VIBRANT tcet MECH ENGINEERS

THAKUR TRUSTS tcet THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

Estd. in 2001

MECHANICAL DEPARTMENT
-PRESENTS-

MECHON

MOBILITY SYSTEMS

EDITION 6 — ISSUE 1

DEPARTMENT OF MECHANICAL ENGINEERING

"Education is the manifestation of the perfection already in the man."

-Swami Vivekanand

VISION

"To become a department of eminence in the field of Mechanical Engineering"

MISSION

"To deliver an excellent undergraduate engineering program that prepares students for successful careers with social sensitivity, and also actively promotes the culture of research amongst students and faculty."

Program Specific Outcomes

PSO1: Identify Formulate and Analyze complex Engineering problems in Thermal Engineering, Design Engineering and Manufacturing Engineering domains.

PSO2: An ability to find out, articulate the local industrial problems and solve problems with the use of Mechanical Engineering tools for realistic outcomes.

PSO3: An ability of collaborative learning to find out costeffective, optimal solutions for sustainable growth.

Program Education Outcomes

PEO1: Prepare with a strong foundation in mathematical, scientific and engineering fundamentals that will enable them to have successful careers in Mechanical and Interdisciplinary Industries. (KNOWLEDGE)

PEO2: Strengthen their knowledge and skills through self-learning abilities throughout their professional career or during higher education. (SKILL & PROFESSIONALISM)

PEO3: Impart critical thinking skills and to develop innovative ideas for Research & Development (RESEARCH & INNOVATION)

Dr. SIDDHESH SIDAPPA

Message by Head of Department

I am delighted to know that our students have succeeded in publishing the ninth issue of mechon for the academic year 2022-2023. MECHON the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down their illustrative and innovative ideas.

This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. I congratulate and thank all the students and faculty co-ordinators who have made untiring efforts to bring out this magazine. I wish them all the best for releasing more such magazines in the future.

Mr. PAWAN TIWARI

Message by Faculty Incharge

It gives me immense pleasure to present the ninth issue of 'MECHON' e-magazine of the Department of Mechanical Engineering. It is the talent and outlook of our students which is portrayed through this magazine. This is one of the best platforms for our students to present multifaceted personalities and innovative ideas. It also enables the students to be aware of their changing surroundings and to consistently learn about new technologies.

I take this opportunity to thank our respected Principal Dr. B. K. Mishra, Mentor Dr. Sanjay Kumar, Head of Department Dr. Siddesh Siddapa, and all the faculty members for their perpetual inspiration and kind support. I believe that this edition will prove to be a success. I express my heartfelt gratitude to the editorial committee for their relentless efforts, the young writers for their valuable articles and all those who have been a part of 'MECHON'.

Table Of Contents

1

Faculty Insights

SINGLE CYLINDER COMPRESSED AIR ENGINE

INTRODUCTION:

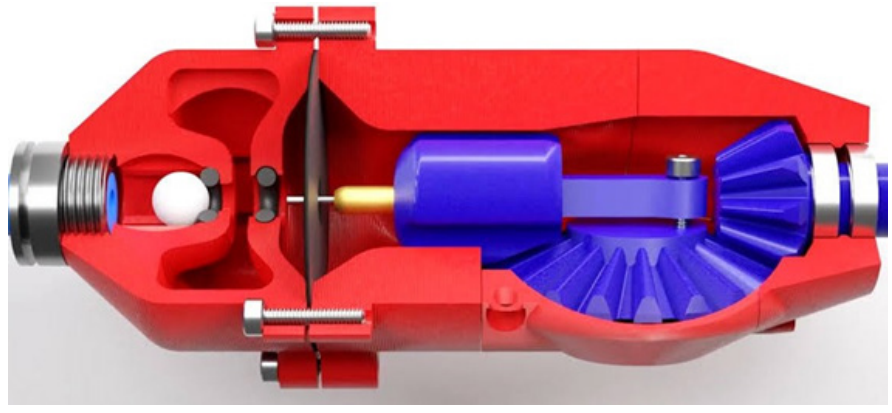
Emissions from the burning of fuels in vehicular transport are a major source of air pollution and are becoming a cause of concern in urban areas. Typical engines burn gasoline to move vehicles and release carbon dioxide, carbon monoxide and water vapor in the form of exhaust gases. These combustion products are causing global problems, such as the greenhouse effect, ozone layer deple- tion, acid rains and pollution which are posing great risk for the environment and eventually for the total life on the planet. But what if there were a way to run an engine with a source that is not only cleaner than hydrocarbon fuels but also more abundant? This can be done by a Compressed Air Engine (CAE).

Compressed air usage in the pneumatic applica- tion has been long proven. Air motors, atmospher- ic actuators and other various such pneumatic apparatus are in use. Compressed air was also used in some vehicles for uplifting the initial torque. Turbo charging has become one of the admired techniques to enhance power and improve the efficiency of the automotive engine that complete- ly runs on compressed air. An Air Driven Engine makes use of Compressed Air Technology for its functioning. Compressed Air Technology is now extensively used preferred for research by differ- ent industries for growing different drives for different purposes. The Compressed Air Technol- ogy is quite straightforward. If we compress nor- mal air into a cylinder the air would grasp some energy within it. This energy can be utilized for appropriate purposes. When this compressed air inflates, the energy is released to do work.

So this energy in compressed air can also be uti- lized to change the position of a piston. This is the fundamental working principle of the Air Driven Engine. It uses the extension of compressed air to drive the pistons of the engine. Therefore, an Air

Driven Engine is basically a pneumatic actuator that creates useful work by expanding compressed air. This work provided by the air is utilized to give power to the crankshaft of the engine.

In the case of an Air Driven Engine, there is no combustion taking place within the engine. So it is non-polluting and less precarious. It re- quires lighter metal only since it does not have to withstand raised temperatures. As there is no combustion taking place, there is no requirement for mixing fuel and air. Here compressed air is the fuel and it is straight into the piston cylinder arrangement. It simply expands inside the cylin- der and does applicable work on the piston. This work done on the piston provides adequate power to the crankshaft.



COMPRESSED AIR:

Compressed air is a combination of gases or a gas that has undergone greater pressure than the air in the general environment. Compressed air is reg- ular air, the volume of which has been decreased with the help of a compressor.

Compressed air, just like regular air, consists mostly of hydrogen, ox- ygen and water vapor. Heat is generated when the air is compressed, and the pressure of the air is in- creased. Current applications using compressed air are diverse, including jackhammers, tire pumps, air rifles, and aerosol cheese. Compressed air is clean, renewable and therefore a great competitor for today's conventional fuels. Its use is currently being analyzed as an alternative to Fossil fuels.

BEHAVIOUR OF COMPRESSED AIR:

When air at atmospheric pressure is mechanical- ly compressed by a compressor, the transforma- tion of air at 1 bar (atmospheric pressure) into air at higher pressure (up to 414 bar) is determined by the laws of thermodynamics. They state that an increase in pressure equals a rise in heat and compressing air creates a proportional increase in heat. Boyle's law explains that if a volume of a gas (air) halves during compression, then the pressure is doubled. Charles' law states that the volume of a gas changes in direct proportion to the temperature. These laws explain that pressure, volume and temperature are proportional; change one variable and one or two of the others will also change, according to this equation:

$(P1\ V1) / T1 = (P2\ V2)/T2$

Compressed air is normally used in pressure rang- es from 1 bar to 414 bar (14 to 6004 PSI) at var- ious flow rates from as little as 0.1 m (3.5 CFM

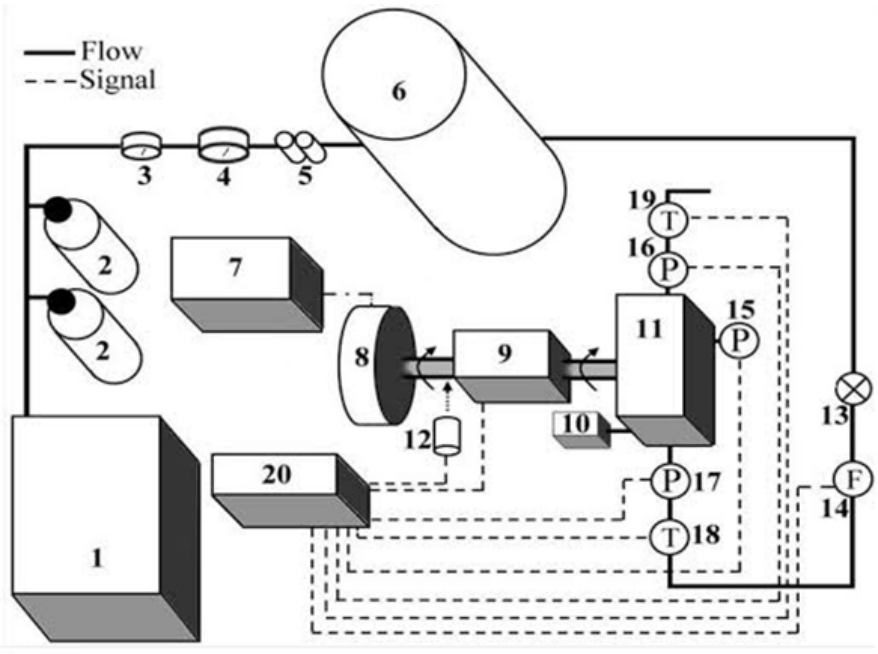
-cubic feet per minute) and up.

HOW COMPRESSED AIR FULES A CAR:

According to the laws of physics any given space can be filled by the uncontained gases. This princi- ple can be applied while inflating a balloon. Com- pressing a gas into a small space is a way to store energy. Later when the gas expands, that energy is released to do work. An air car performs in a sim- ilar manner. Compressed air cars need refilling. Popularization of this technology would result in an increase in the number of air refilling stations at convenient locations.

WORKING OF CAE:

Today, internal combustion engines in cars, trucks, motorcycles, aircraft, construction machinery and many others, most commonly use a four-stroke cy- cle. The four strokes refer to intake, compression, combustion (power), and exhaust strokes that oc- cur during two crankshaft rotations per working cycle of the gasoline engine and diesel engine. The cycle begins at Top Dead Center (TDC), when the piston is farthest away from the axis of the crank- shaft. A stroke refers to the full travel of the pis- ton from Top Dead Center (TDC) to Bottom Dead Center (BDC).



1. Compressor
2. High pressure tank
3. High pressure regulator
4. Low pressure regulator
5. Water filter
6. Buffer tank
7. Power supply
8. Electromagnetic brake
9. Torque sensor
11. Engine
12. High pressure tank
13. Optical tachometer
14. Flow meter
15. Cylinder pressure sensor
16. Outlet pressure sensor
17. Inlet pressure sensor
18. Inlet thermocouple
19. Outlet thermocouple

CONCLUSION

s is a revolutionary engine design which is environment friendly, pollution free, but also very low cost. This rectifies both the problems of fuel crises and pollution. However immoderate re- search is needed to completely prove the tech- nology for both its commercial and technical via- bility. Nowadays the continued need of energy is increasing, but primarily conventional sources of energy are restricted due to that rate on the price of petroleum also continues to be hiked. To please there need alternate fuel or energy is required. But while considering alternate fuel some of factors are to be considered like accessibility, economy, and environment friendly etc., based on that CAT (Compressed Air Technology) is best technology which tend engine to negligible pollutions. If fur- ther enhancement is carried out with stress analy- sis, thermodynamic analysis, decrease compressed energy loss and other losses then productivity of CAE may be further increases.

- Rupesh Deshbhratar
Assistant Professor
Mechanical Department

2

Automation And Advancements

INTRODUCTION

An aircraft landed safely is the result of a huge organizational effort required to cope with a complex system made up of humans, technology and environment. The aviation safety record has improved drastically over the years to reach an unprecedented low in terms of accidents per million take-offs, without ever achieving the "zero accident" target. The introduction of automation on board airplanes and various other variables related to it must be acknowledged as one of the driving forces behind the decline in the accident rate down to the current level. Nevertheless, automation has solved old problems but ultimately caused new and different types of accidents.

With the introduction of new technologies in the market, the usage of computers has become inevitable as it provides great performance in delivering specific tasks seamlessly.

While automation is proving to enhance the completion of a task, it also drastically affects the jobs of operators whose tasks gets shifted from being a performer to a checker.

Since the advent of this main global trend, the aviation field has also welcomed automation with open hands. It is important nowadays to consider automation in all the airlines to perform highly complex and dynamic tasks with ease and very less blunders.

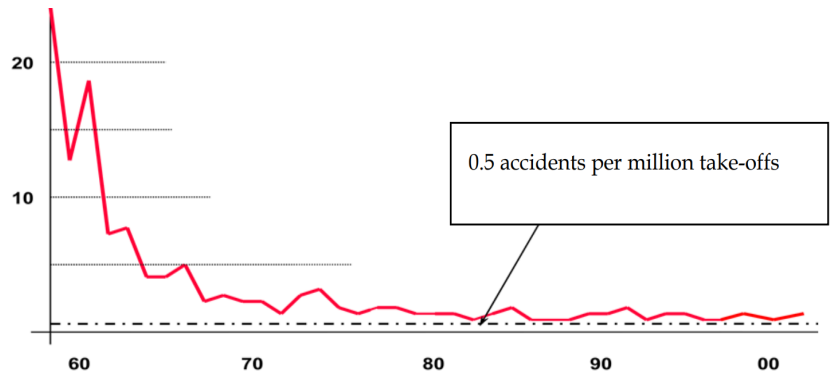
HISTORY OF ACCIDENTS

Automation in the aviation world plays a pivotal role nowadays. Its presence on board airplanes is pervasive and highly useful in improving the pilots' performance and enhancing safety. Nevertheless, certain issues have emerged in the recent past that evidence automation misuse by pilots. This could depend on a series of factors, among them human performance, capabilities and limitations on one side, and poor ergonomics on the other.

We should first investigate the reasons leading to the introduction of onboard automation.

During the Fifties and Sixties, the main causes of aviation accidents were believed to be related to the human factor. The immediate cause of an accident was often to be found in "active failures", e.g. loss of control of the aircraft in which pilots failed to keep the aircraft under control, reaching over-speed limits, stalling, excessive bank angles, etc.

In these cases the root cause was a flawed performance that eventually caused the loss of control (the effect). Factors related to human performance, e.g. the impact of fatigue, attention, high workload sustainability, stress mismanagement, etc. were consequently addressed. Technological solutions were sought to help pilots manage these factors. Innovation at that time eventually led to the introduction of the auto-pilot, auto-throttle, flight director, etc. After the mid-Fifties, as a result of these innovations, the accident curve dropped sharply. Looking at the graph below, we can clearly notice the impact of such innovations on flight safety. The vertical axis corresponds to the number of accidents per million take-offs, while the horizontal axis corresponds to the relative decades.



Automation has undeniably led to an improvement in flight safety. Nevertheless, to enhance its ability to assure due and consistent help to pilots, automation itself should be investigated more thoroughly to determine whether it is suitable in terms of human capabilities and limitations, ergonomics, cognitive suitability and instrument standardization, in order to gradually improve performance.

