

Rise of demand and obstacles for launching flying car in Pakistan

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Abstract

The flying car symbol of advanced technology and it have the ability to change the complete structure of transportation of the world and it has the ability to give new lifestyle opportunity to this world. After long experiments and tests flying cars start commercializing and open for the public for purchase. The first key of a flying car is given to customers in 2020 from the PAL-V flying car. Most automobile and aerospace companies are commercializing their first version of flying cars between 2022-2025. It's been so long rich people of this world demanded flying cars sooner as possible and paid advance booking and invested big into flying car companies. 2021 and 2022 are starting years of the flying car market in this world and NYSE listed first time as a flying car company. Challenges for launching flying cars are getting solving one by one, like infrastructure and regulation framework. For developed countries it's easy to develop infrastructure and regulations due to big-budget but under developing countries like Pakistan are very limited with resources and have very limited access due to less purchase power but there is still a demand for flying cars at a small scale for advancement in aviation and automobile sector of Pakistan. It is taken as a useful asset in the air force and airline bodies for shuttle services from the airport to airport. 16 million population of Pakistan purchase power claim that having the ability to purchase and maintain flying cars if they have infrastructure and access to use it for traveling. By amendment in ultralight legislation framework, few flying cars version able to use in Pakistan and can be operated under CAA Pakistan.

Keywords: Demand of Flying Cars, Infrastructure Planning, Feasibility of Flying, Regulation of Flying Car

INTRODUCTION:

Flying cars automobile product which use for transportation goods and passengers. It invented approx. 50 years before, and but now technology advancement made it possible to use for public and save human time of traveling and safety of traveling. Its vertical takeoff machine which does not required runway for takeoff and small in size to fit home garage. After 2012 hundreds of flying cars designed and tested, and success of many design testing's, authority of automobile and aviation approved for production of flying cars and many advanced payments are paid by buyer and shown interest for purchasing in large scale that's create market demand too high and flying cars become main interest of investors around the world.

Flying cars concept raised when human faced lack of road network and complex roads structure where it's hard to reach, also time factor of traveling, that's a reason invention taken place for traveling through flying in air median of transportation. And it's very costly to use helicopter and customers' demands cheaper option for traveling with comfort and safety, flying cars concept introduced with advance technology. After success of test flights and mass scale production planning issues comes in discussion, how we can produce in massive scale as we are producing ground cars, also requirement for landing, takeoff and parking issues. Its massive project for government to produce infrastructure feasible for flying cars.

RESEARCH QUESTION:

What are rise of demand on air transportation industry to commercialize flying cars in local and international market to modernized automobile industry. And which rise new demand in infrastructure sector for parking and regulation framework for safety. Safe grounds issues for launching flying cars in Pakistan and Factors which are obstacles for launching flying cars in Pakistan and how it can be resolved.

How regulation of flying cars allows in Pakistan, policy makers authorities need to work on it and develop polices on routes and permit licenses. feasibility of flying car with respect to purchase power of people.

Why international market and local market of Pakistan is important for flying cars usage? And Can purchase power of country and continent is feasible for flying car market.

OBJECTIVES

Main objective from this research is identify flying car market in Pakistan and world, and what impact it produces, and in which sector its having right demands, what are obstacles can face while building new market in Pakistan. Innovation in automobile industry in Pakistan, Production capacity and technology implementation.

How flying car can be allowed to operate in regulation of Pakistan and define feasibility of flying car types and ability to launch with respect to purchase power of people. Explore possibilities of international market and local market of Pakistan through research for flying in Pakistan.

Infrastructure required for flying car in Pakistan, with parking, LT-Pads (landing & Takeoff), maintenance and fueling facilities and estimate cost for infrastructure (Tore Johnston, 2021). Explore regulation requirement and available legislation for similar flying activities.

