Investigate space travel and space tourism by Implementing Space Management System website

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***Abstract*— This paper proposes a commercial-tourism space travel plan. Designing fully reusable launch vehicles. The Space Shuttle is complex, laborious, expensive, partially reusable, and unsafe. Low-cost space access may be the next big push after NASA's shuttle program cancellation.**

With current technology, space planes can take off and return to orbit on autopilot, day, or night, in any weather. Future spaceplanes will improve launch, re-entry, and landing safety. To create a safe, cost-effective launch vehicle, expendable rockets and airplanes will be combined.

Creating an air-like passenger spacecraft has huge economic, social, and international relations potential. Passenger Improved technology can start space travel. It'll be space's biggest commercial operation. Space tourism is now the natural progression of spaceflight. Addressing all the risks of space flight is one of the hardest challenges, but humans have a knack for doing the impossible. The paper discusses the many issues that must be addressed throughout a mission. Space tourism is expected to grow and become economically significant, but more market research is needed to make accurate forecasts and attract investors.

Index Terms— Space Planes, Reusable Launch Vehicles, expandable launch vehicles, Space tourism

1.INTRODUCTION

"It is difficult to say what is impossible. Yesterday' s dream is today' s hope and tomorrow' s reality"- Robert Goddard

There has always been a great desire to explore and travel to new and fascinating areas throughout human history. Humanity's fascination with the universe dates to the first time it gazed up at the night sky. Since the dawn of the space age, one of the unspoken goals of space-faring nations has been to make space voyages accessible to the general population.

Space travel is the logical next step for tourism. The goal of space tourism is to provide services that allow humans to visit and experience space for adventure and enjoyment. A space tourist is someone who travels to and explores outer space for adventure and recreational pursuits. This concept excludes Astronaut communities who travel to outer space for professional purposes.

2.Related Work/Literature Review

SPACE TOURISM

The first non-professional astronaut paid for a space trip, starting space tourism. In 2001, Mr. Denis Tito became the first paid space tourist. Despite the aircraft's government vehicle, he paid privately. Space tourism requires many technical advances, such as re-usable technology.

Space tourism today is limited to Earth-based space-themed activities. Terrestrial opportunities make customers want true space tourism, which boosts its market potential. Adventure tourism is booming. It may involve space tourism. Space tourism is a promising market based on current trends.

Adventure tourists who pay several million dollars for a space flight will lead to a well-developed tourist sector with lower rates and easier access. Market research shows 80% of 20-29-year-olds are interested in space flight [1]. Space-related tourism on Earth is a competitive market. Space tourism's strong economic rationale, supported by the government and corporate sector, is its biggest benefit.10% of global GDP is tourism [2]. It can pressure governments and private companies to develop a low-cost reusable launch vehicle for human space exploration.

Private investors could establish specialty markets with government help. Because high investment costs and long payback periods discourage private projects, this is essential.

SPACE TRANSPORTATION

Spaceflight remains expensive. Only the US-Space Shuttle and Russian-Soyuz capsule can carry humans into space at a cost of about US $20,000 per kg [2]. Human rated vehicle expansion has failed. Hermes, Hope-X, and Buran shuttles are still under development. Before a commercially viable space vehicle can be built, engineering constraints related to propulsion, high-temperature withstanding constructions, and so on must be addressed, lowering transportation costs. Technology must consider noise pollution, space debris, and profound impact.

NASA plans to launch its second-generation reusable launchers in 2020. With a goal to limit launch cost to $6000 per kg payload, much less than the current $20,000 per kg [2] to LEO, but still too expensive for space tourism. New Launch Vehicle is 20 times safer than Shuttle. 1 in 250 Space Shuttle failures [2].

Third-generation space vehicles are expected in 2025[2].

Third generation launch vehicle flights may be affordable for the first daring individuals with an average income who can save several months or a year of their wage for their dream flight. The fourth generation of reusable launchers is expected to allow mass space tourism at less than $50 per kg by 2040 [2]. Airplane-like, air-breathing vehicles with efficient rocket engines and new superlight materials are expected.

Future crewed spacecraft in Japan consider space tourism. The Japanese Rocket Society's egg-shaped Kancamagus is a study concept for a fully reusable single-stage spacecraft [2]. A reusable rocket without wings would take off and land vertically. It could launch 50 space tourists. The vehicle would weigh 5,50,000 kg at launch, be made of lightweight aluminum and composite materials, and use 12 liquid hydrogen and oxygen rocket engines [2].