In the last decade, the pendulum has swung back to loss of control as a major cause of aviation accidents, however, compared to the accidents occurring during the Fifties, the factors leading to loss of control appear to be different. Whereas in the beginnings of aviation, human performance was impaired by "under-redundancy", that is, insufficient aids available to pilots for avoiding the effects of factors like fatigue, distraction, workload and stress which reduced the pilots' performance, nowadays many domain experts are pointing at possible cases of "over-redundancy". This means that increasing automation might be putting the pilot out-of-the-loop, thus causing reduced situational awareness, automation complacency or over-confidence and loss of skills, due to lack of practice in manually flying the aircraft. As a result, pilots may not be able to regain control once automation has failed, or may be incapable of effectively monitoring the performance of automated systems (and questioning it when required).

EVOLUTION OF AUTOMATION

Automation seems to follow an evolutionary path rather than a revolutionary approach. Its adoption on board aircrafts does not respond to the planned purpose of enhancing safety "from scratch" in a consistent way, but rather advances trying to continuously adapt to the challenges posed by its environment. This trial-and-response approach can be observed regardless of the fact that innovation introduced on board generally lags a step behind the overall level achieved by the industry. In fact, one of the requirements for a certain technology to be implementable in the aviation domain is its reliability; it is preferable to have a slower yet reliable system rather than a high-speed one that is not completely tested or tried in an operational environment.

Early signs of automation were introduced on board aircrafts during the decade from 1920 to 1930, in the form of an autopilot based on a mechanical engineering concept that was designed to keep the aircraft flying straight: a very basic input to control the flight at a "skill" level. Moreover, as airplanes became bigger and bigger, it became necessary to apply some form of amplification of the pilots' physical force, because of the airflow over large aerodynamic surfaces. Servo-mechanisms were introduced on board, alongside certain devic-

es aimed at facilitating perception of the force acting on such surfaces and absorbing the effects of the so-called Dutch-roll, an abnormal behaviour whereby the airplane yaws and oscillates in an uncoordinated manner. This innovation was the first of multiple steps that began widening the gap between the pilot's input on the yoke and the final outcome that is the aerodynamic movement of the aircraft. Instead of direct control, with the yoke mechanically attached to the ailerons, airplanes began to be constructed with a series of mechanisms intervening between the pilot's input and the expected output.

The second generation of automation included electric devices replacing the old mechanisms. Electric gyroscopes instead of pneumatic ones, new instruments such as the VOR (Very High Frequency Omni-directional Range) to follow a track based on ground aids, the ILS (Instrumental Landing System) to follow a horizontal and a vertical path till the runway threshold, and so forth. The 1960s saw plenty of innovations introduced on board aircrafts that enhanced safety: electric autopilots, auto-throttle, flight directors, airborne weather radars, navigation instruments, inertial platforms, but also improved alarming and warning systems capable of detecting several parameters of engines and other equipment.

The third generation of innovation involved electronics, and was mainly driven by the availability of cheap, accessible, reliable and usable technology that invaded the market, bringing the personal computer into almost every home. The electronic revolution occurring from the mid-80s also helped to shape the new generation of pilots, who were accustomed to dealing with the pervasive presence of technology since the early years of their life. Electronics significantly helped to diminish the clutter of instruments on board and allowed for replacing old indicators - gauges in the form of round-dial, black and white mechanical indicators for every monitored parameter - with integrated coloured displays capable of providing a synthetic and analytic view of multiple parameters in a limited area of the cockpit.

WHY AUTOMATION?

Two main reasons led to the decision to adopt onboard automation: the elimination of human error and economic aspects. The first element stems from the general view whereby human performance is regarded as a threat to safety. The second element is easier to tackle since we can even quantify the real savings related to, say, lower fuel consumption. According to IATA estimates, "a one percent reduction in fuel consumption translates into annual savings amounting to 100,000,000 dollars a year for IATA carriers of a particular State". (ICAO, 1998). Aside from fuel, the evolution of onboard technology over the years has led to a dramatic improvement in safety, operational costs, workload reduction, job satisfaction, and so forth. The introduction of the glass cockpit concept allows airlines to reduce maintenance and overhauling costs, improve operational capabilities and ensure higher flexibility in pilot training.

a. Fuel consumption

A crucial item in an airline's balance sheet is the fuel cost. Saving on fuel is vital to remain competitive on the market. The introduction of the "fly-by-wire" concept helps to reduce fuel consumption in at least three areas: weight, balance and data predictions.

b. Maintenance costs

The glass cockpit concept enables airlines to reduce maintenance and overhauling costs. In conventional airplanes, every instrument had its box and spare part in the hangar. Whenever a malfunction was reported by the crew, maintenance personnel on the ground fixed it by replacing the apparatus or swapping the devices. All these actions required a new component for every instrument. If we consider that an airliner has roughly one million spare parts, we can easily understand the economic breakthrough offered by the glass cockpit concept.

In these airplanes, a single computer gives inputs to several displays or instruments. The maintenance approach is to change a single computer rather than every component or actuator. Based to this operating method, few spare parts are required in the hangar: no more altimeters, no more speed indicators, no more navigation displays. Moreover, training of maintenance personnel is simplified as it focuses on a few items only which, in turn, allows for increased personnel specialisation.

Conclusion

Automation has undeniably led to an improvement in flight safety. Nevertheless, to enhance its ability to assure due and consistent help to pilots, automation itself should be investigated more thoroughly to determine whether it is suitable in terms of human capabilities and limitations, ergonomics, cognitive suitability and instrument standardization, in order to gradually improve performance.
The safety of the aircraft and its passengers are the top most priority for airlines and the automation in aviation is undoubtedly contributing in making it possible.

- Daksh Pandey
SE MECH

FUTURE MOBILITY SOLUTIONS IN MARINIE INDUSTRY

OVERVIEW

Since the dawn of human civilization, transportation has been an important driver of economies. The question is how to create a mobility solution for future transport while meeting today's requirements for low greenhouse gas emissions, efficiency, and economic boundaries? LHP Europe works in various areas to support solutions for future mobility and goods transport.

The supply chain will continue to start with long-distance transport to connect continents. Container ships are the most efficient and environmentally friendly solution. Second, goods are transported in smaller containers, trains and/or trucks over long distances until they are distributed to consumers in urban or rural areas. Today we would like to describe a global solution for the transportation of goods using sea container ships.

INTERNATIONAL TRANSPORTATION OF GOODS

Well over 90% of all goods for international trade are transported by sea. In most cases, there are standardized containers to help achieve the most efficient shipping times. Fixed lines and fixed timetables help keep container ship traffic controlled and the lines only target very large ports. From there, the containers can be distributed to smaller container vessels, also known as "container feeders". Containers can be distributed to smaller seaports or across rivers to different cities.

Large container ships account for about 10% of greenhouse gas emissions in the transport sector. Improving efficiency, route optimization and lower greenhouse gas emissions will be needed to reduce the environmental impact of these large container vessels. LHP offers the ability to address these requirements through IoT, data analytics, autonomous navigation, and powertrain technology.

OPTIMIZED SOLUTIONS AND PARAMETERS

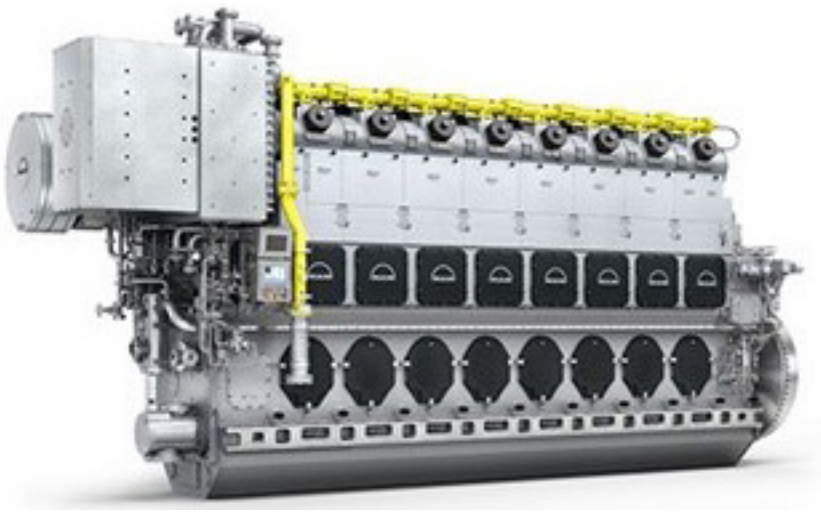
Defining global lines and setting parameters is a very complex process. LHP Europe helps shipping companies find the right number of destinations and the right choice of ship parameters such as vessel size, number of vessels and average speed.

LHP Europe has developed specialized software solutions that help companies find optimized solutions for commercial goals and energy consumption. In addition, LHP Europe supports experienced naval officers with IOT and data analytics solutions. These solutions optimize their sailing parameters such as vessel speed, ocean current and weather conditions to find true optimized trajectories. Most importantly, it leads officers to reach the target point in record time using the minimum amount of energy.

TECHNOLOGY'S ROLE IN MODERN CONTAINER VESSELS

Modern container vessels are equipped with assistance systems such as satellite navigation, cameras and Lidar and Radar systems to support maritime officers in manevering the ships. LHP Europe is working on future developments to raise the level of autonomous navigation by leveraging the synergies of internal research work for the automotive and aerospace industries.

The size of container vessels has increased significantly over the last few decades, with a capacity of 20,000 containers today. In most cases, the propulsion system is a single 2-stroke diesel engine with cylinder numbers from 11 to 14. The propeller is direct driven, so the engine speed is limited to values below 100 rpm. Smaller container feeders have two different drive train concepts. On the one hand, there are drive units with 2-stroke diesel engine technology. On the other hand, the use of medium-speed four-stroke diesel engines, which offer much better maneuvering conditions with almost the same efficiency.



The most important goal of shipping lines is to achieve the lowest total cost of ownership. The efficiency of the drive units reaches values of 50%, which is the highest value for combustion engines.

MAKING A CHANGE FOR THE ENVIRONMENT

Today, in most cases, marine engines burn fossil heavy fuel oil, which is a byproduct of the fuel refining industry. Therefore, many development activities are underway for future alternative solutions for renewable fuels and power units. In terms of fuel development, synthetic fuels have the greatest impact on achieving the greenhouse gas emissions target. Most modern diesel engines can burn liquid synthetic fuels without major changes to the engine design. To achieve the optimal situation, only the injection components and the combustion parameter software need to be modified. Gas versions of diesel engines can burn gaseous synthetic fuels. In conclusion, we can say that the Dual fuel system is a suitable solution for the process of burning gaseous fuel with the highest efficiency and reliability.

Electric propulsion units for container vessels can be developed with the use of fuel cells in mind. Battery energy storage is not suitable for long-distance voyages due to the size and weight of the components. A fuel cell system could use synthetic liquid fuels such as methanol, which could be transformed into hydrogen using a reforming system. LHP Europe participates in research and development activities together with the component supplier and the university institute.

The application of new information technologies, digitization and automation can rapidly change the way maritime transport works and operates. The development towards fully or partially autonomous ships will present both opportunities and challenges for the industry in terms of safety, security, sustainability, existing legal frameworks and operations – in line with the two main objectives of the Commis-

sion – digitalisation and sustainability!
The rapidly changing and rapid deployment of technologies enabling autonomous testing and operation of surface vessels requires an updated role not only for any operator, but also for vessel operations services, including monitoring, management, communication and control of vessel traffic.
Already valid EU legislation – the VTMIS Directive – contains provisions that need to be considered from the point of view of autonomous vessels; how they would affect VTS and what could be done to address future challenges, including direct trade within the EU. Another aspect directly related to the VTMIS directive is the use of communication and monitoring tools (Integrated Maritime Services).
Extensive trials and tests have been identified as a necessary and essential step for the safe and successful operation of the MASS operation.
In order to facilitate the development of a safe predictable area/environment and to ensure safe navigation in the future, also in a mixed traffic situation where manned and unmanned ships will be sailing on the same routes/ports, a formal management group under EU legislation has been launched to proactively investigate various issues already in the summer of 2018. The work is very future-oriented and requires challenging conventional concepts and operations.

The guidelines are the result of a joint effort by the maritime authorities of the Member States of the European Union together with key stakeholders in the industry, under the auspices of the Maritime Autonomous Surface Vessels (MASS) Expert Group, chaired by the European Commission, with the support of the European Commission. Maritime Safety Agency.
These EU Operational Guidelines, which build on and supplement the Interim MASS Guidelines developed by the International Maritime Organization, are not a final product. Rather, they will be continuously modified and improved as experience is gained from trials and tests as well as the results of relevant EU-funded research and studies.
On the occasion of the 2nd International Summit on Ship Autonomy and Sustainability on 30 November 2020, members of the EU MASS expert group advocate a continued positive spirit and enhanced cooperation and coordination between all stakeholders, including the industry concerned, for the safety, sustainable and efficient development of autonomous shipping , endorsed the following key principles:

- Start using EU operational guidelines for MASS trials and tests and exchange within and between EU Member States; and identify further development needs as new challenges arise.
- Present and make the EU operational guidelines available to the public in an appropriate way.
- Bring the EU Operational Guidelines to the attention of the International Maritime Organization (IMO) and other appropriate

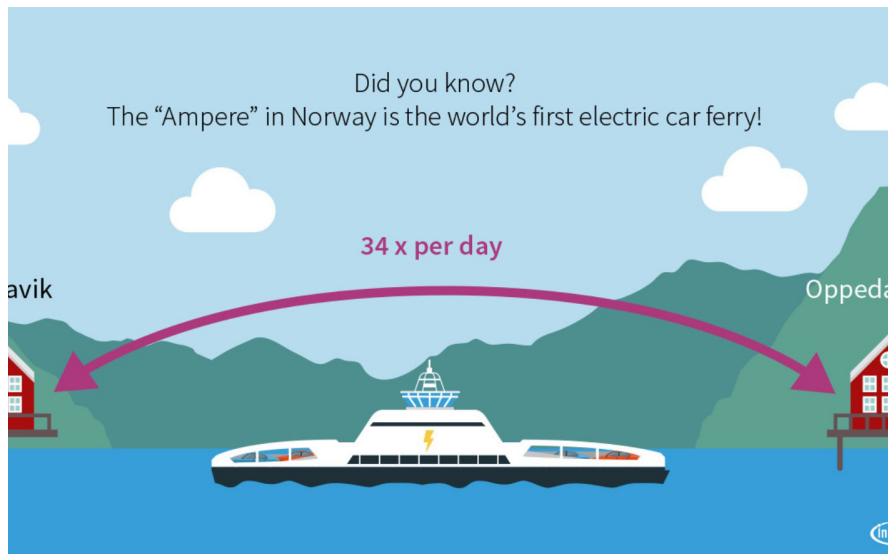
stakeholder fora and like-minded international partners.

- Work on incorporating EU operational directives into regional agreements/plans.
- Support the use and further development of the Union maritime information and exchange system providing integrated maritime services for the safe management, tracking, communication and control of autonomous ships and shipping.
- Continue to work within the MASS expert group, including on:

1. Continuous improvement of the EU operational guidelines in all their aspects, including the use of relevant research and development projects and studies, in order to solve problems and achieve convergence of standards and common understanding for the testing and operation of maritime autonomous surface ships, including ports;
2. Gathering and sharing experiences and developing practical procedures for the operational use of EU operational guidelines, including table-top exercises, building on the work of the European Maritime Safety Agency (EMSA) and establishing contacts with other civil and military forums;
3. In due course, with the support of EMSA, develop appropriate training on EU operational instructions, including information sharing, communication and use of the Union Maritime Information and Exchange System;
4. Improvement of risk assessment methodology, based on e.g. state-of-the-art research;
5. Further exploration of needs, requirements and standards for seamless and integrated information and communication flows between autonomous ships/remote control centers and national/regional vessel operations services, as well as between authorities and operators.