SIGNIFICANCE OF STUDY

Significance of flying cars machine in Pakistan aviation market too much and creating much impact on lifestyle of people. Which reduce traffic pollution on ground, also useful for defense and emergency response. And service of air taxi saves much time and improve way of traveling (Wreg, 2019). It creates positive impact on lifestyle of people, and now people will be more productive due to its speed and comfort of traveling. It enhances experience of people towards traveling (Wreg, 2019). Traffic on roads become pollution and which will cause waste of important time, and reduce productivity at work. Flying Car shift traffic to air and increase speed that will create impact on work life and productivity. Also, very cost effective as compare to ground traffic because ground traffic waste of fuel and time in traffic jam (Wreg, 2019).

Is very useful for law enforcement organizations, traffic and civil police can able to perform his duty more efficiently and more effectively and reach for help timely. And conduct operation against criminals (Wreg, 2019). Defense agency can able to use for surveillance and conduct missions for safety of country borders and people. Customized flying cars can play very important role in small level army cargo to unreachable places from ground. And able to save large amount of fuel by not using helicopters and other big machines (Wreg, 2019). Importance of time for emergency situation is very big game changer, flying car can act as air ambulance. And it saves many people life's by reaching on time and providing first aid service on air (Wreg, 2019).

LITERATURE REVIEW:

Due to covid virus many company failed and its hard to recover but they need to make new strategies such as promotional strategy and restart it work and try to solve its challenges by help of high tech companies and try to meet customers demand (Yang, 2021).

Potential of flying taxis is high due to high rise of population and increased in urbanization, technology made it possible for air transportation for intra and inter-urban destinations. It required to build infrastructure and regulations and control environment issues according to SDG goals (Khandker, 2021).

Japan is leading in flying car with investment for but there is many challenges need to take over still yet, new technology of electric and battery capacity and safety issues, vertical flight would increase the hazards and might need to be covered. The devices might need parachutes to soften crash landings, or might have to explode into small bits to ensure pieces hitting the ground would be smaller (Makarenko L., 2020).

United Arab Emirates has strived to develop artificial intelligence and realize its strategy which aims to apply by establishing the concept of artificial intelligence in its development strategy. UAE is looking for increase in profit through AI technology and by applying advance technology in system (SEBBAGH Rafika, 2021).

Autonomous Vehicles testing goal for real world testing, controlled environment testing, image based testing and simulation for ensure zero error in operation system (Akbas, 2021).

Advanced Air Mobility on-demand air mobility, cargo and package delivery, healthcare applications, and emergency services with challenges growth potential, such as autonomous flight, the availability of take-off and landing infrastructure. Airport Shuttle and Air Taxi have huge market potential of business especially airport to airport service (Rohit Goyal, 2021).

The advantages of flying cars are that reduced cost of building and maintaining traditional roadways, reduced reliance on road infrastructures, increased reliability of travel times, and reduced congestion. But challenges indicated about safety on ground and air both. With law enforcement and maintainance errors (AdekunleMofolasayo, 2020).

“Beside traditional cars, Now Investment is pouring into urban air mobility (“UAM”) the local, on-demand movement of people and goods by air using a range of piloted and semi- and fully autonomous electric aircraft that take off and land vertically” (Ravich, 2020). Personal Aerial Vehicles (PAV), also known as Urban Air Mobility (UAM) are required for future where people are migrate from small cities to large cities, it required better and fast trasportation network (Perkins, 2021).

In flying car design, the power and propulsion systems of the flying car, avionic systems, security systems, magnetic sensors, navigation landing and take-off methods, requirement verification methods, flight performance values were determined. That make machine more safe but still pilot need to trained on ground school and fly under license of pilot license (Metin Uzun, 2021).

Market of Urban Air Mobility is big future market in sector of cargo delivery, air metro and air taxi. Each product have different design requirements and capacity requirements. Main challenges are physical operations and highly independent system to system (NASA, 2018). Flying car rise more than 250 business with related elements, like manufacturing, operations and maintenance. And it required Infrastructure and its required facilities to make flying car transportation successful (Tore Johnston, 2021).

INTERNATIONAL MARKET

The U.S. Air Force is interested in nontraditional electric vertical-takeoff-and-landing technologies, like this Joby Aviation aircraft, that are being pioneered by commercial companies (Joby Aviation). World Aviation market is very large and more than 1500 companies working on flying car research and production. And most highlighted companies' product is Pal-V, Aero mobile 3.0, Terrafugia transition and Ehang 184.