Present-day technology and challenges

Launch vehicles have a high-risk factor compared to air travel due to their small safety margin. Rocket engines generate thrust at high pressures, straining the launcher's structure. They also use explosive propellants. Protecting space tourists from launch vehicle malfunction is crucial.

Commercial jetliners undergo several test flights before being delivered to clients. Launch V vehicles need space-flight certification.

Even expendable launchers are too heavy to reach orbit without discarding rocket stages as their fuel tanks run out. These stages sink or crash. A fully reusable launcher must be able to launch heavier satellites even without a staging mechanism. The following basic questions must be answered:

• Free flying vs. orbiting vehicle

  • One vs. two stages

• Rockets vs. air-breathing combo

  • Horizontal vs. vertical takeoff/landing

2. Space Shuttle for space transportation:

The Space Shuttle is an amazing machine. It is the first and only reusable spacecraft, a heavy lift launch vehicle that can also return heavy cargos, a spacecraft that has delivered and returned three times more people to orbit than all other launchers combined, and it features the most efficient rocket engines ever created. It is, however, complex, labor intensive, very expensive, partially only reusable, and has a less than flawless safety record.

3. Space Planes- a feasible option for space transportation:

With current technology, spaceplanes can take off and return to orbit on autopilot, day or night, regardless of weather. Spaceplanes are three vehicles in one.
Its powerful engines propel it to orbital velocity during launch. Earth's gravity and the space plane's centrifugal force keep it in orbit. To return to Earth, the larger engines are fired in the opposite direction, slowing the space plane and allowing it to fall into the atmosphere. As an airplane, the vehicle glides back to Earth.
To create a safe, cost-effective launch vehicle, expendable rockets and airplanes will be combined.

Space planes can be tested more thoroughly than extendable rockets in step-by-step campaigns like commercial or military aircraft. They could have better safety margins, more backup systems, and safe launch aborts. The Space Shuttle, which uses expendable rocket technology, is partly a space plane due to its multiple aborts.
Future spaceplanes will improve launch, re-entry, and landing safety. They should always be in control, return from space at any time (day, night, or in severe weather), and not need rescue crews or parachutes. Spaceplanes should also have safe abort options throughout flight. True space planes could make human spaceflight safer, like airliners are safer than balloons, parachutes, and fighting aircraft. For mass space tourism, advanced spaceplanes should be as safe as airliners.

3.Methodology

The Space Management system named by “Space Shri” that help us to get an idea about Spaces things like Space travelling, Rocket launching, what are the technologies that use to develop these things so on.
System overview is displayed below.

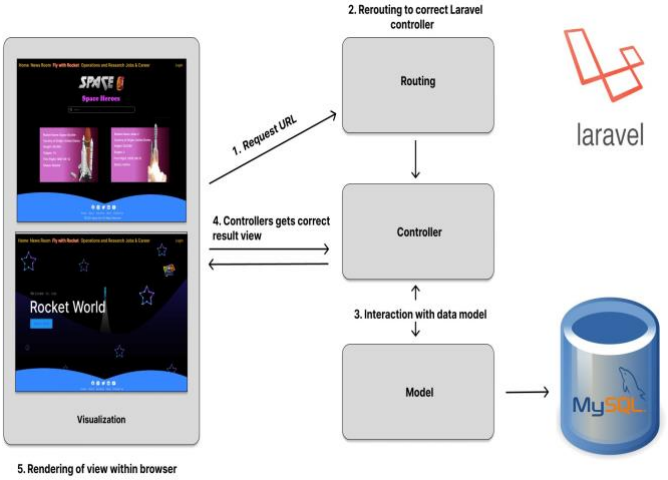


Fig.1.OverView Diagram_1 for Space Management System

We use Laravel and MySQL DB Connection for implement our System. We implement System frontend using PHP Framework- (Laravel-8). Laravel is a web application framework with expressive, elegant syntax. A web framework provides a structure and starting point for creating your application, allowing you to focus on creating something amazing while we sweat the details.

Laravel strives to provide an amazing developer experience while providing powerful features such as thorough dependency injection, an expressive database abstraction layer, queues and scheduled jobs, unit and integration testing, and more.