Four ferries known as the "bird flight line" between Germany and Denmark already sail with hybrid technology. The drive combines an internal combustion engine and an electric drive system. According to the transport company, this reduces CO2 emissions by up to 15 percent. "Vision of the Fjords" in the Norwegian Nærøyfjord is also a hybrid boat: electricity for propulsion comes from diesel generators and batteries. They have a capacity of 600 kWh. The batteries are charged when the ship is sailing with excess power from the diesel engine and when docked with pure hydroelectric power. The ship can sail for three hours on battery power.

In 2019, the Norwegian shipping company Hurtigruten's "MS Roald Amundsen" was introduced as the first hybrid electric cruise ship. The lithium-ion batteries will allow the boat to sail for at least 30 minutes on electric power. The advantage for the passengers is that they glide in complete silence on the Norwegian coats and later on the glaciers of Antarctica without exhaust fumes.



Four ferries known as the "bird flight line" between Germany and Denmark already sail with hybrid technology. The drive combines an internal combustion engine and an electric drive system. According to the transport company,

this reduces CO2 emissions by up to 15 percent. “Vision of the Fjords” in the Norwegian Nærøyfjord is also a hybrid ship: electricity for propulsion comes from diesel generators and batteries. They have a capacity of 600 kWh. The batteries are charged when the ship is sailing on surplus power from the diesel engine and when there is pure hydroelectric power in the dock. The ship can sail for three hours on batteries.

In 2019, the Norwegian shipping company Hurtigruten introduced the “MS Roald Amundsen” as the first hybrid electric cruise ship. Lithium-ion batteries will allow the boat to sail for at least 30 minutes on electric power. The advantage for the passengers is that they glide in complete silence on the Norwegian coats and later on the glaciers of Antarctica without exhaust fumes.

- Yash Khairnar
SE MECH

SPACE TECHNOLOGY GRAND CHALLENGES

The Space Technology Grand Challenges are an open call for cutting-edge technological solutions that solve important space-related problems, radically improve existing capabilities or deliver new space capabilities altogether. The challenges are centered on three key themes:

(1) Expand human presence in space,
(2) Manage in-space resources, and
(3) Enable transformational space exploration and scientific discovery.

These challenges are designed to initiate thought and discussion among our nation's innovators about future NASA missions and related national needs. The challenges will be updated to serve as a reflection and long-term measure of our nation's space technology needs.

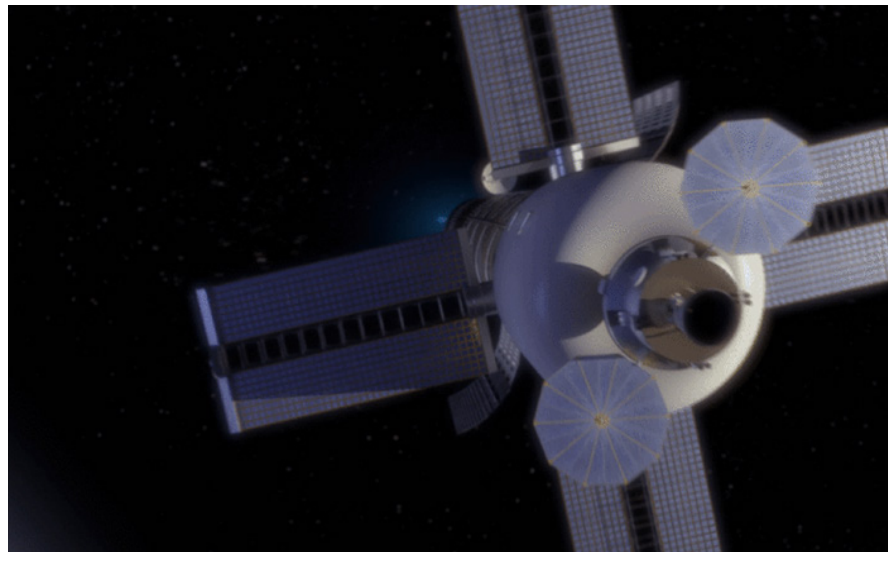
TECHNOLOGY NASA IS USING FOR HUMAN SPACE MOBILITY

Mars is an obvious source of inspiration for science fiction stories. It is familiar and well-studied, yet different and far enough away to compel otherworldly adventures. NASA has its sights on the Red Planet for many of the same reasons.

Robots, including the Perseverance rover launching soon to Mars, teach us about what it's like on the surface. That intel helps inform future human missions to the Red Planet. We'll also need to outfit spacecraft and astronauts with technologies to get them there, explore the surface, and safely return them home. The roundtrip mission, including time in transit – from and back to Earth – and on the Martian surface, will take about two years.

Technology development has already begun to enable a crewed Mars mission as early as the 2030s. Many of the capabilities will be demonstrated at the Moon first, during the Artemis missions, while other systems are more uniquely suited for deeper space. Here are six technologies NASA is working on to make Mars science fiction a reality.

1. POWERFUL PROPULSION SYSTEMS TO GET US THERE (AND HOME!) QUICKER



Astronauts bound for Mars will travel about

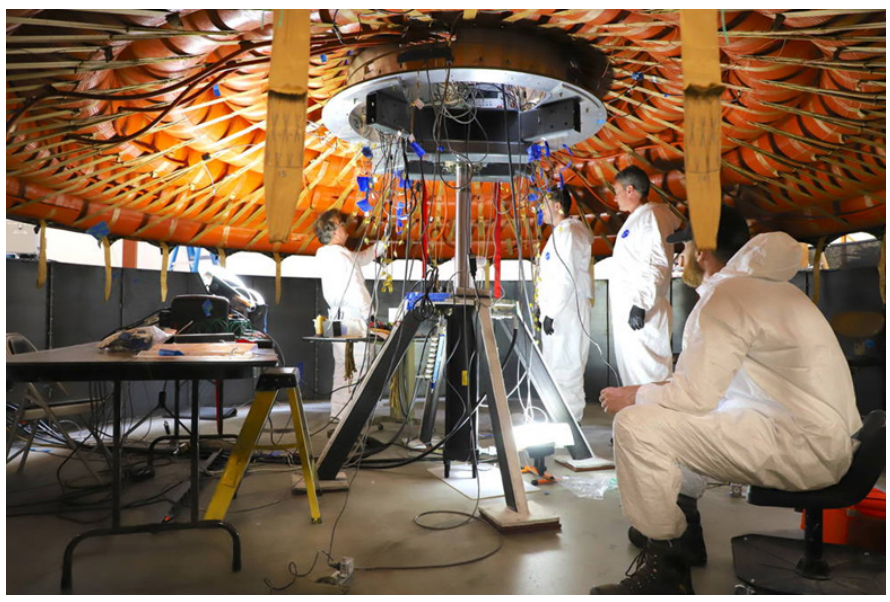
140 million miles into deep space. Advancements in propulsion capabilities are the key to reaching our destination as quickly and safely

Astronauts bound for Mars will travel about 140 million miles into deep space. Advancements in propulsion capabilities are the key to reaching our destination as quickly and safely as possible.

It is too soon to say which propulsion system will take astronauts to Mars, but we know it needs to be nuclear-enabled to reduce travel time. NASA is advancing multiple options, including nuclear electric and nuclear thermal propulsion. Both use nuclear fission but are very different from each other. A nuclear electric rocket is more efficient, but it doesn't generate a lot of thrust. Nuclear thermal propulsion, on the other hand, provides much more "oomph."

Whichever system is selected, the fundamentals of nuclear propulsion will reduce the crew's time away from Earth. The agency and its partners are developing, testing, and maturing critical components of various propulsion technologies to reduce the risk of the first human mission to Mars.

2. INFLATABLE HEAT SHIELD TO LAND ASTRONAUTS ON OTHER PLANETS



The largest rover we've landed on Mars is about the size of a car, and sending humans to Mars will require a much bigger spacecraft. New technologies will allow heavier spacecraft to enter the Martian atmosphere, approach the surface, and land close to where astronauts want to explore.

NASA is working on an inflatable heat shield that allows the large surface area to take up less space in a rocket than a rigid one. The technology could land spacecraft on any planet with an atmosphere. It would expand and inflate before it enters the Martian atmosphere to land cargo and astronauts safely.

The technology isn't ready for the Red Planet just yet. An upcoming flight test of a 6-meter diameter (about 20-feet) prototype will demonstrate how the aeroshell performs as it enters Earth's atmosphere. The test will prove it can survive the intense heat during entry to Mars.

3. HIGH-TECH MARTIAN SPACESUITS

Spacesuits are essentially custom spacecraft for astronauts. NASA's latest space suit is so high-tech, its modular design is engineered to be evolved for use anywhere in space.

The first woman and the next man on the Moon will wear NASA's next-generation spacesuits called the exploration extravehicular mobility

unit or xEMU. The spacesuits prioritize crew safety while also allowing Artemis Generation moonwalkers to make more natural, Earth-like movements and accomplish tasks that weren't possible during the Apollo missions.

Future upgrades to address the differences on Mars may include technology for life support functionality in the carbon dioxide-rich atmosphere and modified outer garments to keep astronauts warm during the Martian winter and prevent overheating in the summer season.

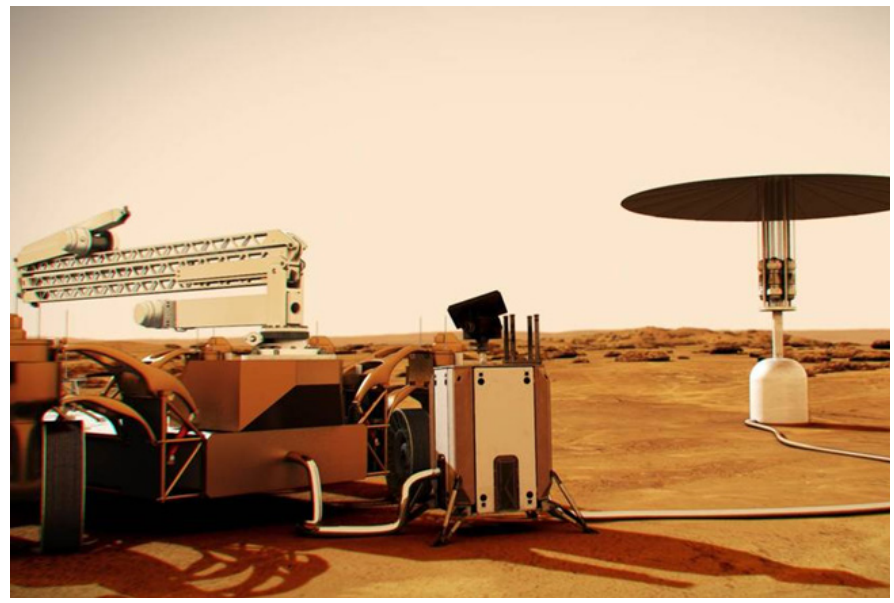
4. MARTIAN HOME AND LAB ON WHEELS

To reduce the number of items needed to land on the surface, NASA will combine the first Martian home and vehicle into a single rover complete with breathable air.

NASA has conducted extensive rover testing on Earth to inform development of a pressurized mobile home on the Moon. Artemis astronauts who live and work in the future pressurized Moon rover will be able to offer feedback to help refine the rover capabilities for astronauts on Mars. NASA's robotic rovers will help with the Martian design, too – everything from the best wheels for Mars to how a larger vehicle will navigate the tough terrain.

Much like an RV, the pressurized rover will have everything inside that astronauts need to live and work for weeks. They can drive in comfortable clothing, tens of miles from the spacecraft that will launch them back to space for the return trip to Earth. When they encounter interesting locations, astronauts can put on their high-tech spacesuits to exit the rover and collect samples and conduct science experiments.

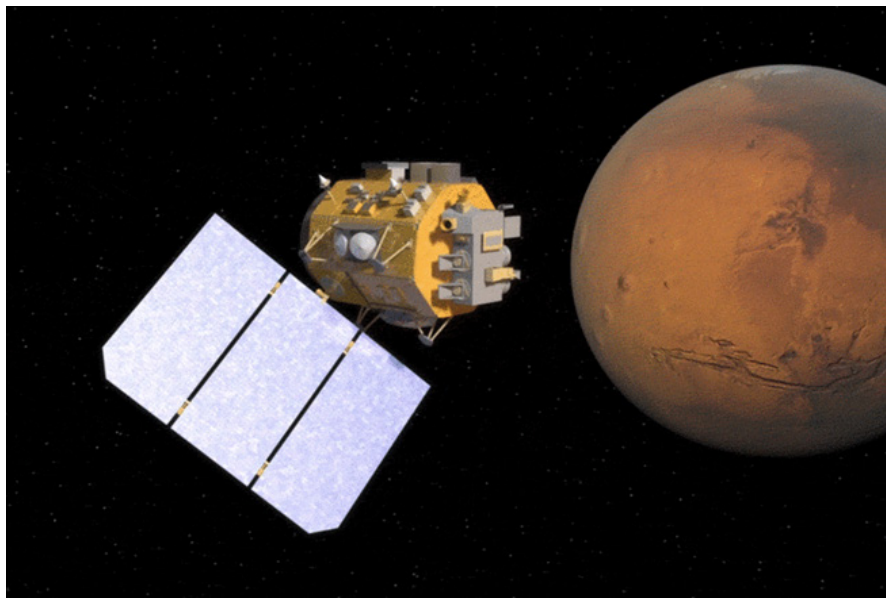
5. UNINTERRUPTED POWER



Like we use electricity to charge our devices on Earth, astronauts will need a reliable power supply to explore Mars. The system will need to be lightweight and capable of running regardless of its location or the weather on the Red Planet.

Mars has a day and night cycle like Earth and periodic dust storms that can last for months, making nuclear fission power a more reliable option than solar power. NASA already tested the technology on Earth and demonstrated it is safe, efficient, and plentiful enough to enable long-duration surface missions. NASA plans to demonstrate and use the fission power system on the Moon first, then Mars.

6. LASER COMMUNICATIONS TO SEND MORE INFORMATION HOME



Human missions to Mars may use lasers to stay in touch with Earth. A laser communications system at Mars could send large amounts of real-time information and data, including high-definition images and video feeds.

Sending a map of Mars to Earth might take nine years with current radio systems, but as little as nine weeks with laser communications. The technology would also allow us to communicate with astronauts, to see and hear more of their adventures on the Red Planet.

NASA proved laser communications is possible with a demonstration from the Moon in 2013. The agency's next demo will work through different operational scenarios, perfect the pointing system, and address technology challenges from low-Earth orbit – things like clouds and other communications disruptions. NASA is building small systems to test for human spaceflight, including on the International Space Station and the first crewed Artemis mission. Another laser communications payload will venture to deep space to help inform what it takes to use the same technology millions and millions of miles away from Earth.