PAL-V LIBERTY

European product dutch engineering and Italian design launched in 2017 and its configuration are 2 seats, maximum takeoff weight 910 kg, 160 km/h, maximum cover range 500 kilometers, fuel capacity 4.3 hours at maximum capacity. First keys of flying car handed over to customer in 2020. The process of idea to successful product took 18 years from 1999 to 2017 and first customer received product in 2020. Expected market price \$400,000 USD (CARS, 2021).

AERO-MOBIL 3.0 & 4.0

This product kind of flying car but not having ability to vertical take-off, retractable wings, it having ability on grassy surface or paved surface airstrips, and roads. Drive on regular gasoline and fit at standard parking. Fuel consumption rate is 15 liters/hours and ability to cover distance 430 miles or 692 kilometers and having 90 mph takeoff speed. For version 4.0 maximum range upgraded to 466 miles, and flight speed 99 mph and takeoff weight remain same 960 kg. Expected market price \$1.6 million USD (CARS, 2021).

TERRAFUGIA TRANSITION

This is product which required runway before takeoff and retractable wings and easy to park, 4 seats and maximum takeoff weight 635 kg. Drive on regular gasoline and cover distance up to 489 miles and 107 mph maximum takeoff speed. Expected market price \$300,000 USD (CARS, 2021).

EHANG 184

This product doesn't require runway for takeoff, it works on vertical takeoff, maximum flight speed 100km/h and duration of flight is 25 min, and maximum altitude can be gain 500 meters. And battery charging timing is one hour, payload can able to take up to 100kg and one seat capacity. Expected market price \$300,000 USD (CARS, 2021).

ASIA MARKET

High GDP countries count big in business market, Purchase power is based on how much wealthy country is, High GDP Countries in Asia are; China, India, Japan, South Korea, Indonesia, Taiwan (Asia G. |., 2020), Low GDP countries in Asia, are; Pakistan, Afghanistan, Iran, Bangladesh, Nepal and others (Asia G. |., 2020). Wealthy Asian countries with high purchase power are; China, Russia, Japan, India and others.

China having highest purchase power in Asia region and leading in market \$25,360 Billion USA, and India is second big purchase power in Asian market \$9,474 Billion USD. Japan is third Largest purchase power in Asia with \$5,443 Billion USD. And fourth largest purchase power in Asia is Russia with 4016 Billion USD (Asia, 2020). Less wealthy countries with low purchase power are; Pakistan, Afghanistan, Iran, Bangladesh, Nepal and others. (Asia G. |., 2020) China predicts 1.5 Trillion USD future investment on commercial aircraft, they required 8700 aircraft. That will be massive investment in aviation sector (NEWS, 2021).

With growth of population in china, Its big demand rise come over ground traveling pollution cut off, or traffic pollution will be reduce on ground by using flying cars traffic option. China become world second largest market in aviation. China plans to increase budget in aviation in future 5 year plan (Aviation, 2021). China will start massive production of flying cars in 2024 on very economical price and better quality. Xpeng X2 flying car is rise \$500 million USD funding. And Listed NYSE electric vehicle flying car plan to sell at \$157,000 USD. Flying car used as air taxi are price more than private used which expected cost will be \$738,000 USD (Huileng Tan, 2021).

India is 2nd largest market in Asia, Aviation market in India grown 14-15% around \$4.33 billion USD till 2025 (Investindia, 2021). India become 5th largest passenger market by 2024 (India i. , 2021). And India is launching its first flying car by 2023 (India, 2021). In India expected to invest \$1.83 bn in the development of airport infrastructure by 2026 and government aims to develop 100 airports by 2024 (Investindia, 2021).

Indian first flying car Vinata Aeromobility coming into public for sell in 2023-2024 and Infrastructure is under development at airports until 2024. Its big market gap in india for investment (India H. A., 2021). Japan having largest market in Asia for

motor Vehicles production having largest budget for production of vehicles with 21 trillion YEN in 2019 and 17 trillion YEN in 2010 (statista, 2020).