Whether you are new to PHP web frameworks or have years of experience, Laravel is a framework that can grow with you. We'll help you take your first steps as a web developer or give you a boost as you take your expertise to the next level. We can't wait to see what you build [3]. And We used Façade design patterns in Laravel for implement crud functions that in space shri, Space management system. Facades have many benefits. They provide a terse, memorable syntax that allows you to use Laravel's features without remembering long class names that must be injected or configured manually. Furthermore, because of their unique usage of PHP's dynamic methods, they are easy to test.

However, some care must be taken when using facades. The primary danger of facades is class "scope creep". Since facades are so easy to use and do not require injection, it can be easy to let your classes continue to grow and use many facades in a single class. Using dependency injection, this potential is mitigated by the visual feedback a large constructor gives you that your class is growing too large. So, when using facades, pay special attention to the size of your class so that its scope of responsibility stays narrow. If your class is getting too large, consider splitting it into multiple smaller classes [3].

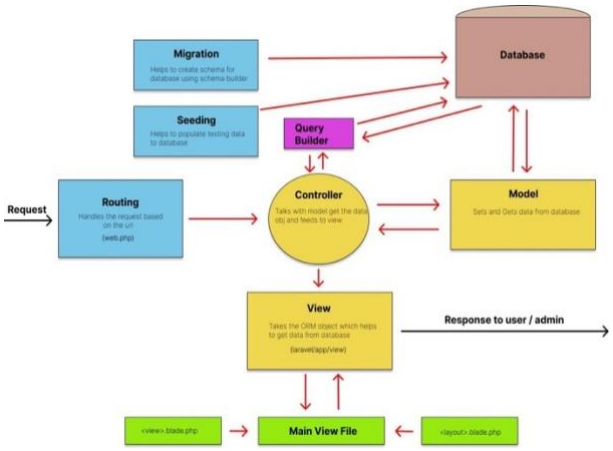


Fig.2.OverView Diagram_2 for Space Management System

This is the flow of the space management system. These are the technologies that we use to implement this system.

Technologies:

Frontend Development

- html5
- css
- bootstrap
- javascript
- jquery
- ajax

Backend Development

- laravel9, php

Database

- MySQL

Tools

- VS Code
- XAMPP
- GitHub
- Azure Board
- SonarQube
- Selenium

Resources

- Laravel Document
- Laravel Related Videos
- Google Charts

Prerequisites

- VS code should be installed
- XAMPP server should be installed
- composer has been installed to the machine
- node has been installed to the machine
- npm has been installed

Procedure of setting up prerequisites and run the project

- Download a zip folder of this project and unzip or clone the repository.
- Open the project in VS code.
- Open a new terminal.
- Type 'composer create-project' and click enter.
- After the project has been created, start Laravel's local development server using the Laravel's Artisan CLI serve command: php artisan serve.
- Started the Artisan development server, application will be accessible iweb browser at http://localhost:8000

To develop the Space Management System, we designed an MVC architecture. This architecture is presented next:

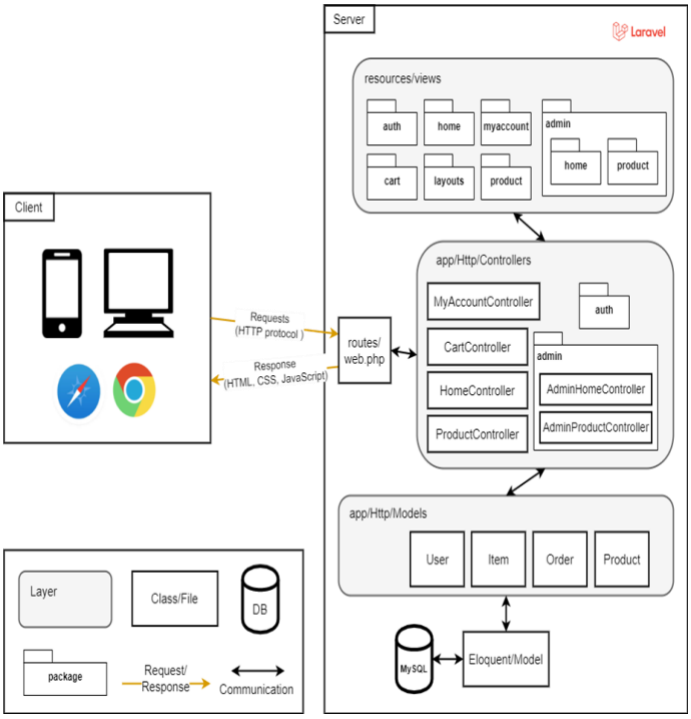


Fig.3.MVC architecture Diagram

You can see the MVC in gray. This diagram matches the real project code. Let's have a quick analysis of this architecture:

- On the left, we have clients (users of our application e.g., browsers in mobile/desktop devices). Clients connect to the application through the Hypertext Transfer Protocol (HTTP). HTTP gives users a way to interact with our web application.
- On the right, we have the server where we place our application code.
- All client interactions first pass for a route file called web.php.
- The web.php file passes the interaction to the controllers.
- Controllers communicate with models and pass information to the views, which are finally delivered to the clients as HTML, CSS, and JavaScript code.

For the view layer we used Blade which is a Laravel templating system.

The previous diagram serves to understand how the application is connected, how each layer or file invokes other layers or files. You can even deduce some architectural rules from that diagram. For example, you cannot invoke views or models from the web.php route file. Or it is not allowed to invoke views from a model file. This is useful to keep our application code clean and flexible to evolving changes. - Database integration, login, and web sessions

We used MySQL as our database server. And we used Laravel Eloquent to connect our Laravel application with MySQL. This is our final database structure:[4]

Table	Action	Rows	Type	Collation	Size	Overhead
applicants	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
jobs	Browse Structure Search Insert Empty Drop	7	InnoDB	utf8mb4_unicode_ci	64.0 KiB	-
migrations	Browse Structure Search Insert Empty Drop	5	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
password_resets	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32.0 KiB	-
personal_access_tokens	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	48.0 KiB	-
users	Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32.0 KiB	-
6 tables	Sum	12	InnoDB	utf8mb4_general_ci	208.0 KiB	0 B

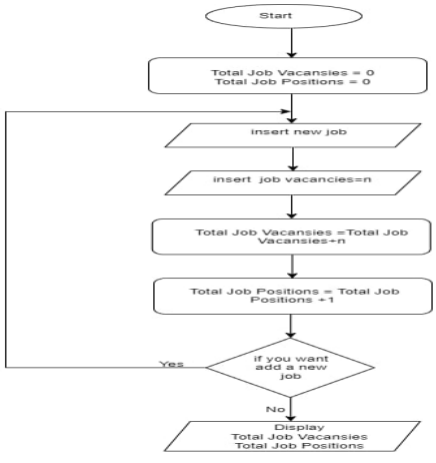
Fig.4. Database Connection Tables

4.Proposed System

Currently, our team has developed a web application for the Space Management System called "Space Shri." When a user comes to our system, they can only view the home interface; after they login to the system, they can view each department's information separately. There are four main departments. They are Fly with Rocket is the next one, handing mainly rocket details; it can view each lunch rocket's details, search relevant rocket details, etc. The operations and research departments are the next ones; they mainly focus on newly created missions and research information; users can search their own mission topics and view that information; news and rooms are the next ones; they hand out newly created news about each department; and the last one is jobs; when users come here, they can view job opportunities and apply for them according to their requirements. Even users can contact our AMIN team through the "contact us" page or social media. In addition, we provide the best user-friendly user interfaces (Fig. UI) and high accuracy about the information.

Basically, this web application can identify two main types of users: admins (the system administrative team) and normal users. As an admin, they can manage each relevant department when they login as an admin. Then admin can view the admin dashboard, select the relevant department, and go ahead. On the rocket management side, they can insert newly created rocket details, update, delete, and search some rockets. When we update or insert some details, it automatically gets the current login admin username and the updated or created date in each department. Missions, research, and departments can manage their missions the same as the previous department and news. Jobs and carrier departments can insert a newly created job vacancy, update, delete, and search some jobs using relevant job titles; likewise, other functionalities are available. In addition, all departments can get the monthly report (Fig. 1tn regarding their relevant information. When we get missions and research to generate the report .it includes the maximum expenses topic, total monthly expenses, and views it's as graph. Even each topic display monthly expenses with costs as a table view. Admin can get that report as a PDF and download pdf. In addition, all departments can get these reports in the current month, it can be easier to analyze them as a summary of each department's information to the admin.