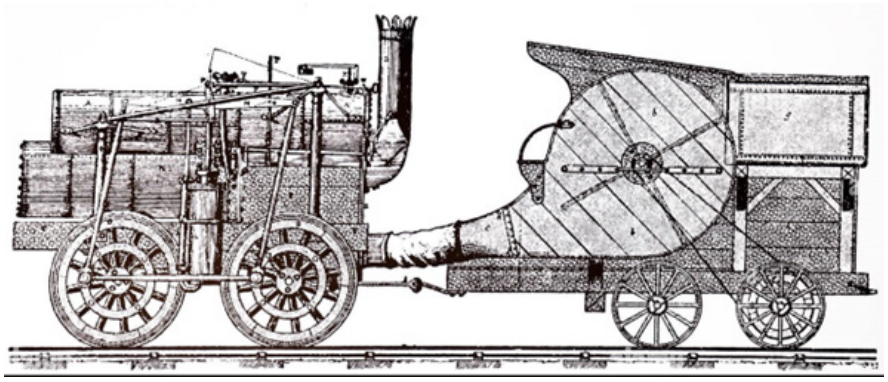
THE BROAD CHALLENGE OF SPACE

The challenges of flying in space are such that a truly radical improvement in nearly any system used to design, build, launch, or operate a spacecraft has the potential to be transformative. In our search for technologies that will radically improve our existing capabilities or deliver altogether new space capabilities, it is likely that any great leap in capability will be the result of several, integrated advances. The Space Technology development portfolio extends across all systems critical to space missions and is not limited to the specific Space Technology Grand Challenges listed above. To meet the broad challenge of maintaining a robust and vibrant space program, investments will be considered in any space technology that has the potential to be transformative. The future demands active curiosity, open minds, and a determination to resolve challenges as they present themselves.

-Tanushi Shah
SE MME

Advancements in Rail Mobility

HISTORY OF RAILWAYS



Marc Seguin designed this engine to pull coal trains from mines to waterways. This steam locomotive dates from 1829 and has a tubular boiler.

Railways were invented in Great Britain, starting at the end of 18th century. In France, it was not until 1826 that the first section of railway was built, thanks to the pioneering work of Marc Seguin.

Rail transport expanded considerably during the 2nd half of the 19th century and the beginning of the 20th, but there was considerable decline in the second half of the 20th century due to the increase in car and lorry use. As a consequence, many branch lines were permanently closed.

In the last twenty years, high speed trains (TGVs), saturated roads and the development of urban rail transport have led to new expansion of railways.

ANCIENT SYSTEMS

The Post Track, a prehistoric causeway in the valley of the river Brue in the Somerset levels, England is one of the oldest known constructed trackways and dates from around 3838 BC, making it some 30 years older than the sweet track from the same area. Various sections have been designated as scheduled monuments.

Evidence indicates that there was a 6 to 8.5 km long Diolkos paved trackway, which transported boats across the Isthmus of Corinth in Greece from around 600 BC.

Wheeled vehicles pulled by men and animals ran in grooves in limestone, which provided the track element, preventing the wagons from leaving the intended route.

The Diolkos was in use for over 650 years, until at least the 1st century AD. Paved trackways were also later built-in Roman Egypt.

CURRENT SCENARIO

The transport sector is responsible for more than half of the global oil demand and around one quarter of global CO2 emissions from fuel combustion. Therefore, changes in transformation are fundamental to achieving energy transitions globally. Yet while rail is among the most energy efficient modes of transport for freight and passengers, it is often neglected in public debate.

The Future of Rail examines how the role of rail in global transport might be elevated as a means to reduce the energy use and environmental impacts associated with transport.
Transport is the conveyance of passengers and goods by means of wheeled vehicles specially designed to run along railways or railroads. It is a rapid, energy-efficient, but capital-intensive means of mechanized land transport. It is part of the logistics chain that facilitates international trade and economic growth in most countries.

FUTURE SCOPE

Global demand for transport is growing fast. Given present trends, passenger and freight activity will more than double by 2050. Such growth is a token of social and economic progress, but it carries with it greater energy demand and increased CO2 emissions and atmospheric pollutants. A greater reliance on rail has the potential to cut that growth.

In a world becoming ever more urbanized, rail travel is well matched to urban needs. High speed rail can serve as an alternative to short distance air travel, and convention and freight rail can complement other transport modes to provide efficient mobility. This report discusses what can be done and how on a global scale, with a special focus on the needs and opportunities in India.

IDEAS TO IMPROVE RAIL MOBILITY

In the long term, operators could ramp up investment in infrastructure and service excellence. Doing so will likely require investment in high-density, high-speed and high-frequency networks. This involves increasing capacity and level of service through capital investments that include rolling stock, infrastructure, and digital technologies.

Around the world, operators are upgrading their fleets. Rolling stock investments have been projected to increase across all geographies at a rate of 6 percent a year between 2019 and 2024.5 New rolling stock increases capac-

ity, creates higher customer satisfaction, improves sustainability, and offers the opportunity to modernize interiors, add connectivity, and improve services.

Density, speed, and frequency are three factors that position train travel as an efficient and convenient passenger service—and the case for high density, high speed, and high frequency has already been made numerous times around the world. In France, Germany, Italy, Spain, and Japan, the introduction of high-speed rail massively increased rail modal share, replacing cars for shorter distances and planes for longer distances.

Furthermore, as urbanization leads to increased populations within cities and city agglomerations, rail is an efficient means to relieve traffic congestion from individual mobility in high density regions, and aid sustainability. Rail generates four to six times less CO2 emissions than traveling by internal combustion engine cars, and even generates less than electric vehicles.

When evaluated against air transportation, rail is a more sustainable option, producing about 10 to 15 times less CO2 per passenger.

-Sahil Pawar
SE MECH

EV's in Transportation

From the beginning, the story of motor vehicles has been one of innovation and evolution. If you were to plot a timeline of the industry, you could probably start in 1886 when Karl Benz (of Mercedes-Benz fame) patented the designs for the first automobile, which utilized the first-ever internal combustion engine. Of course, that brings us to the production of modern hybrid and electric vehicles (EVs) now in the 21st century. As someone whose work is deeply ingrained in the evolution of EVs, I have seen their potential to transform many industries from public transportation to logistics and beyond.

HOW EV's ARE REDUCING CARBON FOOTPRINTS AND MAKING POLLUTION FREE ENVIRONMENT.

All-electric vehicles produce zero tailpipe emissions, meaning that the total emission footprint of an EV is really the emission footprint of its power source. Unlike other motor vehicles, EVs produce no direct air pollutants or greenhouse gases, thereby cutting the emissions of carbon dioxide and methane.The shift to EVs is also essential for ongoing smart city initiatives across the world In addition to reducing emissions and airborne pollutants, EVs can help maintain higher air quality, leverage smart technologies throughout transportation systems and improve public utility and transportation infrastructure, particularly where electrical grids and charging stations converge.

By linking EV charging stations to public transportation infrastructure, we can create greater operational efficiencies. However, recent brownouts during heatwaves in California and Texas indicate electrical grids must be hardened to ensure consistent power will be available to residents even when EVs are plugged into the grid.

Infrastructure Barriers To Adoption And How To Overcome Them

It will cost money to prepare the market, the electrical grid and the nation's public transportation infrastructure for EVs, and that remains one of the greatest barriers to adoption. Today, the top three barriers I see are:

High expense: Transforming an industry is expensive, although I believe worth it. While an EV charging station can cost upwards of $1 million, this cost can be mitigated by funding from federal grant programs such as those for the Buses and Bus Facilities Program, which supports states and transit organizations seeking to invest in new or rehabilitated transit equipment and infrastructure.

Short supply: If diesel-based engines were to be banned today, there would not yet be enough EVs to replace them all — but that may soon change. As demand increases and funding for EV investment increases, transportation companies should work on increasing supply. At the same time, alternative fuels such as clean biodiesel are increasing in popularity and could fill in the gaps in the EV supply. In the future, we may see a diversity of vehicles leveraging clean energy resources like biodiesel and hydrogen fuel cells on our roads.

Lack of charging technology: Specifically, the problem lies in the relative lack of EV charging infrastructure nationwide. In some areas, such as cities with higher rates of EV adoption, limited public infrastructure already exists,

and charging stations can be found in public spaces, such as grocery store parking lots. In other areas, no infrastructure exists, and investment in public charging infrastructure is needed. This presents an opportunity for us to determine the best possible locations for EV charging stations in each community. Private companies should work together with local, state and federal officials to complete these assessments.

THE FUTURE OF EVS

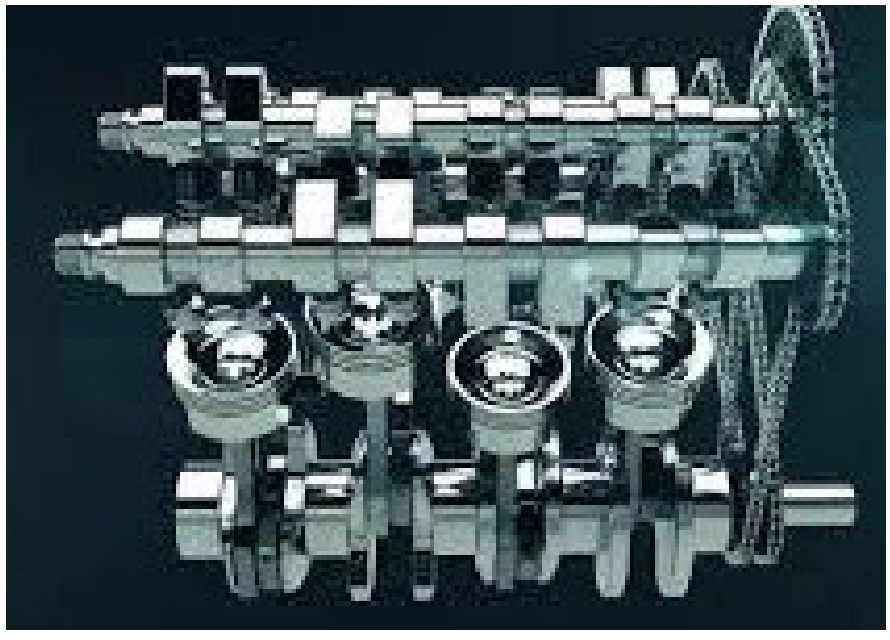
Expectations are that there will be significant federal investment in EV infrastructure in the next few years. At present, the proposed $1 trillion infrastructure bill includes $7.5 billion for EV charging stations focused on connecting rural and historically disadvantaged communities, $7.5 billion for zero- and low-emission buses and ferries and $73 billion to build a more robust electrical grid. Though these amounts are lower than some original proposals, the bipartisan nature of this bill indicates legislators across the aisle recognize the need for advanced transportation infrastructure. This raises our hopes for more investment in the future.

-Kartik Gaikwad
SE MECH

INTRODUCTION

The ignition and burning of the fuel occur within the engine itself in an internal combustion engine (ICE). The energy from the combustion is then partially converted to work by the engine. The engine is made up of a stationary cylinder and a moving piston.

Internal combustion engines provide excellent drivability and longevity, powering almost 250 million highway transportation vehicles in the United States. They may use renewable or alternative fuels in addition to gasoline or diesel (e. g., natural gas, propane, biodiesel, or ethanol).
They may also be coupled with hybrid electric powertrains to improve fuel efficiency or plug- in hybrid electric systems to expand hybrid electric vehicle range.



CURRENT TRENDS

The popularity of electric vehicles has expanded far beyond hybrids l ike the ubiquitous Toyota Prius. Ford Motor Company said earlier this year that it will create hybrid versions of its vehicles. both its powerful F- 150 truck, the best- selling vehicle in the country vehicle, as well as the performance- oriented Mustang. Earlier this month, Volvo said that beginning in 2019 , all of its freshly introduced Hybrid or all- electric vehicles would be available. This was accomplished promptly.

Followed by reports that France and the United Kingdom want to outlaw the by 2040, the sale of new petroleum- powered automobiles.

Definitely. According to John Heywood, a mechanical engineering professor at the Massachusetts Institute of Technology, combustion engines would still be used in 60% of l ight-duty cars in 2050, typically in conjunction with electric motors in hybrid systems and primarily fitted with a turbocharger. He thinks that vehicles powered only by batteries will account for 15 % of sales.

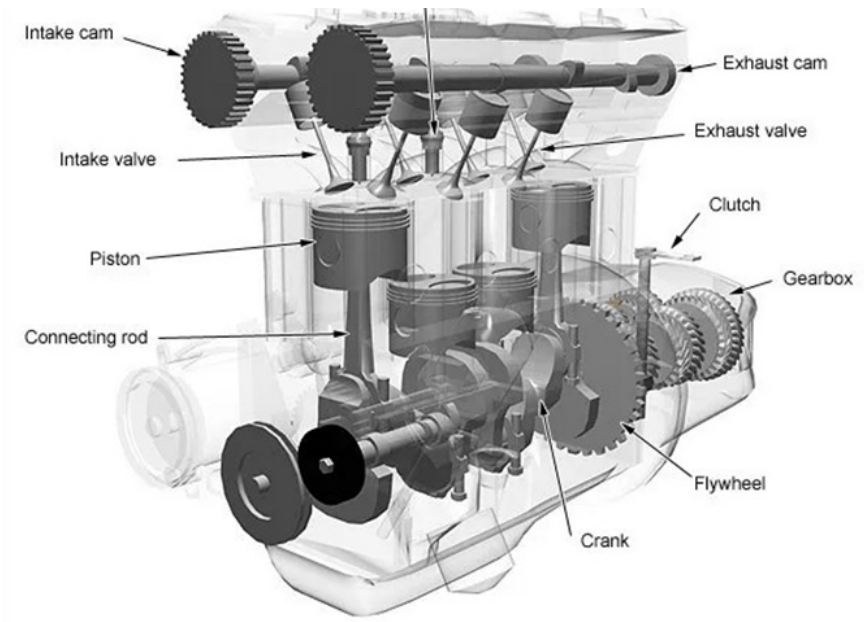
Turbochargers' power- boosting advantage is widely used now, but in the next years, it may be shifted toward the creation of smaller engines that nevertheless suit consumers' demands. " The true gain comes from downsizing," Dr. Heywood explained. " This lowers friction, which consumes a major portion of the energy." the intake of energy."

Dr. Heywood, who has wondered whether he might be best suited for benefit his pupils by instructing them on combustion or
The future of gasoline is addressed by electrochemistry. from a different angle: the practical constraints. " You can drive a battery electric automobile while holding a gas nozzle." " It takes five minutes to transfer ten megawatts of electricity," he remarked. detailing the current refuelling situation Recharging a Tesla Elec-

tricity at that rate now, he claims, would necessitate " a cable you can' t see." couldn' t keep up."

The issue is, how much better can gasoline engines get?
Traditional piston engines have gone a long way, with technical advancements l ike as direct fuel injection, variable valve timing, and cylinder shutdown systems being commonplace.

With advancements in l ightweight body materials and dual- clutch gearboxes, mileage has continually increased, so additional increases are now tough to come by—usually in the single digits.