Japan is investing on supercar, like flying cars and hoverbikes up to 77.7 trillion YEN. Keisuke Honda and other big companies started investment on flying car. X-Turismo Limited Edition' from Tokyo-based drone startup and Xpeng collaboration with China. Mass production will start in 2024 (Kilpatrick, 2021). Pakistan is looking for buying flying cars from international market and unable to produce due poor economical situation. Lack of availability of funds due to unstable environment and loans. Only limited amount of purchase can be done in future by authorities.

PAKISTAN MARKET

Pakistan have limited budget and almost 50% budget went into payment of interest of loan, remaining 50% is used to run country, highly instability of country is due to loan payments. Country not able to afford advancement of sectors and better lifestyle of nation. It's hard for country to afford health and education at basic level.

Pakistan only use to buy products from outside country because no able to afford production inside. Due to lack of investment and skilled labor.

Less quality education available only for limited people who can able to afford it. That create inequality between rich and poor. Large amount unemployment creates poverty and people unable to buy mandatory essentials.

Only political, business man and federal organization have purchase powers to afford needs and little amount of want at low scale. Pakistan have 45 person who are net worth 100+ million USD (Pakistan, 2021). Anwar Pervez' net worth is US\$3.75 billion which makes him the richest Pakistan-born Briton in the UK.

Wealth distribution in Pakistan is slightly varied, with the top 10% of the population earning 27.6% and the bottom 10% earning only 4.1% of the income. Pakistan generally has a low gini co-efficient and therefore a decent distribution of income (relatively lower inequality) (wikipedia, 2017).

More than 16% people are rich in Pakistan, 25% people in are upper middle class, they can able to afford flying car. Total number of people with affordability of flying cars are 40% of population (wikipedia, 2017). 60% people are lower middle class or poor and not able to afford basic or daily needs of life (wikipedia, 2017).

Future flying car market in Pakistan are 15% people who is having direct purchase power to afford flying car as daily use. 25% people of Pakistan have purchase power to purchase but with limited use only (wikipedia, 2017). Federal Government of Pakistan having purchase power to buy flying cars and use it for defense purpose. It's very important for defense sector keep assets upgraded and match needs of warfare and defense. It's essential tool to use for ground and air operations. US Airforce started its work for buying flying cars for asset building use as tool for solidify defense. Flying car are very useable for speedily shuttle troops and equipment into war zones (usveteransmagazine, 2020).

INFRASTRUCTURE

Construction Building: There is big requirement for building new infrastructure for facilitation of flying cars in the inside city. And which include Parking area and LT Pads (landing and Takeoff) meanwhile we also required to build maintenance facilities centers and fuel station facilities. For meeting large requirement of orders, we need mega production units for manufacturing flying cars (Tore Johnston, 2021). Building cost of flying car infrasture network would be \$15 million USD to \$20 million USD and annual operation cost would be range from \$35 million USD to \$50 million USD per year (Tore Johnston, Mckinsey, 2021).

LAND AREA IN COMMERCIAL SITE:

Large land area required for building parking and LT pads and other facilities. It's hard task challenge to finding perfect place in dense commercial area for building facilities (Tore Johnston, 2021). Roof top and ground Vertical pads and parking area can be constructed and it can cost according to property prices of market and It may be small facilities will build in dense area and can be expand gradually. It will help to start function of flying cars and for future planning expansion with purchase of property and convert into parking plazas according to demand. Dense area can be very restricted area due to safety of people; only limited number of flying cars can get permitted to land and fly (Tore Johnston, 2021). Open field areas or big arranged towns are best for flying cars long distance traveling is preferred on flying beside short distance (Tore Johnston, 2021).

GOVERNMENT CHALLENGES

Government may face many challenges for policy making for flying car infrastructure and air-space (atmosphere) usage. Also, can be create problem overlapping frequencies with flying cars devices that may case loss of control on flying cars. Flying-cars should be safe for ground homes and people and also safety in air. Airworthiness department of CAA - Civil Aviation Authority ensure the safety of flight. Complex maintenance system at very large scale and with ordinary people with ability to flying freely can become threats for ground living community. Strict process of training and maintenance required to implement with renewal of its continuities.

