works under leadership of 40-year rocketry, aerospace, and aerodynamics veteran, CTO Franklin Ratliff, and 28-year Space entrepreneur veteran and Titans Principal Founder, Neal S. Lachman.

Titans Spaceplanes Quantitative Objectives & Requirements

The Titans Spaceplane is a safe and efficient vehicle with the following quantitative objectives and requirements:

- Total vehicle reusability – with many reuses
- Rapid turnaround
- Ferry capability with cargo between airfields
- Minimized launch costs
- High reliability of delivery
- Ability to reach any LEO plane from alternate launch sites
- and return to the same site; includes single-pass orbits

Spaceplanes are orders of magnitude safer than rockets

It's estimated that between 1 and 2% of rockets malfunction at, during, or after launch. The Titans Spaceplanes, being single-stage-to-orbit (SSTO) eliminate the need for complex staging mechanisms used in multi-stage rockets. Staging events are a major point of failure risk.

In case of emergencies during ascent or re-entry, a Titans Spaceplane can potentially glide back to a runway landing, offering a safer alternative to ballistic re-entry over water or unpopulated areas.

The Titans Spaceplanes, like airplanes, are designed for reuse, reducing launch costs and potential debris from discarded rocket stages.

Launch and landing windows with Rockets: Not our Problem

When launching rockets with humans on board, weather conditions at both the launch site and the landing site play a crucial role in determining the launch and landing windows. These windows are carefully calculated periods during which the risk of encountering adverse weather is minimized, ensuring the safety of the crew and the success of the mission.

Even launches without humans on board are routinely scrubbed due to weather conditions. Most weather conditions (except in extreme circumstances) are not a real concern for TSO since the Titans spaceplanes function like airplanes during take-off and landing.

The factors that influence a rocket’s launch and landing windows due to weather

Launch Site:

- **Wind:** Excessive wind speed and direction can destabilize the rocket during ascent, impacting its trajectory and potentially causing control issues. Strong crosswinds can also push the rocket off course. Launch windows are chosen when wind speeds are within acceptable limits.
- **Precipitation:** Heavy rain, hail, or thunderstorms can create dangerous icing conditions on the launch vehicle, increasing its weight and potentially leading to structural failures. Additionally, lightning strikes pose a significant risk to both the rocket and ground personnel. Weather forecasts predict clear or lightly populated skies during the launch window.
- **Visibility:** Thick fog or low clouds can obscure the launch pad and surrounding area, hindering critical visual checks and potentially requiring a launch abort. Optimal launch windows occur when visibility is good enough for safe and efficient launch procedures.

Landing Site:

- **Wind:** Similar to the launch site, strong winds at the landing site can make it difficult to control the spacecraft during descent and touchdown, potentially leading to a harsh or off-target landing. Landing windows are chosen when wind conditions are calm or within acceptable limits.
- **Precipitation:** Heavy rain, snow, or ice on the landing pad can create slippery conditions, increasing the risk of a skidding or hydroplaning landing. Clear and dry conditions are ideal for a safe and controlled touchdown.
- **Visibility:** Good visibility is crucial for both the pilots and ground personnel to monitor the spacecraft's descent and landing trajectory. Fog or low clouds can obscure critical visual cues, necessitating a landing abort and potentially delaying the mission.

Window Duration:

Launch and landing windows can vary in duration depending on the specific mission requirements and weather conditions. They can range from a few minutes to several hours, with multiple backup windows sometimes available in case of unexpected weather changes.

Overall, weather plays a critical role in determining the launch and landing windows for missions with human crew.

Space Shuttle Orbiters were the safest spaceplanes ever

Some people may point to the two Space Shuttle disasters, but both disasters had to do with damage caused by the rocket (system/booster) they were launched on.

- Space Shuttle Challenger, January 28, 1986: O-ring seal failure in the right Solid Rocket Booster (SRB) due to cold weather and wind shears
- Space Shuttle Columbia, February 1, 2003: Damage to the left wing's edge by debris from the external tank during launch

The Space Shuttle orbiters, as spaceplanes, however, were the safest space vehicle, ever.