FUTURE SCOPE

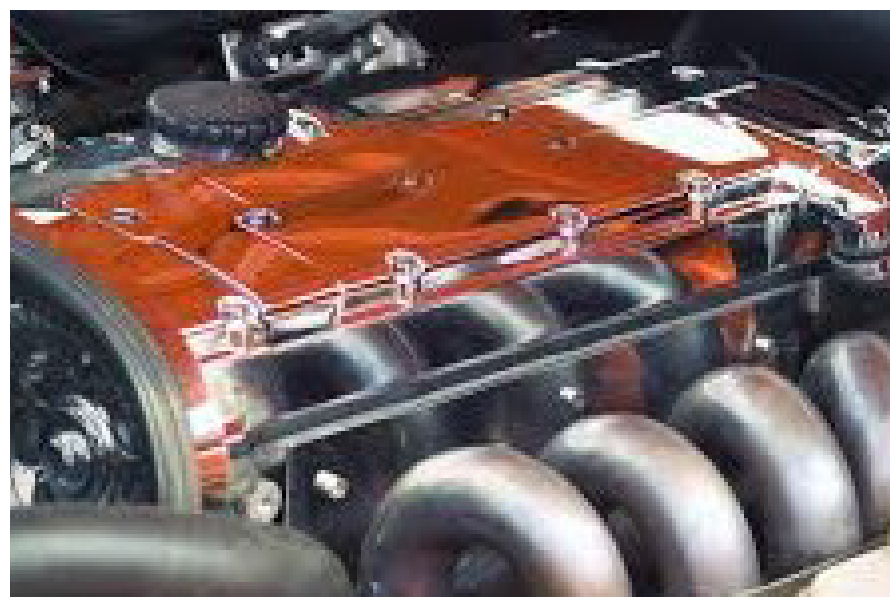
In contrary to widely circulated media reports, ICE and IC engine research has a bright future (e. g. The Economist). The power generating, automobile, and gasoline businesses are large, with annual revenues in the trillions of dollars (US) and massive infrastructure. We are undoubtedly l iving in revolutionary times, but it is evident that power generating sources will not become entirely renewable, and transportation will not become entirely electric for some decades, if ever. However, improving efficiency and reducing reliance on fossil fuels are interesting avenues for future IC engine development.

Highly efficient " completely flexible" engines with hybri ised solutions are extremely l ikely to play a significant role in achieving desired efficiency increases as well as emission/ GHG reductions. 20 Finally, it must be understood that, in practise, consumers choose their powertrain based on a variety of reasons, including cost.

Politicians, vehicle manufacturers, and academics do not determine consumer preferences.

A policy that favours only one technology solution may be inefficient and, in the long run, incorrect.

A better strategy is to utilise real- world data to allow competing technologies to thrive; if they demonstrate efficiency and carbon savings, they must be given as quickly as feasible. Continued success necessitates the recruitment of the greatest young minds to participate in this endeavour to provide a dynamic and sustainable future for the ICE.



CONCLUSIONS

However, electric vehicles are far from ready for such a takeover. While Tesla struggles to construct the mass- market Model 3 on a large scale, the rest of the auto industry is talking big about a battery- powered onslaught, but most won' t start shipping vehicles in large numbers for years. Electric vehicles account for fewer than 1 % of new automobile sales in the United States. The road to 100 percent will be difficult, and the engine will not give up without a struggle. Internal combustion engines will continue to be the major source of vehicle power for decades to come.

Typical working cycles include two and four strokes, with various uses and benefits in processes, such as scavenging for charge- gas intake and exhaust (two- stroke) and intake and exhaust strokes (four- stroke), as well as compression and expansion strokes. Internal combustion engines must adapt and improve to minimize emissions, reduce fuel consumption, and maintain performance and power.

Furthermore, as fuel sources evolve, engines will need to adapt to use these new fuel sources. There are several predictions about the future of internal combustion engines.

-Shreya Chauhan
SE MME

The Next generation of Air Mobility

Mobility acts as an important activity in everyone's life. The large part of global energy consumption goes into mobility. As a result the sector is responsible for large amount of emissions impacting both human health and the environment.

The COVID-19 Pandemic had a severe impact on the aviation industry across the globe. The [pandemic has ben hard for aviation at large scale, But it also given us a hint what the next generation of commercial aircraft will look like. Efficiency and Zero-emission aircraft will be one of the key features of any aircraft.

AIR EMISSIONS

In the last two years the aviation industry has exploded with billions of passengers taking to their destination. A mid range aircraft also consumes thousands litre of fuel per hour emitting carbon dioxide and other pollutants in air. According to the Environmental and Energy Study Institute , aviation industry accounts for 2.4 % of global CO2 emissions. The emission is increasing day by day as the no of passengers are increasing. As a result the demand for more efficient aircrafts is also rising.

Both Boeing and Airbus, the largest aircraft manufacturing companies, are taking steps to counter the situation by building more efficient aircraft with high flight loads and enacting carbon offsetting schemes. The next generation of air mobility surely needs to reduce its carbon footprint to sustain in the upcoming future.

SUSTAINABLE AVIATION FUEL

Building a new aircraft takes up a huge capital investment along with time period of 10-12 years. Taking into consideration the near future waiting for such long period will not be a good choice. Therefore the manufacturers are working on how can a existing aircraft can be made sustainable and more efficient. Thats where Sustainable Aviation fuel comes into picture. Replacing the standard kerosene-based jet fuel with SAF (Sustainable Aviation Fuel) will reduce carbon emissions without new aircraft itself.

SAF is manufactured by combining waste products and raw materials from fuel manufacturing and other sustainable sources which are blended in standard aviation fuel. This mixture is used as a fuel for jets results in reduction in usage of fossil fuel per flight. Most

of the airlines are testing SAF including major airlines like Etihad Airways, Air India, Vistara.

However this biofuel is not a permanent solution it is a step towards emission reduction till the time a zero emission aircraft is manufactured.

NEXT GENERATION OF AIRCRAFT.

Recently boeing launched its new design for the future aircraft. Along with the collaboration of NASA a new design of aircraft was showcased. The plane carries a TTBW (Transonic Truss-Braced Wing) which is more aerodynamic and thinner than any current aircraft.

The best feature of this plane is the design and length of the wings. The wings can also fold into half with the support provided by the truss. The aircraft is also efficient with 9% reduction in fuel burn on a flight of up to 3,500 nautical miles. The aircraft is all set to be launched in 2030 and can be a leader narrowbody market and 737 replacement.

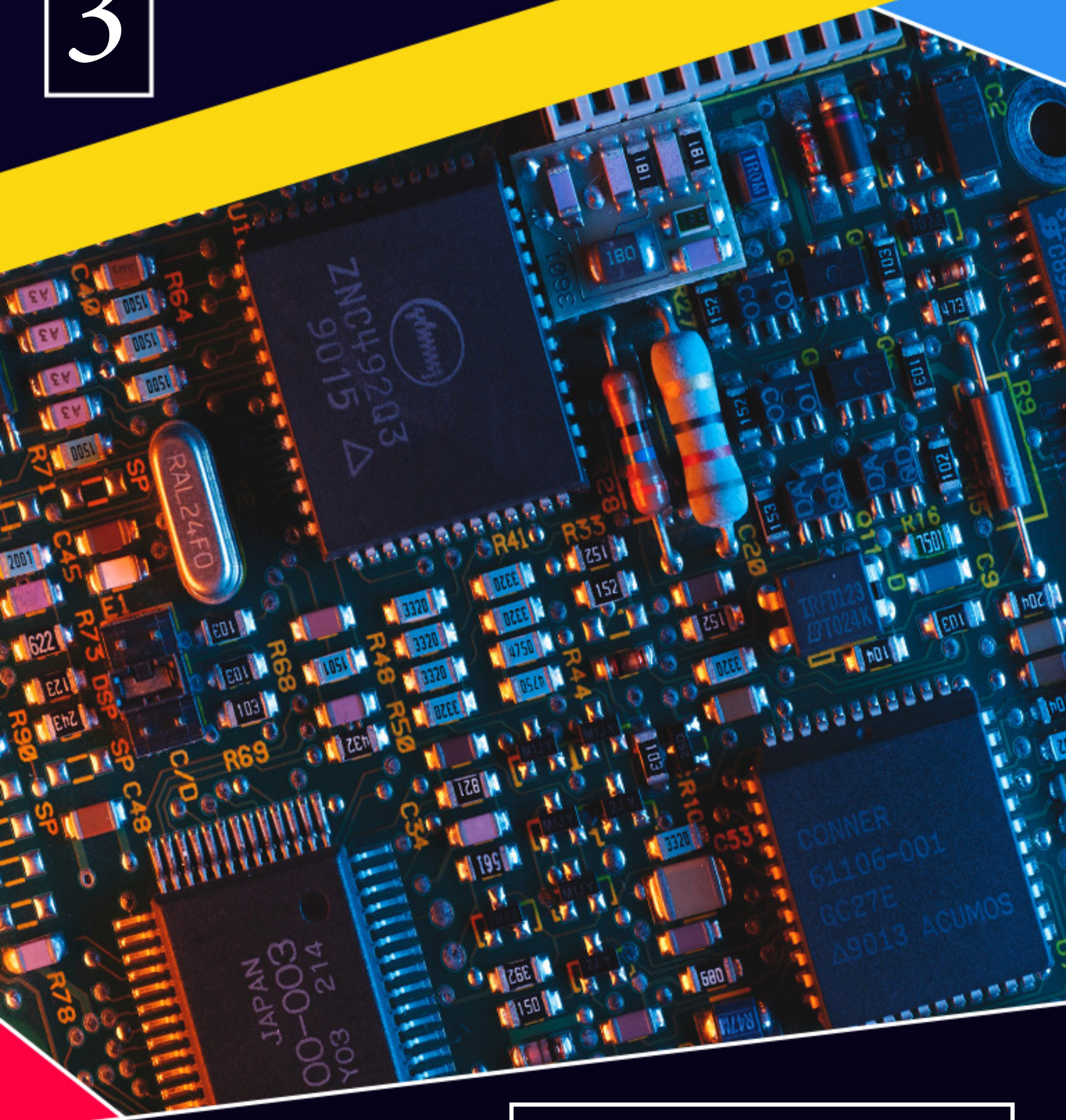
Meanwhile airbus is focusing on new idea of commercial aircraft with the features of zero emissions and new wing designs across the line. The aircrafts will be using hydrogen fuelinstead of traditional fossil fuels fulfilling their goal of zero emissions.

Hydrogen could be a great alternate and help achieve climate goals, however it needs further testing. All the three aircrafts of airbus cover different market segments. The first aircraft will cater for narrowbody replacement with a renge of over 2000nm and carries 120-200 passengers.

The second aircraft can be turn out to be replacement for 100 passengers aircraft. These two aircrafts offer effiecient replacements for the current generation aircraft.

- Zuned Chauhan
SE MECH

3



Emerging Technologies

HYPERLOOP TRAIN

INTRODUCTION:

Hyperloop is the future of transportation. Hyperloop is a high-speed transportation system. It is intended for public and freight transport. This term was made famous by Elon Musk. Used to describe a modern project based on the vactrain concept (first appeared in 1799).

INFORMATION ABOUT THE HYPERLOOP TRAIN:

Hyperloop systems consist of three basic elements: tubes, pods and terminals. A tube is a large sealed low pressure system (usually a long tunnel). The module is a car pressurized to atmospheric pressure that runs inside this tube with essentially no air resistance or friction using magnetic propulsion (augmented by a fan in some cases). The terminal handles arrivals and departures under the original form designed by Musk, differing from vactrains in that it relies on residual air pressure inside the tube to provide wing lift and fan propulsion.

HOW THE HYPERLOOP TRAIN WORKS:

The Hyperloop is a train-like transportation structure that can reach breakneck speeds. Hyperloop technology is still in development. With projected speeds of up to 750 miles per hour, it would be two to three times faster than bullet trains. Riders could travel from San Francisco to Los Angeles in 30 minutes. A company known as virgin hyperloop is working on these hyperloop trains. The Virgin Hyperloop uses a "near vacuum" in the tube, which allows for high speeds, low energy consumption and almost completely eliminates drag. Inside the tube, the battery-powered pods slide at speeds of up to 670 mph. It is a comfortable, quiet and safe experience for passengers on board.

HYPERLOOP DESIGN:

- Closed chambers can carry passengers or cargo.
- Low-pressure pipes reduce aerodynamic drag.
- Magnetic levitation (maglev) keeps each module moving above the track while it is on its way.
- An electric drive moves each module through the tube.

HISTORY OF HYPERLOOP TRAINS:

The Hyperloop moves via an efficient electric motor and friction is reduced in two ways:

• Unpressurized tunnels create a near-vacuum environment where almost all air is sucked out. This creates an environment where extremely high speeds are possible because there is minimal drag or wind resistance.

• Magnetic levitation (maglev) will cause each module to float. This eliminated wheel or tire friction that occurs in other forms of land transportation. This technology is already used in high-speed bullet trains. In the image above, the magnets are in red for levitation and propulsion. The magnets in blue are for horizontal stabilization.

Two maglev methods are currently being developed for hyperloop applications. Passive maglev uses a specific configuration of magnets that constantly create a current and keep the pod constantly moving. No external power supply is required. In another embodiment, active maglev combines passive-style permanent magnets with electromagnetic ones. This allows the current to be adjusted to smooth out the ride.

WHICH COMPANIES ARE WORKING ON IT:

1. Virgin Hyperloop:

Virgin Hyperloop (formerly Hyperloop One) is one of the best-funded hyperloop projects, giving it the most research and development funding. It also leads the way in patents and in 2020 completed the first ever hyperloop passenger test.

One of his major feasibility studies was how to connect Kansas City and St. Louis, MO, with a hyperloop track along the I-70 corridor. The company is currently designing full pods that would accommodate 28+ passengers. The final infrastructure should be able to transport 30,000 passengers per hour.

The company's timeline is to achieve safety certification by 2025 and carry passenger transportation by 2030. This year, the company will begin construction on a $500 million Hyperloop Certification Center in West Virginia, which will have a mile-long test track.

2. Hyperloop TT:

Hyperloop Transportation Technologies is not going it alone. The company has joined forces with other partners in construction and infrastructure. Hyperloop TT may not have as much capital as Virgin Hyperloop, but its business model is to have a broader strategy that creates a coalition with existing industries.

The Hyperloop TT has a test track in France. It plans to build a hyperloop between Abu Dhabi and Dubai, with the line operational by 2023. In the US, the company plans to operate a hyperloop by 2028, connecting Chicago, Cleveland and Pittsburgh. This route could potentially unify the labor market in the region while reviving regional manufacturing through the ability to transport goods quickly.

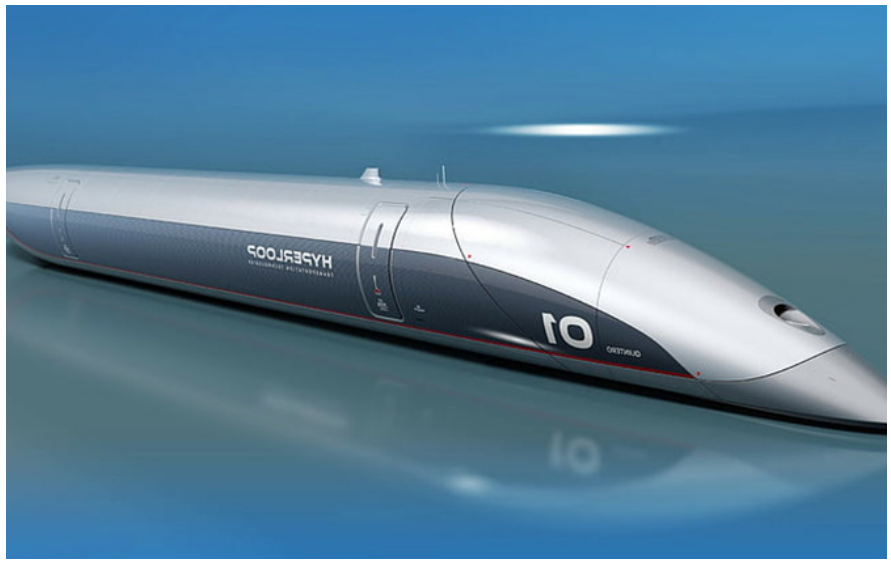
3. SpaceX Elon Musk Hyperloop:

Despite Elon sparking the current hype for hyperloop, Tesla and SpaceX are not developing hyperloops. Instead, Musk presented the world with a challenge to develop the technology. However, Musk is still involved in the industry. SpaceX has built a hyperloop test track for

student competitions near its headquarters.
In addition, Musk's tunneling company could benefit from the development of hyperloops. The Boring Company could be involved in building the underground tunnel infrastructure. Currently, Musk is looking at hyperloop tunnel projects that would connect NYC to Washington, DC, as well as from Los Angeles to San Francisco, and a third tunnel in Texas.