Pollution of flying cars can be creating side effects of noise and carbon emission that can create health issues for human, to ensure limited and un harmful operation must be conducted. Emergency landing and uncontrolled elements that mislead the path of flying towards red zone area (prohibited areas) should be controlled by proper air traffic police.

Weather abnormal condition flying control and restrictions implementation, should be done in advance before flying. Solution of controlled flying can be done if software of control of flying car also connected to control tower of CAA - Civil Aviation Authority, which only allow routes and control speed and everything under observation. All commands can be applied from CAA - Civil Aviation Authority control tower to control emergency conditions for safety of both ground and air. Cybersecurity and hijacking protection system must be installed for controlled operations, and must be monitored by federal defense organization, it can be very dangerous and also can be used in air to ground attacks, it must be safe from evil hands.

Altitude restriction from collision prevention, flying car to flying car and flying car to aircrafts. Also, from buildings and mountains. Weight restriction from overloading by mistakes can be very harmful and dangerous for flight safety. Flight above people can be also very dangerous for life of people and it must be controlled from controlling devices.

Process of getting permit to flight and training of pilot must be trained or license after strict training process in authorized and licensed training school by CAA – Civil Aviation Authority.

EXISTING TRANSPORTATION NETWORK

Existing system for air transportation divided into different categories, wide body aircraft and narrow body aircraft, light aircraft, and helicopter. On the other side road network at large scale available in Pakistan for ground traveling. Ultralight aircraft regulation is available with all policies. Which are implemented since many years, also manufacturing inside manufacturing hangers. All kind of ultralight aircraft able to fly under that regulation and few flying cars are able fly airport to airport under this ultra-light regulation and permit to fly in Pakistan zone under ultralight license.

REQUIRED TRANSPORTATION NETWORK

Flying cars required large scale infrastructure which included parking, maintenance and fueling centers. Infrastructure must be built at high quality and up to recommended standards, in order to achieve high standard of maintenance, maintenance centers must be licensed and approved by authority. Fuel centers must be located near to place of landing and takeoff and required quality fuel must be available and eclectic charging station must be available at parking slot. Regulation of country must be upgraded with separate department in CAA and under federal ministry for motoring all activities in country airspace.

MARKET STUDY OF DEMAND:

Market gap available for solution of fast and air transportation at small level taxi. Advancement of major organizations like: Military organization, Traffic Police organization, Civil Police organization, Government organization and VIP Taxi Charter Services. Business opportunity available in market to sell that product and also having big impacts on lives of people.

USAGES OBJECTIVES FOR FLYING CARS AS AN ASSET IN PAKISTAN

The objectives of flying car usage in Pakistan are; Comfortable traveling, Safe traveling, Cost effective traveling, Less traffic pollution on ground, Technology advancement, Speed of traveling and Emergency quick respond.

Use of Flying Cars in Rescue Missions, Protection Missions (Protocols), Crossing Wide Rivers, VIP Protocols, Cargo, reach top floors of buildings, reach areas which don't have any road networks, aerial surveillance of villages and its crops, Motorways for road safety, Medical Emergency, Air Mechanic for emergency car repair services, Country Boarder Safety and Surveillance, tourism on mountains traveling, traffic controlling police and taxi service.

URGENCY OF FLYING CARS IN PAKISTAN

Urgency of flying cars in Pakistan always depends of availability of funds or investments, there is always room for improvement in every sector, if basic needs funds fulfilled first priority and extra funds can be used for improvement of assets. Requirement of flying cars are starts from flying clubs for training purpose, and advance flying car simulators and basic version of flying car. Requirement of flying cars in defense sector is always welcome new technology for solidify more defense powers. Requirement of flying cars in Government law enforcement sector is very key point of investment specially on motorways, Pakistan has large motorways network also CPAC project, they need emergency services can be use by flying cars.

ADVANTAGES AND DISADVANTAGES OF FLYING CARS

Advantages: Minimizing traffic pollution is big advantage of flying cars, it reduces traffic on ground and reduce less burning of fuel and eco-friendly. Flying car able to flying long distance in short time, and with low consumption of fuel and without stoppage timing on roads signals, road twists and turns. It doesn't need big road network infrastructures, check points or with complex road routes. It's just required straight and easy air route to travel (Wreg, 2019).