Fig.4.Userflow Diagram_1



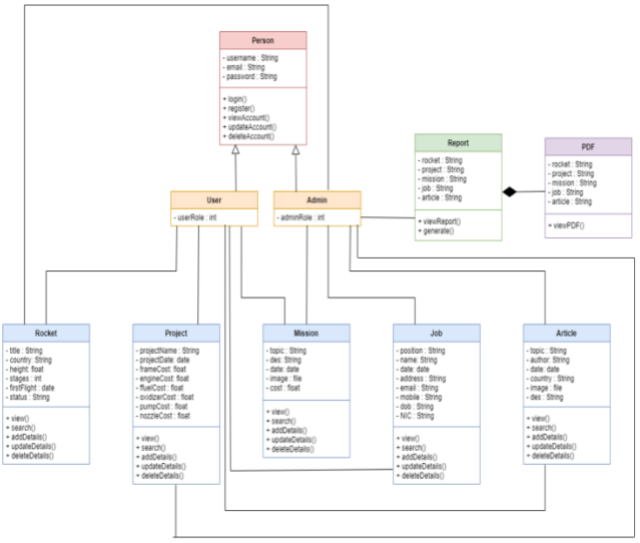
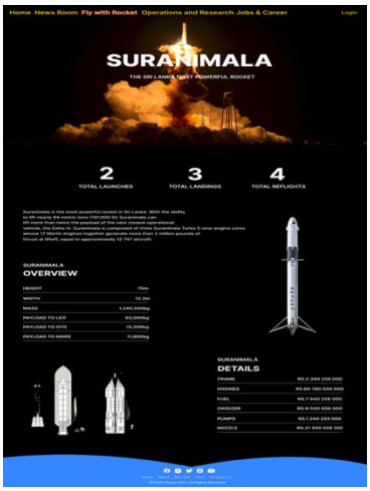
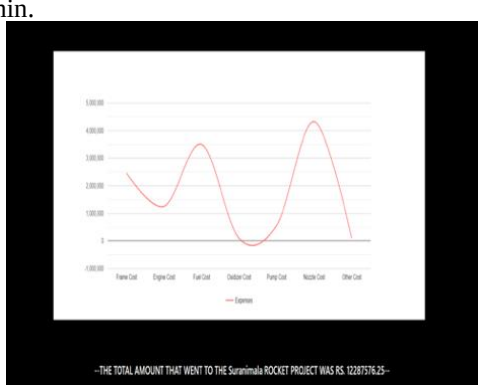


Fig.5.Class Diagrams for Space management System

Basically, in this system (Fig.4.) can identify ten classes as person, user, admin, rocket, project, mission, job, article, report, and pdf. Class person is an ancestor of class user and admin if person is above user and admin in the inheritance hierarchy. User and Admin can access Rocket, Project, Mission, Article and Job classes. Additionally, only the administrator can access the report class. That way he or she can generate a PDF for the entire system.





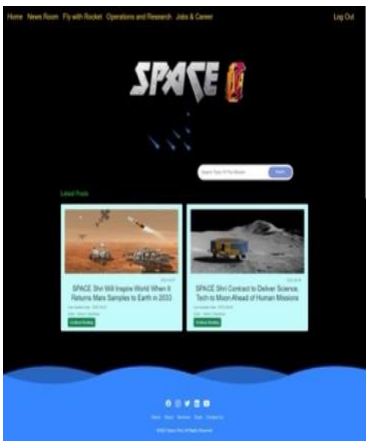


Fig. UI

This system has many more features than others. Jobs and careers are the most important components of this system. the ability to view a summary of how many job openings this company has. The system will automatically calculate the count. The main feature of the system is that the system will keep track of the new job vacancy count and the new job position count. [fig no-4]

In this system, there are more features. The most crucial aspect of this system is the calculation of total expenses of projects. The amount need not be considered by the user. Amount automatically calculated by the system. That is the major aspect of this system. The system will record the expenses per

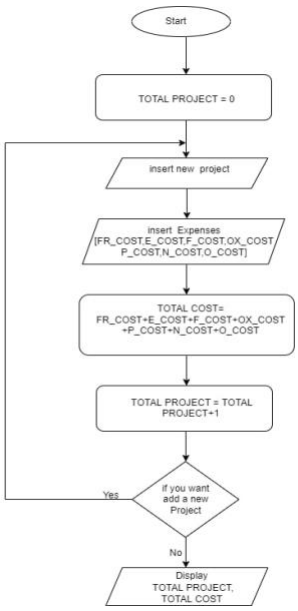


Fig.6.Userflow Diagram for Space management System

project, count of frame cost, Engine cost, fuel cost, oxidizer cost, pump cost, Nozzle cost and other cost. [Fig no-4.6]

total amount calculated by adding the costs per project.