4. JTC20:

In 2020, a consortium of European and Canadian hyperloop companies became the next big player in the industry. This joint technical committee jointly deals with international standardization issues and will deal with regulation, interoperability and security. The group includes Hardt Hyperloop (Netherlands), Hyper Poland, TransPod (Canada) and Zeleros Hyperloop (Spain).



What are the advantages of Hyperloop technology?

1. High speed is one of the advantages of Hyperloop technology

Hyperloop pods reach speeds of more than 500 miles per hour up to 760 mph. This means that it is the fastest mode of transport ever. The hyperloop takes a maximum of 30 minutes to transport commuters from LA to SF and vice versa. The same distance usually takes 8 hours by car, depending on traffic.

2. Fast and frequent travel

Vacuum trains will reduce travel time where trains can cover a greater distance in less time to reach point B from point A and vice versa. More cargo and passengers can go and return on the same day. Apart from improving the livelihood of citizens, it would also improve business.

3. Hyperloop's main advantages include energy efficiency
The Hyperloop technology will use solar energy and reduce passenger emissions from transport by 90 to 95%. According to Tesla Motor founder Elon Musk, the Hyperloop modules will run on wind power and solar magnets that control the movement of the modules and stop them whenever necessary.

Elon Musk also said that the hyperloop technology would generate more energy than the capsule would consume. Solar panels would be placed on the roof of the tubes to supply constant energy for its operation.

4. Cheaper way of transportation

The hyperloop is estimated to cost about 1/10th of what California's high-speed rail system costs. This means passengers can pay as little as $25 for a single trip. However, the Hyperloop Train project is estimated to cost around $7.5 billion.

Project engineers, on the other hand, believe that a hyperloop project may cost more than a high-speed rail system, as costs may vary

slightly. But this is still one of the advantages of hyperloop technology, given that no other train can reach its destination as fast as hyperloop pods.

5. Sustainability

The hyperloop technology system runs on clean energy, as there will be no carbon footprint from solar and wind power. There will be no Hyperloop Transportation Technologies emissions as the system is built on an electrified mechanism.
HTT uses a combination of solar, kinetic, wind and geothermal energy sources. This technology would produce 20% more energy than the pods consume.

WHAT ARE THE DISADVANTAGES OF HYPERLOOP TECHNOLOGY?

Although the HTT system is sustainable and far superior to conventional transportation systems, there are still numerous limitations of hyperloops. Cash outlays, external issues, and even technical glitches haunt project developers and engineers. Some of the issues are listed below.

1. Chances of failure are dire disadvantages of Hyperloop

Since the network of tubes is extensive for hyperloop transportation, the entire system needs careful monitoring and maintenance. Even a fleeting patch of technical glitches, power outages or breakdowns can occur at any time.

Even a single dent can cause the vacuum to collapse, which would be even more painful as the tube extends to enormous lengths. In addition, an accidental bump into one of the pillars supporting the tube can lead to disaster. For these disadvantages of hyperloop technology, the entire network would have to be monitored 24/7.

2. The human factor

Hyperloop tubes are airtight, narrow, less spacious and without ventilation. Experts speculate that this would cause many problems for passengers as they are not used to traveling this way.

The lack of ventilation would lead to claustrophobia as there are no windows and passengers would travel in small capsules. Passenger movement would also be restricted during the journey.

3. Steel strips will expand due to thermal expansion

The Hyperloop technology will use steel belts for the capsules. Steel expands and contracts as the temperature rises and falls. When the tracks warm up, they change their volume.

Linear expansion is one of the common drawbacks of hyperloop transportation, as it can destroy the tube in the process. The only way to reduce this problem is to leave small gaps in the right places, just like traditional railways.

- Prasad Jadhav
SE MECH

THE FUTURE OF DRONE MOBILITY

Drones were originally introduced as military/police equipment and were primarily used for surveillance and surveillance against targeted attacks. Applications and usage of this technology have since evolved to include a variety of labor-intensive and complex tasks across all industries. These include detecting defects in oil/gas pipelines, checking crop health, detecting hot spots in fire situations, monitoring mining and construction activities, filming movies, delivering packages, and more.

Drones are a game-changing technology that will change in ways we never imagined in the next decade. We may not think much about the future of drones, but drones will have a profound impact on our entire lives. The drone is literally out of this world. NASA successfully landed a Perceive Lance rover on Mars earlier this year, carrying an important payload, Mars Her Ingenuity helicopter.

The first location at Urban Airport opens this month and serves as a blueprint for more than 200 similar drone stations around the world over the next five years as air taxis
and automated deliveries become a reality. is the first hub in Coventry, UK and is backed by the UK Government, Supernall (Hyundai's Advanced Air Mobility division) and Coventry City Council.

In addition to take-off and landing areas, there is a click and collect variation. Major retailers such as fashion brand Anatomy, Italian food maker Bottega, caterer Compass Group, electronic signage specialist LG Business Solutions, intelligent vending machine provider Mother, and fashion label Paul & Shark. The merchant and food and beverage brand has signed an agreement with Urban Air. Offer a new customer experience.

This was the first time drone technology was tested in another world. The Ingenuity flight was short, but it's a Wright Brothers moment. Ingenuity has made several successful flights in the much thinner atmosphere of Mars, and is now at NASA's Jet Propulsion Laboratory.

extended the flight for another month of testing. This is just a small step in the development of drones.

WHERE DRONES ARE TODAY

Today's commercial drones fall into the electric vehicle (EV) category. Yes, just like electric cars, drones offer another important option to stave off greenhouse gases and become carbon neutral.

Artificial intelligence (AI) is also powering the future of drones. AI can increase the speed of drones in several industries because it works in situations and conditions where humans cannot. Similar to Automatic Dependent Surveillance Broadcast (ADS-B), real-time data can also be analyzed to adjust flight telemetry based on terrain and other obstacles. ADS-B provides situational awareness and self-isolation between aircraft and has been used in commercial aircraft for years

In addition to technology, industry regulations have helped mitigate safety concerns. The Federal Aviation Administration (FAA) recently issued guidelines requiring digital license plates that can remotely identify unmanned aerial vehicles. This is an important step towards integrating small unmanned aerial vehicles into the country's airspace

Artificial intelligence (AI) is also powering the future of drones. AI can increase the speed of drones in several industries because it works in situations and conditions where humans cannot. Similar to Automatic Dependent Surveillance Broadcast (ADS-B), real-time data can also be analyzed to adjust flight telemetry based on terrain and other obstacles. ADS-B provides situational awareness and self-isolation between aircraft and has been used in commercial aircraft for years

In addition to technology, industry regulations have helped mitigate safety concerns. The Federal Aviation Administration (FAA) recently issued guidelines requiring digital license plates that can remotely identify unmanned aerial vehicles. This is an important step towards integrating small unmanned aerial vehicles into the country's airspace system.

This identification technology is an integral part of the FAA's ability to fly drones autonomously "beyond visual range (BVLOS)." Similar to advances in the automotive industry, these autonomous capabilities include the integration of LiDAR with new ones. With these advances and regulations, passenger flying machines, many times larger than most light commercial drones today, will soon introduce Urban Air Mobility (UAM) to our highway systems.

ADOPTION OF DRONES IN THE RETAIL AND LOGISTICS INDUSTRY

The retail and logistics industry is investing in and using drone technology to implement alternative and scalable delivery models. Industry giants such as Amazon, UPS,
DHL, and Walmart have already implemented drone delivery services on their platforms. The industry is also supported by specialist drone delivery providers and technology
providers such as Wing, Zipline and Matternet. The global drone package delivery market size is estimated to be USD 8 billion by 2027, growing at a large CAGR of 41.8%.

Countries Leading Adoption of Drone Delivery is: Asia - China and Japan for packaging a

2. Africa - Providing medicines and test samples in remote areas of Rwanda and Ghana.

3. Oceania – Australian and Vanuatu food, personal and home care products.

4. Europe – Finnish, Icelandic and Swiss food, pharmaceutical and other retail products

5. United States - Several states in the United States and Canada have different packages.

DRONE DELIVERY OPERATIONS

The Drone Delivery Ecosystem includes

1. National Aviation Authority (key stakeholder in all air traffic management operations)
2. International Civil Aviation Organization
3. Drone Owners/Drone Service Providers
4. Drone Pilots (Remote Pilots Flying Drones)

CHALLENGES TO DRONE INDUSTRY

Manpower Availability for Large Scale Operations: The availability of skilled and experienced drone delivery resources is limited.
Infrastructure: The cost of initial drone implementation and setup is high. Setting up drone launch pads, coordinating drone movements with buildings and open spaces, licensing, battery charging facilities, software and technology,
training facilities, and research and development all require significant investments. Public Acceptance: Many consumers are still reluctant to accept drone deliveries due to privacy and security concerns.Weather Effects: Efficient drone delivery depends on weather conditions such as rain, wind and snow. Drone Abuse: Packages can be stolen and drone equipment can be damaged.

THE FUTURE OF DRONES

Drone technology and the use of drones for deliveries is essential. Soon, several industries will use drone technology to bring innovation to businesses such as surveillance, research and last-mile delivery. The e-commerce giant has been at the forefront of drone technology research, development and patent filings since 2005 and continues to invest.
Entering this field, we focus on reducing last-mile delivery operating costs, improving delivery times, and integrating drone technology into mobile phone applications to provide a better user experience. Drone delivery services will continue to grow in the coming years. Companies must continue to invest in improving their drone delivery programs and technology before realizing operational growth and cost advantages.

As cities around the world scramble to find solutions to their traffic jams, Uber Air suggests it's closer than you think, taking a sizable chunk of the UAM pie themselves. trying to separate. According to Reportlinker's Global Forecast to 2030, the UAM market is expected to grow from $2.6 billion in 2020 to $9.1 billion in 2030, with ideas such as Vertiplaces, Vertiports and Vertistops being adopted. increase. Recently, the FAA, NASA, and others developed plans to support NASA's Advanced Air Mobility (AAM) efforts, awarding Oneida County his $897,000 contract for his AAM and Vertiport development at Griffith International Airport. I was. Much of the future of drones may seem like science fiction, but it's a lot closer than you think. UAM and the con-

cept of Vertiplaces and Vertiports could change our urban landscape, so executives should keep up with these changes, see how they impact their businesses, analyze data and cost Should offer a reduction. One recent example is Joby Aviation, which announced a partnership with America's largest parking operator to create new parking spaces for urban air taxis

Recently, the FAA, NASA, and others developed plans to support NASA's Advanced Air Mobility (AAM) efforts, awarding Oneida County his $897,000 contract for his AAM and Vertiport development at Griffith International Airport. I was. Much of the future of drones may seem like science fiction, but it's a lot closer than you think. UAM and the concept of Vertiplaces and Vertiports could

change our urban landscape, so executives should keep up with these changes, see how they impact their businesses, analyze data and cost Should offer a reduction. One recent example is Joby Aviation, which announced a partnership with America's largest parking operator to create new parking spaces for urban air taxis

As cities around the world scramble to find solutions to their traffic jams, Uber Air suggests it's closer than you think, taking a sizable chunk of the UAM pie themselves. trying to separate. According to Reportlinker's Global Forecast to 2030, the UAM market is expected to grow from $2.6 billion in 2020 to $9.1 billion in 2030, with ideas such as Vertiplaces, Vertiports and Vertistops being adopted. increase. Recently, the FAA, NASA, and others developed plans to support NASA's Advanced Air Mobility (AAM) efforts, awarding Oneida County his $897,000 contract for his AAM and Vertiport development at Griffith International Airport. I was. Much of the future of drones may seem like science fiction, but it's a lot closer than you think. UAM and the concept of Vertiplaces and Vertiports could

change our urban landscape, so executives should keep up with these changes, see how they impact their businesses, analyze data and cost Should offer a reduction. One recent example is Joby Aviation, which announced a partnership with America's largest parking operator to create new parking spaces for urban air taxis

In my experience, drones can impact nearly every business and quickly deliver a positive return on investment

For example, all business functions such as delivery, surveying, site selection, construction, real estate, agriculture, indoor and outdoor inspection are affected by drones. Here are three tips for getting started with this new technology.

2. If you are unsure about using drones in your business, consider a drone service provider as a starting point.

3. If you are considering implementing or expanding the use of drones in your organization, consider engaging a consultant who can help reduce implementation time and grow your program in a cost-effective manner.

Either way, the future of drones is clean, efficient and quiet. Drones are rapidly evolving beyond data collection into heavy-duty transportation vehicles, transporting us into the future. Note George Jetson. The future is today.

Flying Drones and Robotaxis accelerate the transportation of people and goods. A CIO must incorporate air mobility into his supply chain strategy to remain competitive. US-based startup

- Kunj Sharma
SE MECH

BRT System

Bus rapid transit (BRT), also known as a busway or transitway, is a bus-based public delivery gadget designed to have a good deal more potential, reliability and different fine features than a conventional bus machine.Normally, a BRT device consists of roadways which might be dedicated to buses, and offers priority to buses at intersections where buses can also interact with other traffic
; alongside layout functions to lessen delays because of passengers boarding or leaving buses, or paying fares. BRT targets to combine the capacity and speed of a mild rail line with the claimed flexibility, decrease price and simplicity of a bus device.

The world's first BRT system was the Busway in Runcorn New Town, England, which entered service in 1971. As of March 2018, a total of 166 cities in six continents have implemented BRT systems, accounting for 4,906 km (3,048 mi) of BRT lanesand about 32.2 million passengers every day.

Bus rapid Transit is a method of mass fast transit (MRT).Bus speedy transit takes its name from rail speedy transit, which describes a excessive-ability urban public-transit gadget with its personal right of way, multiple-car cars at quick headways, longer prevent spacing than conventional streetcars and buses, platform-level boarding, and preticketing.

The expression "BRT" is specially used within the Americas and China; in India, it is called "BRTS" (BRT machine); in Europe it is often called a "busway" or a "BHLS" (stands for Bus with a high degree of service). The term transitway become originated in 1981 with the outlet of the OC Transpo transitway in Ottawa, Ontario, Canada.

Critics have charged that the time period "bus fast transit" has once in a while been misapplied to systems that lack maximum or all of the critical features which differentiate it from conventional bus services. The time period "bus rapid transit creep" has been used to describe seriously degraded levels of bus carrier which fall a long way brief of the BRT general promoted with the aid of the Institute for Transportation and improvement policy and different corporations.