Disadvantages: It consumes same energy power for longer or short distance travel for vertical take-off, it can become costly takeoff for short distance traveling. Noise of flying cars is more than ground cars, especially take-off sound, sound of takeoff as similar to helicopter takeoff sound. It required safe infrastructure for take-off and landing also parking. And operational cost and maintenance cost flying car is more than ground vehicle (Wreg, 2019).

HOW TO SELL IN PAKISTAN:

Subscription model for selling services of air-taxi. And package per KM/H charges and basic LT charges. Hourly Pricing for long route, and LT charges. Usage based rental flying car with pilot or without pilot. And Selling on full price and with training license.

METHODOLOGY:

Research is processed by studying articles of aviation industry market and articles especially based on demand of aviation industry and feasibility reports and conference published presentation and authentic new feed article published by flying car manufacturing companies and collected secondary qualitative and quantitative data such as articles and news feed as an input for research. Method of study articles are selected with the reference of business point of view.

LIMITATIONS OF THE PROJECT:

Available data on google scholar search engine and new articles published, Assumption on the base of statics of available data collected from organization, forecasting according to data given by manufacturing companies and authorities and Interviews conducted by myself as a researcher.

DISCUSSION:

Flying car can be only allowed to operate in Pakistani regulation but with limited scale due to economical and safety factors and feasibility of flying car product types and categories can be selected with evaluating type of land of operations and can be aware people about ability to launch with respect to purchase power of people and its benefits.

Rise of demand on air transportation industry to commercialize flying cars in local and international market to modernized automobile industry which rise new demand in infrastructure sector for parking and regulation framework for safety which can be achieve by modifying ultralight aircraft and unmanned flights regulations. Regulation (legal Permit to fly), Registration (flying car in government record), Infrastructure, Supportive Services, Training and License and Flying Car Machine Production (Product).

Infrastructure for flying car in Pakistan, with parking, landing Pad & Takeoff Pad, fueling facilities and maintenance and estimate cost for infrastructure are too high and only can be achieve from foreign direct investment, and outsource complete business structure in investors hands and feasible strategy to use productively and due to economic instability Pakistan government can't able to afford infrastructure of flying cars. In Pakistan history, Sialkot airport was built by local business investor groups and that create positive sign of interest for building infrastructure of flying car in future.

CONCLUSIONS

Flying car is aviation product having ability to fly and run-on roads, with advance technology and valuable asset. It can be used in multiple sectors and facilitate people for traveling and transfer of goods. And it saves time and cost on long routes, and it come with a lot of unsolved challenges, main issues of operation around the globe are infrastructure and regulation framework. Obstacles in Pakistan to launch flying car is lack of infrastructure and lack of funds available for bear operational cost, and advance control tower facility to connect with all flying cars, and that's why especial regulation framework develop at slow rate, but there is opportunity, Pakistan can able to use foreign direct investment or local business investor to build it, Pakistan having history of building airports by FDI foreign direct investment and local business investors. Pakistan is also able use flying cars as an airport shuttle that takeoff and land from airport to airport. Also use ultralight regulatory framework and but some modification and amendments required in ultralight legislation framework to convert into flying cars legislation framework. More than 16 million Pakistani people are able to afford flying car services and it may be increase if operation cost will decrease. Big buyers of Pakistan like federal government, civil government and airline industry buy and use as charter service or air taxi and build infrastructure. But flying cars are have limitation for flying and only effective in good weather conditions and limited weight carrying ability.