The computation aspect may be seen as follows:

TOTAL COST=

FR_COST+E_COST+F_COST+OX_COST+P_COST+N_COST+O_COST

FR_COST=Frame cost

E_COST=Engine cost

F_COST=fuel cost

OX_COST=oxidizer cost

P_COST=pump cost

N_COST=Nozzle cost

O_COST=Other cost

5.Discussion

With the ever-growing technology, human beings used to think beyond their limits. As a result, man is now poised to conquer space and even inhabit it. When the world is under such a situation, Sri Lankan people have very little knowledge in this regard. Developers created this system as a solution to this. With this, any person regardless of age can be aware of new discoveries related to space in the world. Such a system cannot be seen in Sri Lanka and this fact was the reason for them to create this system. This is quite like the popular web application of NASA Company. Developers are happy to be able to present a similar web application to Sri Lanka. In the future, developers will add features to this system and make a good web application.

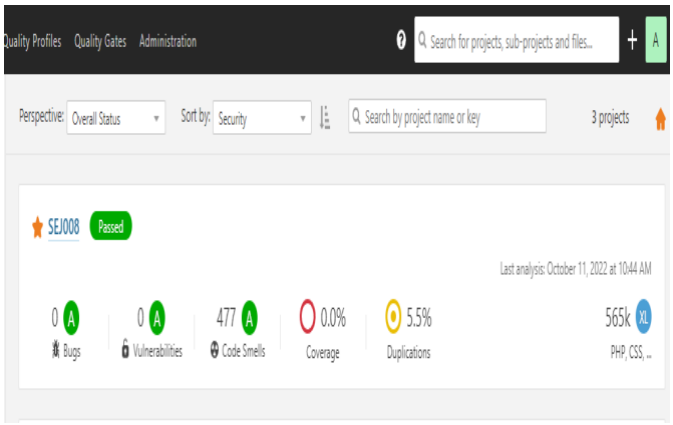


Fig.7. Evidence of Success of Testing

With this application, if a rocket is created by Sri Lanka, how it is, what its nature is, and how it costs can be seen. Although this is a dream for a country like Sri Lanka, the aim of this system is to provide a solution to some extent. At a time when Sri Lanka is facing an economic crisis, if such an institution exists in Sri Lanka, what are the job opportunities available to Sri Lankan people and how do apply to them? This is like a preparation for a person who wants to work in a space agency like NASA, how to do it. In addition to this, various events related to space happening in the world have been gathered in one place for the user to view. How convenient is it to be able to go to various web applications and search them all in one place? That advantage can be achieved by this application.

No matter how good a web application is, it should work correctly without errors in a user-friendly way. Thus, the web application was tested using various software to make this system work without errors. The picture above shows the error-checking result of this system. This was done using SonarQube software.

In the future, the developers of the system intent to add new ones. Astronomy clubs at the school level are associated with this system and intend to make it popular not only in Sri Lanka but all over the world with their support. In addition, it is intended to collect people related to this field and use their

knowledge to present new discoveries to the world through this application. Developers try to bring the daily happenings of the world to the user instantly. In the future, each partnership (administration, customers) is expected to use facial recognition to monitor participants.

6.CONCLUSION

Private aerospace development businesses are the most likely starting point for space tourism to become a noticeable commercial activity. There is a gap between the requirements of potential investors and the capabilities of firms to deliver them in terms of investment in a space tourism start-up one of the challenges to Space Tourism. There are no big technological issues in creating sub-orbital planes for Space Tourism. Space tourism has the potential to be a game changer in the future since it represents a massive market. More surveys and studies are needed to assess the market size, but current research suggests that Space Tourism can offer the necessary launch volume to provide low-cost access to space. For these reasons, the government's role in supporting the development of new launch vehicles and providing the industry with a robust, severe regulatory framework becomes critical.

company. To solve the challenges of risk and payback duration, unconventional forms of finance may be required. We let our imaginations run wild when outlining future possibilities of space tourism. Anything is feasible as long as humanity maintains its great desire to continue researching and improving technologies. Nonetheless, we must confront the realities of known universe physics, monetary allocation to initiatives, political and societal will, and time. We live in an exciting time; we are on the verge of making space for people who want to see, hear, feel, taste, and experience the wonders of the universe. Tourism in space will become a reality. The financing of the development costs of new launch vehicles is

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