THE MAIN HIGHLIGHTS OF BRT SYSTEM ARE

1. Dedicated lanes and alignment
2. Off-board fare collection
3. Intersection treatment
4. Platform-level boarding
5. High capacity vehicles
6. Quality stations
7. Prominent brand or identity
8. In tunnels or subterranean structures

- Dedicated lanes and alignment- Bus-only lanes make for faster travel and ensure that buses are not delayed by mixed traffic congestion

- Off-board fare collection- Fare prepayment at the station, instead of on board the bus, eliminates the delay caused by passengers paying on board

- Intersection treatment- Prohibiting turns for traffic across the bus lane significantly reduces delays to the buses. Bus priority will often be provided at signalized intersections to reduce delays by extending the green phase or reducing the red phase in the required direction compared to the normal sequence

- Platform-level boarding- Station platforms should be level with the bus floor for quick and easy boarding, making it fully accessible for wheelchairs, disabled passengers and baby strollers, with minimal delays.

- High capacity vehicles- High-capacity vehicles such as articulated or even bi-articulated buses may be used, typically with multiple doors for fast entry and exit. Double-decker buses or guided buses may also be used

- Quality stations- BRT systems typically feature significant investment in enclosed stations which may incorporate attractive sliding glass doors, staffed ticket booths, information booths, and other more standard features listed above. They will often include level boarding, using either low-floor buses or higher boarding platforms level, and multiple doors to speed passenger boardings and enhance accessibility to disabled passengers

- Prominent brand or identity- A unique and distinctive identity can contribute to BRT's attractiveness as an alternative to driving cars,[33] (such as Viva, Max, TransMilenio, Metropolitano, Metronit, Select) marking stops and stations as well as the buses

- In tunnels or subterranean structures- A special issue arises in the use of buses in metro transit structures. Since the areas where the demand for an exclusive bus right-of-way are apt to be in dense downtown areas where an above-ground structure may be unacceptable on historic, logistic, or environmental grounds, use of BRT in tunnels may not be avoidable.Since buses are usually powered by internal combustion engines, bus metros raise ventilation issues

similar to those of motor vehicle tunnels. Powerful fans typically exchange air through ventilation shafts to the surface; these are usually as remote as possible from occupied areas, to minimize the effects of noise and concentrated pollution.

Bus Rapid Transit (BRT) Systems Market – Covid-19 Impact and Recovery Analysis and Market Size:

Tracking the direct effect of COVID-19 in this market, in addition to the oblique impact from different industries. This Bus rapid Transit (BRT) systems market document offers specific evaluation supported with the aid of reliable facts on sale and revenue via gamers for the period 2017-2022. The record additionally

includes agency description, foremost business, Bus speedy Transit (BRT) systems product creation, current tendencies and Bus rapid Transit (BRT) structures sales by using place, kind, utility and with the aid of income channel.

global Bus fast Bus speedy Transit (BRT) structures market is segmented with the aid of players, vicinity (usa), by way of type and through utility. gamers, stakeholders, and different contributors within the international Bus rapid Transit (BRT) systems marketplace could be capable of gain the upper hand as they use the report as a powerful useful resource. The segmental analysis specializes in revenue and forecast with the aid of kind and through utility for the length 2017-2028.

report further research the marketplace improvement reputation and future Bus rapid Transit (BRT) systems marketplace trend across the world. additionally, it splits Bus rapid Transit (BRT) structures market Segmentation via type and by applications to absolutely and deeply research and monitor market profile and potentialities.

THE MAJOR PLAYERS IN THE BUS RAPID TRANSIT (BRT) SYSTEMS MARKET ARE:

- Cubic
- Xiamen Kinglong
- MAN Corporation
- Yutong Group
- Init
- Jiangsu Huimin Traffic Facility
- Innovation
- Youngman
- Lantianyuan Technology
- Qingdao Hinsense
- Novasbus
- Rapid Transit
- Volvo Group
- ZF
- ITDP
- Siemens

FUTURE SCOPE:

EXPANSION OF BRT NETWORKS:

India's BRT community has increased appreciably from 2009 to 2018. The operational community increased from 30 km in 2009 to approximately 360 km by mid-2018. currently, the transit gadget is operational in 11 cities – Ahmedabad (a hundred and fifteen.6 km), Indore (eleven.sixty five km), Rajkot (10.7 km), Bhopal (23 km), Pune (sixteen km), Amritsar (25 km), Jaipur (42 km), Naya Raipur (6.59 km), Surat (29.nine km), Visakhapatnam (forty three.36 km) and Pimpri-Chinchwad (35.fifty nine km).In the meantime, the BRT machine in Hubli Dharwad is currently on the improvement stage. it's going to span a period of 22.25 km along the Hubli-Dharwad state highway and comprise corridors – Hosur Circle to Dharwad imperative Bus Terminus (CBT) (hall 1, 19.five km) and Hosur Circle to Hubli CBT via Rani Channamma Circle and the Hubli railway station (hall 2, 2.seventy five km). In October 2018, trial runs were performed for the challenge that is likely to be operational by way of end November 2018.

In the meantime, BRT initiatives are being proposed for any other 5 cities on a pilot basis, protecting an overall distance of 166.2 km. except, plans also are afoot for increasing the prevailing BRT corridors in Pimpri-Chinchwad, Pune and Indore.

In Nagpur, Maharashtra Metro Rail enterprise restrained is making plans to develop a BRT gadget, spanning a duration of twenty-two.5 km, to perform at the Amravati, Katol, Karadi and Umrer roads, at an anticipated price of Rs 4.5 billion. A complete mobility plan is being prepared for the undertaking.

The Delhi authorities has proposed the revival of the BRT system within the town by using introducing an express bus carrier (additionally known as BRT 2.0) from Karawal Nagar to the Mori Gate bus terminal, covering a distance of thirteen km. It has already appointed Delhi incorporated Multi-Modal Transit gadget confined (DIMTS) for carrying out the feasibility observe for the hall.

furthermore, the municipal groups of Pimpri-Chinchwad and Pune are presently within the technique of carrying out initial works for increasing the prevailing BRT networks in the respective cities.

The Indore Municipal corporation has proposed the development of some other 14 km long BRT device on the excellent corridor within the town. besides, the feasibility take a look at and distinctive venture document practise is under manner for the currently announced BRT initiatives in Hyderabad (9 km), Chennai (ninety six.7 km) and Kochi (25 km).

KEY CHALLENGES

Even though the BRT network has expanded considerably over the years and is planned to be expanded further, the system has not been very successful in India. For instance, the Delhi BRT was dismantled in 2016 owing to poor planning, low frequency and poor connectivity. Besides, the BRT systems in Surat, Bhopal and Indore have also failed to meet their core objectives of increasing public transport users and reducing the number of road accidents.
Besides, land acquisition issues, implementation delays, poor planning, and poor civic and traffic sense are other issues that affect the success of BRT projects. To address these issues, measures such as proper planning, deployment of advanced technologies, adequate financing, strict traffic vigilance, effective coordination among stakeholders, proper connectivity to bus stations, etc., are required to be taken. This can effectively help in converting the failed BRT model to an efficient and reliable mode of public transport.\
Conclusion:
Bus rapid transit (BRT), is a effective and advantageous mobility system but its growth has been severely hit by corona virus but it will continue to develop and will increase its importance in the society as it provides ease to the numerous travellers.

- Tarun Mugdal
SE MME

SELF DRIVING CAR

Self-driving or Autonomous or Robotic car comprises of various sensors such as Thermographic cameras, radar, lidar, sonar, GPS, odometry and inertial measurement units which are capable of sensing environment and allows movement of cars safely with little or no Human Input .Automation of cars is developed on the basis of six levels of automation by SAE International they are Level 0 - no automation; Level 1 - hands on/shared control; Level 2 - hands off; Level 3 - eyes off; Level 4 - mind off, and Level 5 - steering wheel optional. Various companies work on the development of self-driving cars either by self or by collaboration with major car manufacturing companies.At present few companies got license approval to launch their cars and run on roads at level-3. Whereas TESLA,TOYOTA launched level-4 cars and BAIDU in China provided driverless taxi service for their people.

At present if we talk about we are at level two in terms of autonomous which means self controlled sterining, brakes ,speeding which is based on the activities detected by the sensors such as lidar which allows self driving vehicles to make calculated decisions with its ability to detect objects in its immediate environment and move accordingly,GPS used to get the location and guide you accordingly before automation the major requirement of electrification few years of ago who thought that without wasting a single unit of gas we could travel hundreds kilometer long ,but now its possible and growing rapidly .most manufacturing company are now selling their EV with automation features and by 2025 it is assumed that entire world will use Electric vehicles and the topic which will remain debatable is its level of autonomous.

Ultimately autonomous cars aim to eliminate human errors while creating more time and space for what truly matters and improve mobility for those who cannot drive currently due to disability ,age limit ,or other factors for example if no one is at home and if somehow a person got injured or a pregnant lady faces labor pain or some other problem so they can reach hospital safely for this the aim is to reach level4 or level5 to meet solutions of this type of natural problems.

In India Few startups and companies are working on the development of autonomous cars at level 4and5. They are Minus Zero ,Swaayatt Robots ,Flux auto ,Auto NXT Automation ,Flow mobility ,Quixote ,Accelo ,Isenses ,Add Innovation ,Tractor Genie.
World wide Waymo ,GM Cruise ,Argo AI are the leading companies in self-driving cars manufacturing .Waymo in Arizona recently announced plans to launch autonomous car rides for people soon ,whereas Argo AI are soon expected to lead the market.

According to experts autonomous cars are much more safer than human operated cars as humans where interact with various distractions causes accidents and autonomous cars with AI control provides minimal or no life risks on roads .Earlier it was like a sci-fi and now it gains lots of interest and after pandemic most of the peoples ideology shifted towards autonomous in various fields and cars are one of those ,Japan the most advanced nation approved driver less cars in their nation but in highly populated nations it stills job opportunities but in future it will strengthen its roots in India .Experts view is that till 2030 most nation will run autonomous vehicle and around 2035 India will also be fully automated.

EXPERTS PREDICTION ON FEATURES IN AUTONOMOUS VEHICLES IN FUTURE:

1.Fully functioning office spaces 2.Additional Entertainment options 3.Enhanced safety Features 4.Various driving modes 5.Additional cargo capacity 6.Privacy &Cybersecurity features.Customizable Interiors 8.Robust Communications Systems 9.Hybrid Road & air capabilities.

Automation will be a must in future and it will create various opportunities and it will be the key to success and development.

- Agnesh Kushwaha
SE MECH

Today, many companies are researching ways to conquer urban airspace. It makes me imagine a skyscraper trip like a scene from “Blade Runner” or “Fifth Element”. The emerging technology should be viewed with both hope and skepticism. Some experts question the practicality and sustainability of air taxis for solving major urban transport problems.

WHAT IS AN AIR TAXI?

An air taxi, air taxi or aero taxi is a small city or commuter aircraft that carries passengers.
The limits of this definition are limited to the many possibilities that air transportation has offered over the last decade. In a new era where drones are knocking on the door of freight transport, the next sensible step would be to adapt this solution to passengers.. This aircraft combines many well-known innovations:

There is a strong desire to develop self-driving models (Airspace has certain advantages in that this technology overcomes the obstacles encountered in land transportation.
Potential for reducing travel times in cities
Air Taxi Service Offers The services offered by Air Taxi consist of carrying a small number of passengers or a single passenger. Within this premise, there are many modalities. For example, Brazilian on-demand flight platform Flapper offers four types of her:

I. Helicopter Flight.
II. Shared flight.

The aircraft, dubbed ‘Empty Legs’ by the company, return from outbound flights and offer return flights at a low cost.

Industry innovation promises to take over the city’s airspace in the years to come, but this type of service began in the 1960s. Apart from traditional commercial flights, they represented a form of private transportation for the little-to-be-afforded elite. It is one of the privileges of athletes. The question today is whether the current format can open the door to transportation for the masses at an affordable price.

Fares will be significantly higher if the flight departs from or arrives at a remote airport away from public airports. The reason for this is that these types of companies typically operate between major airports.
Historically, this mode of transport has had myriad limitations with respect to mass transit applications. Recent innovations, especially in the area of eVTOL, are revolutionizing.

The idea is to turn air taxis into a less polluting, more profitable and affordable business that can reduce transportation time.

TECHNOLOGY MATURITY

Many research centers and companies around the world are working on this utopia
This is the case with the VA-X4 from the British company Vertical Aerospace, which has a range of about 160 kilometers.

Of course, the electrification of aviation always has the same implications as land transport. Invest in battery chemistry, develop technology and fast charging points to increase autonomy.

MORE SUSTAINABLE AND LESS POLLUTING THAN CARS...?

Avolon, in a statement to The Guardian, proposes making a successful landing at the same, or at least similar, price to a traditional taxi.

The same article points out that some sources predict a green revolution thanks to air taxis. They cause one-fifth of the emissions from helicopters. And recent calculations from the University of Michigan calculated that his three-passenger eVTOL at full capacity emits 52% less emissions than a gas car and 6% less than an electric car. 1.5 people.

Other solutions addressing the sustainability and feasibility barriers of this new era of air travel can be found in a project developed by the German company Lilium.

They have the support of national authorities and are expected to enter commercial service as air taxis in 2024. Lilium is also working with ABB on another challenge related to the charging infrastructure sector.

LEGAL ASPECTS OF URBAN AIRSPACE

This technical challenge is also solved by drone technology. For several years, China's eHang has focused on an electric prototype that can provide these short urban air transport services.

The latest models eHang16 or VT-30 are legally accepted in some parts of the world such as Norway and Spain. This is another urgent challenge facing the sector by covering legal loopholes and obstacles affecting airspace.

SMALL CITY AIRPORT

This revolution reminds us of the scale of our infrastructure. Is it possible to expand the network of micro-airports?

This is what the Californian company Joby Aviation has so far completed more than 1,000 of his eVTOL test flights. One of his specialties is getting passengers from home to work without going through airports (and of course without traffic jams). With the support of the authorities, the company has signed contracts with real estate agents and parking lot managers with a view to constructing the roof.

In the UK, the government is sponsoring the Urban Airports initiative to build the first of his eVTOL-designed miniports in Coventry. Theoretically, it will be the first of 200. Hyundai is also working on this project. South Korea hopes to launch its own air taxi prototype by 2028.

Will taxis fly in the future? As with many other new technologies, there is no easy answer to this question.

The outlook for the industry is encouraging. Frost & Sullivan believes air taxi services will begin in the Middle East, New Zealand or Singapore this year. The study shows that by 2040 he will achieve a CAGR of 45.9% to serve 430,000 units worldwide.

- Raj Jaiswar
SE MECH

Covering regarding three quarters of the area of the earth, the ocean may be a crucial supply of sustenance, medicine, and commerce. However, such a huge expanse in each surface area and depth presents a myriad of challenges in observation, exploration and underwater operation, cherish corrosion, cloudy water, vasoconstrictor and high pressure. Realistic constraints need additional advanced theory, methodology and instrumentation for underwater robots.

The goal of this analysis topic is to develop advanced underwater golems, capture new and rising underwater robot theories, technologies and challenges, promote discussion of universal materials, modules, or different devices to confirm a coherent system of capabilities for underwater robots, and to foster innovation and collaboration among all interested parties. Capabilities during this space hold the potential to revolutionize the eventualities of underwater observation, exploration and operations, creating them a lot of intelligent and property and pressing the time required to i m - plement new capabilities for emerging needs.

Potential topics include, however aren't restricted to:· Bionic and new abstract underwater robots

· Underwater soft robots

· Autonomy and intelligence in underwater robots

· Underwater navigation, steering and management in dynamic environments

· Ocean observation and exploration victimization underwater robot

s· Underwater operation robots

· Novel materials, devices and technology for enhancing underwater robots.