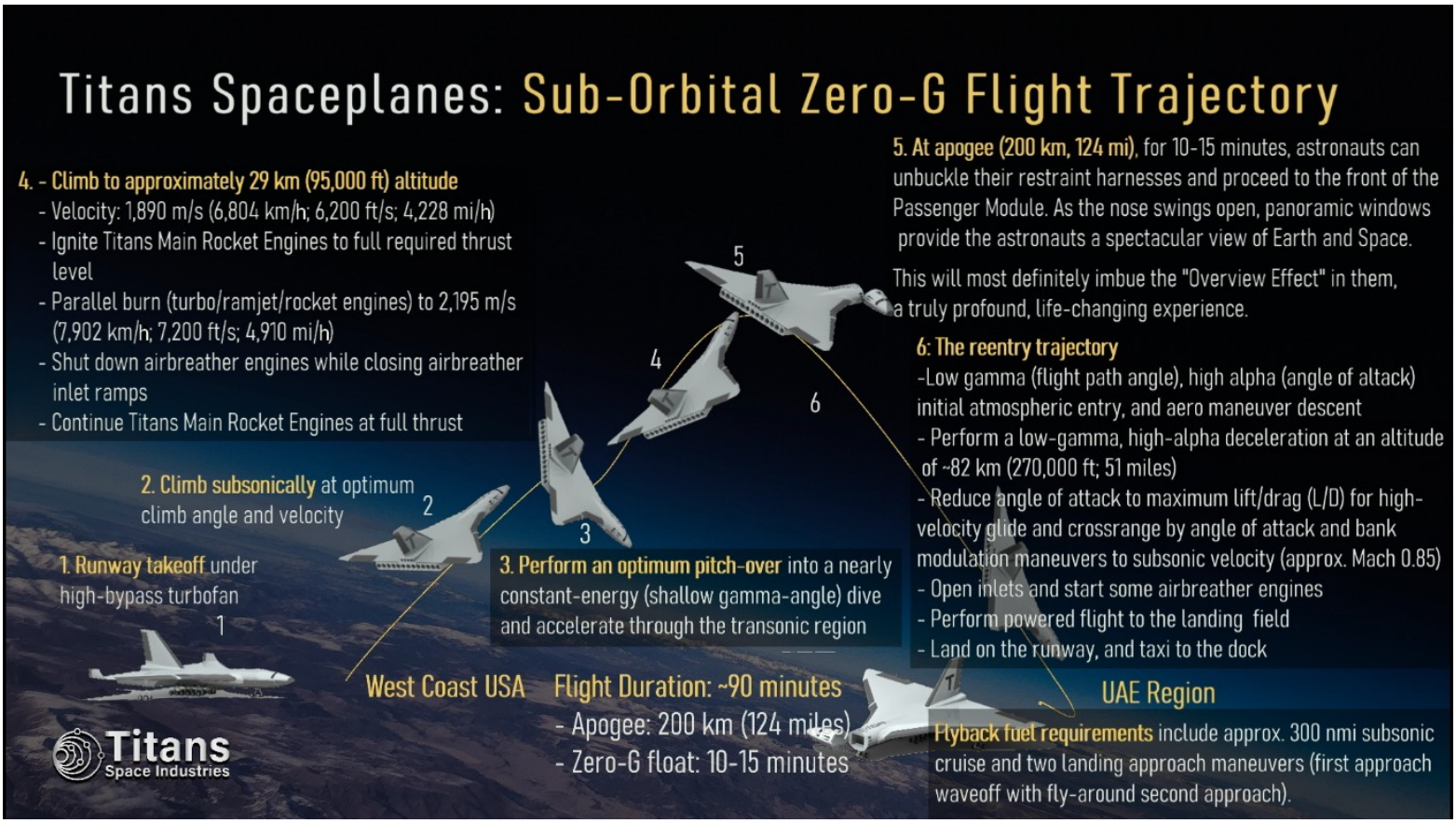
“The Challenger was the fault of an external strap-on booster,” he said. “And the Columbia was the fault of the external tank insulation coating. If it had been single stage, there wouldn’t have been any external boosters and there wouldn’t have been any tank.” - Robert Salkeld, space pioneer, inventor of dual-fuel rocket engines, and SSTO shuttle advocate; Santa Fe – The New Mexican, July 10, 2014