REFERENCE:

1. Grind Drone. (2017, August 17). DRONE FEATURES / INFO. Retrieved 07 01, 2019, from grinddrone.com: <http://grinddrone.com/drone-features/advantages-and-disadvantages-drone>
2. Interesting Engineering, Inc. . (2019, 01 22). INNOVATION DRONES. Retrieved 07 01, 2019, from Interesting Engineering: <https://interestingengineering.com/drone-hunters-9-of-the-most-effective-anti-drone-technologies-for-shooting-drones-out-of-the-sky>
3. DiLabrien. (2016, july 14). tech.co news. Retrieved 07 01, 2019, from tech.co: <https://tech.co/news/6-harmful-ways-people-using-drones-2016-07>

4. epicsta. (2019, 01 01). DIYDrones. Retrieved 07 01, 2019, from epicsta.com:
<https://www.epicsta.com/tag/DIYDrones>
5. picclick. (2017, 01 01). M8N-GPS-Module. Retrieved 01 01, 2019, from picclick.com: <https://picclick.com/M8N-GPS-Module-w-Compass-GPS-Bracket-for-APM28-351248460960.html>
6. unmannedtechshop. (2017, 01 01). apm2-8-autopilot. Retrieved 01 01, 2019, from unmannedtechshop.co.uk:
<https://www.unmannedtechshop.co.uk/product/apm2-8-autopilot-kit/>
7. Bobela, S. (2016). Developing a drone delivery system for blood in Bangalore, India. Bangalore: University .
8. Asia, G. |. (2020, DEC). Tradingeconomics. Retrieved from Tradingeconomics:
<https://tradingeconomics.com/country-list/gdp?continent=asia>
9. Asia, G. (. (2020, January 1). Indexmundi. Retrieved from Indexmundi:
<https://www.indexmundi.com/map/?v=65&r=as&l=en>
10. Tore Johnston, R. R. (2021, August 1). Mckinsey. Retrieved from Mckinsey:
<https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/to-take-off-flying-vehicles-first-need-places-to-land>
11. Wreg, R. (2019, Jan 1). Advantages and disadvantages of flying cars. Retrieved from Innovate-eco: <https://innovate-eco.com/advantages-and-disadvantages-of-flying-cars/>
12. NEWS, A. (2021, Sept 23). breakingtravelnews. Retrieved from breakingtravelnews:
<https://www.breakingtravelnews.com/news/article/boeing-predicts-us1.5tr-china-aviation-market-by-2040/>
13. Aviation, C. B.-Y. (2021, January 12). Aviationweek. Retrieved from Aviationweek: <https://aviationweek.com/air-transport/airports-routes/caac-begins-2021-ambitious-five-year-plan-chinese-aviation>
14. Huileng Tan Chinese electric-vehicle maker Xpeng plans to mass produce flying cars by 2024 and says they'll cost less than \$157, 0. (2021, OCT 25). Businessinsider. Retrieved from Businessinsider:
<https://www.businessinsider.com/chinese-ev-maker-xpeng-flying-car-mass-production-plans-2021-10>
15. India, H. A. (2021, OCT 06). Indian firm unveils Asia's first hybrid flying car at major world expo . Retrieved from auto.hindustantimes: <https://auto.hindustantimes.com/auto/cars/indian-firm-unveils-asia-s-first-hybrid-flying-car-at-major-world-expo-41633492288709.html>
16. Investindia. (2021, oct 27). investindia. Retrieved from investindia: <https://www.investindia.gov.in/sector/aviation>
17. India, i. (2021, OCT 11). ibef. Retrieved from ibef: <https://www.ibef.org/industry/indian-aviation.aspx>
18. statista. (2020, OCT 13). statista. Retrieved from statista: <https://www.statista.com/statistics/677992/japan-motor-vehicle-production-value/>