For further information about the Titans Spaceplanes:

- Watch this FAQs video (link)
- Visit the Titans Spaceplanes page
- Visit the extensive FAQs page

For further information about the Titans Engines Systems, please visit the Titans Engines webpage.

Sub-Orbital Flight Trajectory



Ultra-Fast Flight times: Supersonic vs Hypersonic vs TSO Sub-Orbital

It's currently impossible to calculate precise suborbital flight times due to several factors:

1. No Established Service: As of December 15, 2023, no company offers regular suborbital flights, let alone specific routes.
2. Varying Vehicle Performance: Titans Spaceplanes are still under development, and their flight characteristics (speed, apogee, etc.) can differ significantly. This makes it difficult to provide accurate estimates without specific vehicle data.
3. Dynamic Flight Routes: Suborbital trajectories wouldn't necessarily follow the shortest geographical paths due to factors like Earth's rotation, wind currents, and fuel efficiency considerations.

However, we can offer some general estimates based on current projections and typical suborbital flight characteristics.

Flight Time Range: Suborbital flights typically have a time range of 30 to 90 minutes, depending on factors like vehicle, trajectory, and apogee.

Route Variations: Expect slight variations in time between routes due to different distances and potential adjustments in trajectories for optimal flight efficiency.

Specific Examples:

- LA to Dubai: Longest distance, potentially requiring a higher apogee and longer flight time (75-90 minutes).
- New York to Dubai: Slightly shorter distance than LA-Dubai, potentially around 65-85 minutes.
- New York to London: Relatively short distance, potentially around 30-45 minutes.
- LA to New York: Cross-continental distance similar to New York-Dubai, potentially around 65-85 minutes.
- London to Dubai: Similar distance to New York-Dubai, potentially around 65-85 minutes.
- London to Sydney: Long transcontinental route, potentially requiring a high apogee and longer flight time (80-90 minutes).
- Sydney to Dubai: Similar distance to London-Dubai, potentially around 65-85 minutes.
- New York to Sydney: Long distance similar to LA-Dubai, potentially requiring a higher apogee and longer flight time (80-90 minutes).
- LA to Sydney: Similar distance to New York-Sydney, potentially around 80-90 minutes.
- New York to Hong Kong: Transpacific distance shorter than - New York-Sydney, potentially around 55-75 minutes.
- London to Hong Kong: Similar distance to New York-Hong Kong, potentially around 55-75 minutes.
- Hong Kong to Sydney: Relatively short regional route, potentially around 30-45 minutes.

It’s important to note that while advertising travel times of 30 minutes is appealing, TSO calculates at least 90 minutes for its long distance journeys, and at least 60 minutes for all other routes.