19. Kilpatrick, M. (2021, OCT 27). Hoverbikes and flying cars: The future is on its way in Japan and China. Retrieved from Hoverbikes and flying cars: The future is on its way in Japan and China:
<https://www.newshub.co.nz/home/technology/2021/10/hoverbikes-and-flying-cars-the-future-is-on-its-way-in-japan-and-china.html>
20. Pakistan, M. i. (2021, MARCH 1). Number of centa-millionaires in Pakistan from 2006 to 2026. Retrieved from Number of centa-millionaires in Pakistan from 2006 to 2026: <https://www.statista.com/statistics/785215/pakistan-number-of-centa-millionaires/>
21. wikipedia. (2017, Jan 1). wikipedia. Retrieved from wikipedia: https://en.wikipedia.org/wiki/Poverty_in_Pakistan
22. usveteransmagazine, U. A. (2020, Jan 1). usveteransmagazine. Retrieved from usveteransmagazine:
<https://usveteransmagazine.com/2020/02/us-air-force-buy-flying-car/>
23. Yang, J. (2021, Jan 1). Challenges and Opportunities for Touring Industry and New Energy Automobile Industry . Retrieved from e3s-conferences: https://www.e3s-conferences.org/articles/e3sconf/pdf/2021/28/e3sconf_pgsg2021_03006.pdf
24. Khandker, S. (2021, March 1). nder which conditions will "Flying Taxis" become relevant for inner-city passenger transport in the future? Retrieved from researchgate: https://www.researchgate.net/profile/Swarnalekha-Khandker-2/publication/350383823_Under_which_conditions_will_Flying_Taxis_become_relevant_for_inner-city_passenger_transport_in_the_future/links/605cb55a458515e8346fd14a/Under-which-conditions-will-Flying-T
25. Makarenko L., A. T. (2020, Jan 1). Flying Cars. Retrieved from rep.bntu.by:
<https://rep.bntu.by/bitstream/handle/data/60827/21-24.pdf?sequence=1>
26. Akbas, M. I. (2021, JAN 1). Testing and V esting and Validation F alidation Framework for A amework for Autonomous Aerial onomous Aerial Vehicles. Retrieved from commons.erau.edu:
<https://commons.erau.edu/cgi/viewcontent.cgi?article=1849&context=jaaer>
27. SEBBAGH Rafika, B. F. (2021, july 18). Reality of Artificial intelligence A study based on the Emirati experience's case. Retrieved from asjp.cerist: <https://www.asjp.cerist.dz/en/downArticle/147/10/2/159944>
28. Rohit Goyal, C. R. (2021, July 2). Advanced Air Mobility: Demand Analysis and Market Potential of the Airport Shuttle and Air Taxi Markets. Retrieved from asjp.cerist.dz: <https://www.mdpi.com/2071-1050/13/13/7421/pdf>
29. AdekunleMofolasayo. (2020, JAN 1). Potential Policy Issues with Flying Car Technology. Retrieved from reader.elsevier: 1.
<https://reader.elsevier.com/reader/sd/pii/S2352146520304130?token=5E63542EA37C46E83455C56561238706F7D87B01A76B53F85051AEDED328D05973333CAAD1B45417D29BF0CD855675F6&originRegion=eu-west-1&originCreation=20211009092113>

30. Ravich, T. (2020, Aug 03). On-Demand Aviation: Governance Challenges of Urban Air Mobility. Retrieved from papers.ssrn:
https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID3644262_code2095716.pdf?abstractid=3644262&mirid=1
31. Perkins, A. (2021, Jan 1). A Comparison of the Effectiveness and Integration Capability of Personal Aerial Vehicles (PAV) into the Existing Transportation Network of the City of Los Angeles. Retrieved from ideaexchange.uakron.edu:
https://ideaexchange.uakron.edu/cgi/viewcontent.cgi?article=2674&context=honors_research_projects
32. Metin Uzun, S. Ç. (2021, AUG 16). Electrically Driven VTOL Flying Car Designing and Aerodynamic Analysis. Retrieved from dergipark.org: <https://dergipark.org.tr/en/download/article-file/1687888>
33. NASA, U. (2018, NOV 01). URBAN AIR MOBILITY (UAM) MARKET STUDY. Retrieved from ntrs.nasa.gov:
<https://ntrs.nasa.gov/api/citations/20190002046/downloads/20190002046.pdf>
34. Tore Johnston, R. R. (2021, JAN 1). To take off, flying vehicles first need places to land. Retrieved from [mckinsey](http://mckinsey.com):
<https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/to-take-off-flying-vehicles-first-need-places-to-land>
35. CARS, F. (2021, Jan 09). 10 MODERN FLYING CARS IN REAL LIFE. Retrieved from [beautifulife](http://beautifulife.com):
<https://www.beautifulife.info/automotive-design/10-real-flying-cars/>