Time Saving: Ultra-Fast Sub-Orbital vs Hypersonic Travel

Route	Current Commercial (Avg)	Suborbital (Est. Range)	Hypersonic (Est. Range)	Time Saved (Suborbital)	Time Saved (Hypersonic)
LA – Dubai	15-16 hrs	75-90 min	3-4 hrs	14-15 hrs	11-12 hrs
NY – Dubai	12-13 hrs	65-85 min	2-3 hrs	10-11 hrs	9-10 hrs
NY – London	7-8 hrs	30-45 min	1-1.5 hrs	6-7 hrs	5-6 hrs
LA – NY	5-6 hrs	65-85 min	1-1.5 hrs	4-5 hrs	3-4 hrs
London – Dubai	12-13 hrs	65-85 min	2-3 hrs	10-11 hrs	9-10 hrs
London – Sydney	22-24 hrs	80-90 min	5-6 hrs	20-23 hrs	16-19 hrs
Sydney – Dubai	12-13 hrs	65-85 min	2-3 hrs	10-11 hrs	9-10 hrs
NY – Sydney	22-23 hrs	80-90 min	5-6 hrs	20-22 hrs	16-18 hrs
LA – Sydney	22-23 hrs	80-90 min	5-6 hrs	20-22 hrs	16-18 hrs
NY – Hong Kong	15-16 hrs	55-75 min	2-3 hrs	13-14 hrs	12-13 hrs
London – Hong Kong	15-16 hrs	55-75 min	2-3 hrs	13-14 hrs	12-13 hrs
Hong Kong – Sydney	8-9 hrs	30-45 min	1-1.5 hrs	7-8 hrs	6-7 hrs

The above table contains approximate ranges based on current understanding and projections. The actual flight times would depend on specific details of the Spaceplanes and chosen trajectories, which are not yet fully available for these routes.

It's important to keep in mind that concrete information about specific routes and timelines will emerge as the TSO service offerings develop further in the coming years. One major issue regarding routes concerns USA regulations, which may mean that China and Hong Kong may not be allowed for spaceplanes routes.

Sub-Orbital Space Travel: Route Planning

Preliminary Schedule

		Spaceplane 1			Spaceplane 2			Spaceplane 3			Spaceplane 4		
Monday	AM	London	Dubai	New York	Dubai	Los Angeles	Sydney	New York	Dubai	London	Los Angeles	Dubai	Sydney
	PM												
Tuesday	AM	Sydney	London	Dubai	Los Angeles	Dubai	London	Dubai	New York	London	London	New York	Dubai
	PM												
Wednesday	AM	Los Angeles	Dubai	London	New York	Dubai	Los Angeles	Singapore	New York	London	London	Dubai	New York
	PM												
Thursday	AM	London	Dubai	Hong Kong	Los Angeles	Dubai	London	Dubai	New York	Sydney	New York	Dubai	Los Angeles
	PM												
Friday	AM	Los Angeles	Dubai	London	London	Dubai	Sydney	Dubai	New York	London	New York	Dubai	Los Angeles
	PM												
Saturday	AM	Singapore	New York	London	New York	Dubai	Los Angeles	London	Dubai	Hong Kong	Los Angeles	Dubai	New York
	PM												
Sunday	AM	New York	Dubai	Los Angeles	Hong Kong	Los Angeles	Dubai	Dubai	New York	Hong Kong	New York	London	Dubai
	PM												

It's important to keep in mind that concrete information about specific routes and timelines will emerge as the TSO service offerings develop further in the coming years. One major issue regarding routes concerns USA regulations, which may mean that China and Hong Kong may not be allowed for spaceplanes routes.

Flight Frequency

The (preliminary) schedule shown in the previous section results in the following flight frequency:

Daily:	London - Dubai	NYC - Dubai
	Dubai - New York	LA - Dubai
6 x /week	Dubai - LA	
5 x/week	NYC - London	
4 x /week	Dubai - London	

Currently, Dubai plays a central role in our planning as it is the most visited city in the world (as of 2023). Depending on Titans Space Industries' agreements with the UAE government, Dubai could be one of the main hubs for TSO's operations.

Sub-Orbital Travel Scheduling

Below is an outline for a possible schedule for TSO's four spaceplanes with the flexibility for return trips based on location:

Dynamic Routing with Hub Optimization:

1. Hub Selection: We could choose a central city with high expected passenger traffic, like Dubai, as the hub for connections and layovers.
2. Route Pairing: We could divide the remaining seven cities into three pairs based on travel times and traffic patterns:
    - Pair 1 (3 hours total): London - New York, Barcelona - Singapore
    - Pair 2 (4.5 hours total): LA - Hong Kong, Dubai - London
    - Pair 3 (6 hours total): Sydney - New York, Dubai - Singapore
3. Schedule Rotation:
    - Day 1-3:
        - Morning: Each Spaceplane departs the hub with its assigned pair (e.g., Plane 1: London - New York, Plane 2: LA - Hong Kong, etc.).
        - Afternoon: Upon arrival, the Spaceplane continues the return leg if all available seats are booked for the full route. Otherwise:
            - If another Spaceplane at the hub needs assistance with a return trip due to high demand, it can join that return trip (e.g., Spaceplane 2 from Hong Kong can join Spaceplane 1's New York return if needed).
            - If no assistance is needed, the Spaceplane remains docked at the hub until the next scheduled departure.
    - Day 4-6:
        - The schedule swaps Fast Pair 1 and Medium Pair 2 for route diversification and balancing passenger demand.
    - Day 7:
        - Run Slow Pair 3 for longer travel times and adjust schedules to accommodate any accumulated wait times for return flights.
4. Flexibility and Optimization:
    - If a Spaceplane arrives at the hub and all other Spaceplanes are already departed, it can switch to a different city within its travel time limit based on real-time demand

and available bookings (e.g., Spaceplane 3 arriving from New York can switch to Singapore if demand is higher).

- TSO will utilize a central booking and communication system to manage passenger connections and reallocate Spaceplanes efficiently based on actual demand.

Benefits

- This system maximizes utilization by ensuring full flights and minimizing empty departures.
- Dynamic routing adapts to real-time demand and offers flexible connections for passengers.
- The dedicated hub facilitates efficient layovers and minimizes turnaround times.
- Regular schedule rotations provide route variety and balance passenger traffic.

Considerations

- The above requires TSO to utilize robust real-time data and booking systems for demand analysis and dynamic adjustments.
- Efficient communication and coordination among pilots and ground control/mission control are crucial.
- Passengers might experience slight variations in return times due to the dynamic nature of the system.

Additional Notes

- This is a general framework, and specific timings and adjustments can be made based on passenger data and operational constraints.
- We may also consider incorporating maintenance time slots into the schedule to ensure regular upkeep of the spaceplanes.
- We will monitor and adapt the system based on actual passenger behavior and flight patterns for continuous improvement.

For TSO, the key is to strike a balance between maximizing efficiency, catering to passenger needs, and maintaining operational flexibility in our dynamic spaceplane schedule.

Space Tourism: Comparative Analysis

Virgin Galactic, Space Perspective, and Worldwiew have space tourism offering.

- Virgin Galactic: The only one with a sub-orbital offer, has halted commercial operations until 2026. It is believed that VG sold up to $1 billion in presales.
- Space Perspective: A balloon ride up to 100,000 feet. Sold more than 1,600 tickets worth $200 million.
- World View: Also a balloon ride up to 100,000 feet. Sold more than 1,250 tickets at $50,000.

Space Tourism Comparison Matrix	Launch Method	Altitude/ Apogee (estimate)	Full Duration (estimate)	Zero-G experience (estimate)	Sunsets Sunrises p/d	Persons Capacity	Full Price p/p (estimate)	Launch Frequency (estimate)
Blue Origin	Sub-orbital rocket	106 km 65 mi	~11 minutes	~5 minutes	N/A	6	$20-30m	1/month available: now
Virgin Galactic	Jet launch & Sub-orbital plane	94.5 km 58.7 mi	2.5 hours	~6 minutes	N/A	5	$450K	3/month Available: 2026
Space Perspective	Balloon (Stratospheric)	30 km 18.6 mi (~100 ft)	~6 hours	N/A	N/A	9	$125K	1/week Available: 2025-2026
World View	Balloon (Stratospheric)	30 km 18.6 mi (~100 ft)	5-8 hours	N/A	N/A	9	$50K	1/week Available: 2025-2026
International Space Station (ISS)	Rocket	420 km 261 mi	1 week up to a few months	Continuous	16 Sunrises 16 Sunsets	7 to 10	$50-100m	1/month available: now
Titans Orbital Cruises	Spaceplane	300 km 186.4 mi	5 hours	3 hours	2 Sunrises 2 Sunsets	15 to 330	$200K (Diamond) $300K (Platinum) $500K (VIP)	1/day available for groups: H2-2027 available for individuals: 2031
Titans Sub-Orbital Zero-G	Spaceplane	200 km 124.2 mi	90 minutes	10-15 minutes	N/A	15 to 330	$25K (Diamond) $40K (Platinum) $100K (VIP)	Frequent available for groups: H2-2027 available for individuals: 2031
Titans LEO Space Station	Spaceplane	400-425 km 248.5-264 mi	3 to 5 days	Continuous	16 Sunrises 16 Sunsets	12 to 24	$5m Two: $8m	1/week Available: 2028
Titans Lunar Space Station	Spaceship	Low-Lunar Orbit	7 to 10 days	Continuous	Earth view	12 to 24	$25-35m	2/month available: H2-2028
Titania Lunar Colony	Spaceship & Lunar Transporter	Lunar Surface	2 to 4 days	Lunar Gravity	Earth View	12 to 24	Included	2/month available: H2-2028

Source: Blue Origin https://www.blueorigin.com/new-shepard/fly
Source: Virgin Galactic https://brochure.virgingalactic.com/spaceflight
Source: Space Perspective https://spaceperspective.com/experience
Source: World View https://www.worldview.space/space-tourism
Source: NASA/ISS https://www.nasa.gov/reference/international-space-station/
Source: Titans Orbital Cruises https://titansspace.com/orbital-cruise/
Source: Titans Sub-Orbital Zero-G Flights https://titansspace.com/sub-orbital-zero-g/
Source: Titans LEO Space Hotel https://titansspace.com/leo-space-hotel/
Source: Titans Space Tourism https://titansspace.com/titans-space-tourism/
Source: Titans Lunar Orbital Hotel https://titansspace.com/lunar-orbital-hotel/
Source: Titania Lunar Colony https://titansspace.com/titania-lunar-resort/

Pricing for
Titans Orbital Cruises and
Titans Sub-Orbital Zero-G flights
have been updated on January 4, 2024

Financial Analysis

As explained in the section titled Potential Market Size: 100+ Million Individuals, Titans Sub-Orbital has the potential to sell at least 1 million tickets per year.

The spaceplane design with up to 330 flyers per flight, and the company's routes, as explained in the section Preliminary Schedule could easily handle 1 million flyers per year.

The analysis below comprises of the following key assumptions:

- Total Flights per day: 8 (2 per spaceplane)
- Total Operational Days (per Spaceplane per year): 350
- Total Passengers per day: 2,160
- Total Passengers per year: 756,000
- Average Occupancy: 70-75% per flight
- Total Gross Revenue: $26.9 billion p/a

At a 10x valuation, TSO can become a $250 billion company by 2030.

	Ticket $ (average)	Ticket $ (average)	Ticket $	Flights/Day	Total Operational Days/Year
	$100,000.00	$25,000.00	$40,000.00	8	350
	(VIP)	*(Diamond)*	*(Platinum)*		
Average Occupancy #					
115 Platinum *(capacity is 150 persons)*			$4,600,000.00	$36,800,000.00	$12,880,000,000.00
140 Diamond *(capacity is 180 persons)*		$3,500,000.00		$28,000,000.00	$9,800,000,000.00
15 VIPs *(capacity is 25 persons)*	$1,500,000.00			$12,000,000.00	$4,200,000,000.00
				Total (est. revenue)	**$26,880,000,000.00**

Total passengers		
Per day	Platinum	920
	Diamond	1,120
	VIP	120
		2,160
	Per Year	**756,000**

Total Flights/Year
2,800

Further Information

1. Articles about Titans Space Industries
2. Sub-Orbital Space Tourism
3. Ultra-Fast Travel
4. Launching Astronauts

Contact

Please use the following forms to contact us:

1. Astronauts Contact Form
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