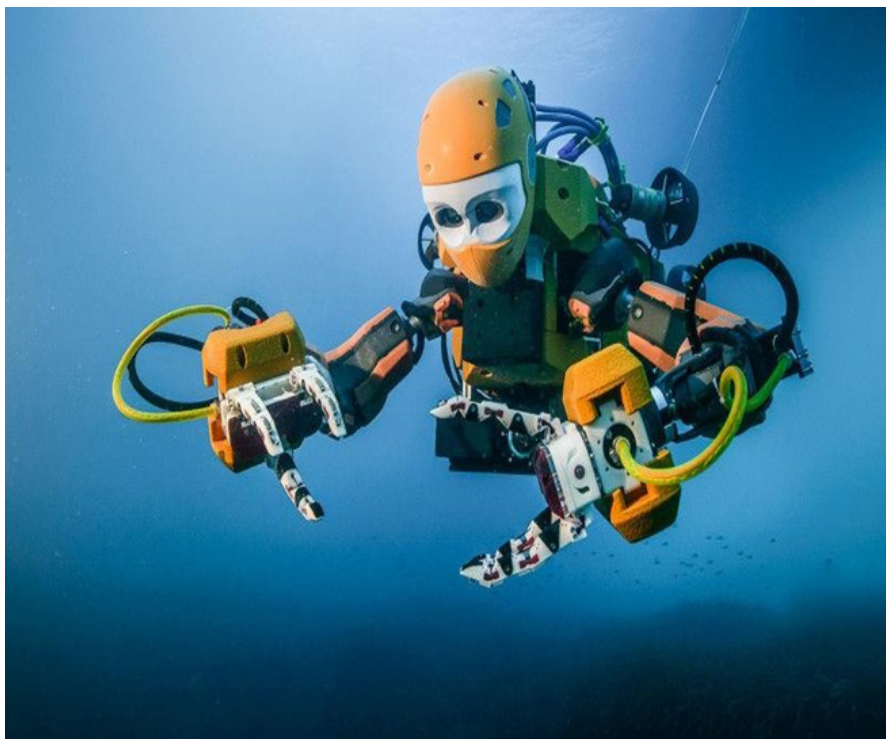
The marine setting represents a difficult framework for the exploitation of latest automation-related methodologies and technologies. The oceans cowl over 70% of the earth's surface and support anestimated 90% of the life forms on our planet. They represent one among the most resources for food, employment, andeconomic revenue, and are a possible supply of still unknown living and

mineral resources, similarly as various and sustainable energies. From a scientific purpose of view, the deep ocean is believed to carry the key to the origin of life. At identical time, the oceans also harbor a massive cultural heritage within the forms of archeologic sites nevertheless to be explored. However, the oceans stay for the most part unknown, with 2 thirds of them remaining still undiscovered.

This is very true within the case of the deep ocean: deep, dark, vast, and subject to tremendous bar pressure, the lowest of the ocean is the biggest element of the surface of our planet and nonetheless it's additionally the smallest amount known. Clearly, a lot of work remains to be done to own a synoptic read of the open ocean and also the deep oceans over extended areas of interest and to use the resources obtainable in an exceedingly property manner. this may need the development of new ways and tools for ocean exploration and exploitation and the reinforcement of robust cooperative links among universities, analysis institutes, companies, and stakeholders worldwide to satisfy this goal.

In line with the higher than trend, there's presently worldwide interest within the development of latest tools to support the exploration, observation, sampling, and protracted observation of the marine environment. The

styles of operations required are tough to be accomplished exclusively through sheer human effort. Therefore, the hunt for the employment of advanced technological tools like remotely operated vehicles and totally autonomous robots to boost the potential to enhance the human information on such a large and mysterious environment. Maritime and armed service applications such as ship monitoring and maintenance, emergency operation support, offshore inspections and different connected activities also can enjoy scientific and technological enhancements on advanced technologies for ocean exploration.



As within the case of house exploration, the ocean setting places formidable challenges to the event of autonomous and/or persistent systems for exploration and sampling. In fact, engineers and scientists should attempt to meet the extraordinarily tight style constraints obligatory by the cruel conditions that each surface and underwater platforms have to face.

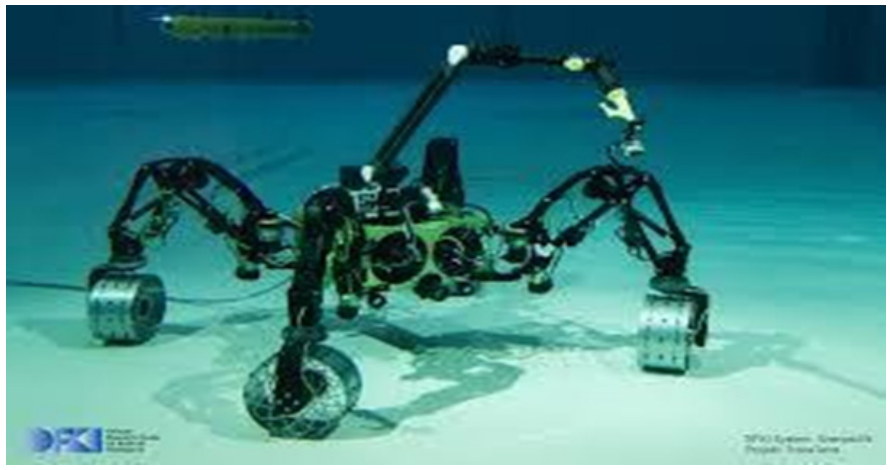
Among these, the following are worth stressing:

1. high pressures and low temperatures concerning extraordinarily deep or harsh environments (e.g., abyssala and polar areas) need appropriate parts and water-tight containers and equipment.
2. underwater communications mandate the employment of acoustic devices that in difficult operational eventualities are plagued with intermittent communication losses and multi-path effects and exhibit reduced information measure and low reliability,
3. long vary missions require that the vehicles be equipped with correct power offer systems (also relying on alternative technologies corresponding to fuel cells,

biological batteries, star panels, etc.) and economical energy management systems.

DOMAIN OVERVIEW:

Marine AI encompasses a very big selection of topics that are sometimes outlined as application domains. In every domain, autonomous marine systems play a key-role within the accomplishment of specific difficult scientific, commercial, and social group goals. The latter will solely be met through committed analysis and development work resulting in up-to-date methodologies and technologies that are steady affording marine robots the potential to handle increasing advanced problems.



RELEVANT COMES:

Following the applying domain classification, variety of relevant projects concerning every domain are in brief delineate next. within the process, we tend to highlight their innovative options aimed toward rising single and multiple vehicle systems performance, reducing costs, and enhancing operational safety.

CHALLENGES:

Marine robots represent 2 major categories; remotely operated and autonomous. the primary embrace Remotely Operated Vehicles (ROVs), whereas a representative cluster of the latter consists of Autonomous Underwater Vehicles (AUVs), typically remarked as pilotless Underwater Vehicles (UUVs). within the last twenty

years, ROVs and AUVs have steady become the work- horses of scientific/commercial underwater exploration and exploitation, going away the utilization of manned submersibles for terribly explicit and specialized.

FUTURE TRENDS:

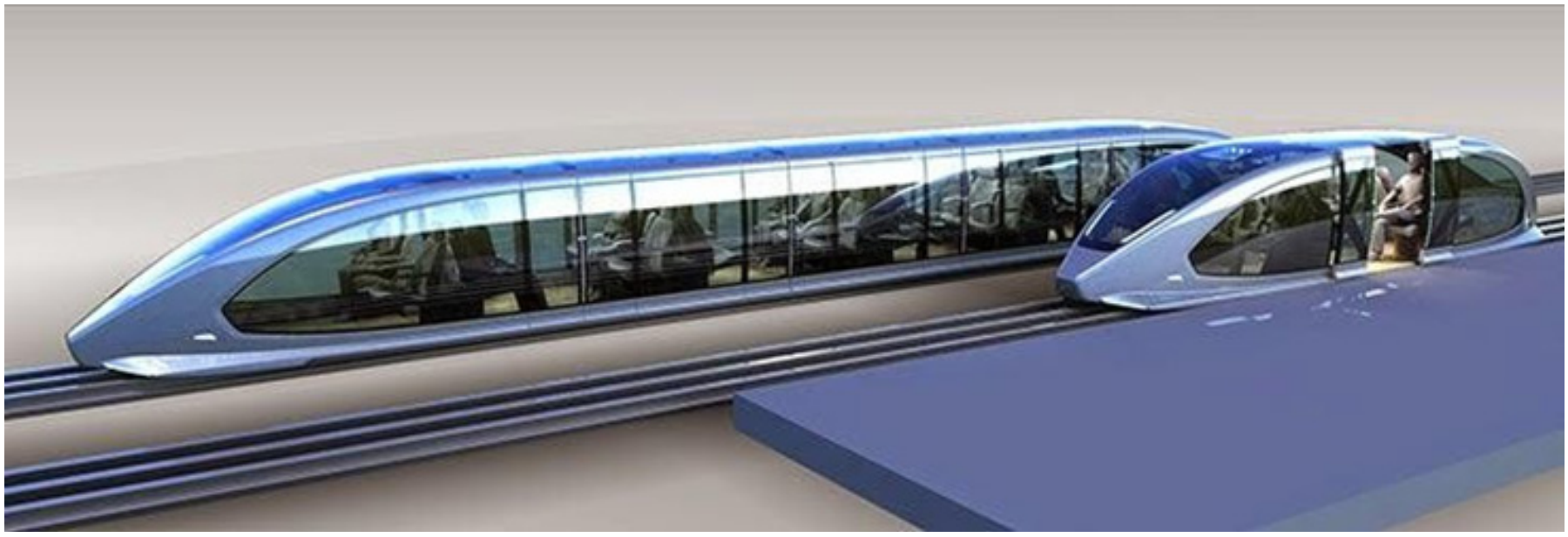
This section could be a temporary outline of four extraordinarily innovative, forward trying comes within the USA, India, Norway, and Korea, that hold sizeable promise for the event of innovative technologies in marine artificial intelligence.

CONCLUSIONS:

The paper gave an summary of a number of the foremost relevant domains in marine AI with so much reaching scientific, commercial, and social group impact. the primary half targeted on elect pioneering comes within the field and derived the course of the most objectives accomplished. within the second part, several of the rising challenges were discussed, light their importance and role in advancing analysis and development in the field of marine robotics. a number of the first trends involving cutting.

- Aastha Singh
SE MME

MAGLEV TRAINS



OVERVIEW

Today, we're taking a closer look at future train transport developments that rely on 'MAGLEV TECHNOLOGY' .

Here we don't have wheels, yes No wheels! Its on tracks using magnets. At high speeds it is smoother, quieter and more efficient than conventional trains, as there is no friction with the tracks Maglev systems have been built for lifetime, and though they started slow, some of the latest generation trains are breaking speed records.

I can share one example of it, The Shanghai Maglev Train, the world's fastest passenger train, regularly exceeds 267 mph (430 km/h). The only other currently operational Maglev systems serving the public are the Linimo in Japan and Daejeon in South Korea.
Combining the advantages of maglev with the flexibility of personal transport is the SkyTran which is currently being built in Israel.
High speed passenger maglev systems currently in development include the

Magline in Canada and Chūō Shinkansen in Japan.

Despite all of these advantages of Maglevs over conventional rail, there are still many challenges that must be overcome in order to win the battle for prominence on the rails. The first is perception of safety. In the decades of testing that maglevs have gone through so far, they have encountered only a handful of accidents, which is not a bad track record.

Many in the public remain wary of the technology, however, since it has had limited use in commercial operation and has yet to prove itself free of negative health effects or other threats to the public's well being. Just recently, a project intended to extend the Shanghai maglev was shelved, partly due to concerns by the track's neighbors over potential health problems arising from the magnetic fields . Since the Shanghai maglev uses EMS, which has weaker magnetic fields than the EDS, this is likely to be an even greater issue for EDS-

based technologies.

In 2015, a maglev train in Japan broke the record for the fastest train in the world, traveling at 374 mph. The journey from Tokyo to Nagoya on these trains is actually faster than flying, when considering the time spent jumping through airport hoops. The train service, however, is not predicted to open until 2027.

FEW ADVANTAGES OF THE MAGLEV TRAIN'S ARE: -

1 Less Smog in the City.
2 Reverse Sprawl. .
3 More Efficient Use of Time.
4 Reduced Congestion.
5 Reduced Dependence on Foreign Oil.
6 Safer than Driving.
7 Economic Boost

CONCLUSION

Maglev's will soon become a much faster and more reliable alternative to conventional rail; and once mankind is able to figure out the secret to flying trains, we can only assume that the flying cars cannot be too far behind.

- Nand Kumar Pandey
SE MME

Air robots are flying robots, usually used in conjunction with unmanned spacecraft or unmanned aerial vehicles.
Since the 1960s, there has been research into robotic "rovers" to explore the moon and other worlds in the solar system, but such machines have their limitations. They tend to be expensive and have limited range, and due to communication time delays at interplanetary distances, they must be intelligent enough to navigate without disabling themselves.

However, for planets with atmospheres of arbitrary matter, there is another way.
Autonomous flying robots or "air robots". Most of his Aerobot concepts are based on balloons, mostly balloons, but sometimes airships. Balloons that fly over wind obstacles can explore large areas of the planet in detail at relatively little cost. Planes for planetary exploration have also been proposed.

Lighter-than-air robots, or air robots, can provide platforms for exploring planets and moons with atmospheres such as Venus, Mars, Titan, and gas giants. Air robots have moderate power requirements, longer mission durations and long flight capabilities. You can do a local survey. This vehicle can transport and deploy scientific instruments and field labs over long distances. Large surface samples can also be taken.

BASICS OF BALLOONS

The idea of sending a balloon to another planet may sound strange at first, but balloons have many advantages for planetary exploration. They can be lightweight and can be relatively inexpensive. They can cover a lot of ground, and their high-altitude vision gives them the ability to study vast terrain in much more detail than would be possible from orbiting satellites. The relative lack of is not a big hindrance, as you generally do not need to aim at a specific location.

The design of the balloon for a possible planetary mission involved some unusual concepts. One of these is the solar or infrared (IR) Montgolfier. This is a hot air balloon whose outer skin is made of a material that traps sunlight and radiant heat from the planet's surface. Black is the best color for absorbing heat, but other factors come into play, and the material does not necessarily have to be black.
Solar Montgolfier has several advantages for planetary exploration because it is easier to deploy than light gas balloons, does not necessarily require a tank of light gas to inflate, and is relatively tolerant of small leaks. They have the disadvantage that they are only in the air during the day. The other is a "reversible fluid" balloon. This type of balloon consists of an envelope connected to a reservoir, which contains an easily vaporizable liquid. Balloons can rise by evaporating liquid into gas and descend by condensing gas back into liquid. There are various ways to implement this scheme, but the physical principle is the same in all cases.

Balloons designed for planetary exploration carry small pods containing payloads of equipment. The nacelle will also include power, control, and communication subsystems. Due to weight and power limitations, communication subsystems are generally small and low-power, and interplanetary communications are performed by orbiters acting as relays.
The Solar Montgolfier descends at night and

guide ropes attached to the bottom of the gondola wrap around the ground to anchor the balloon during the dark hours.

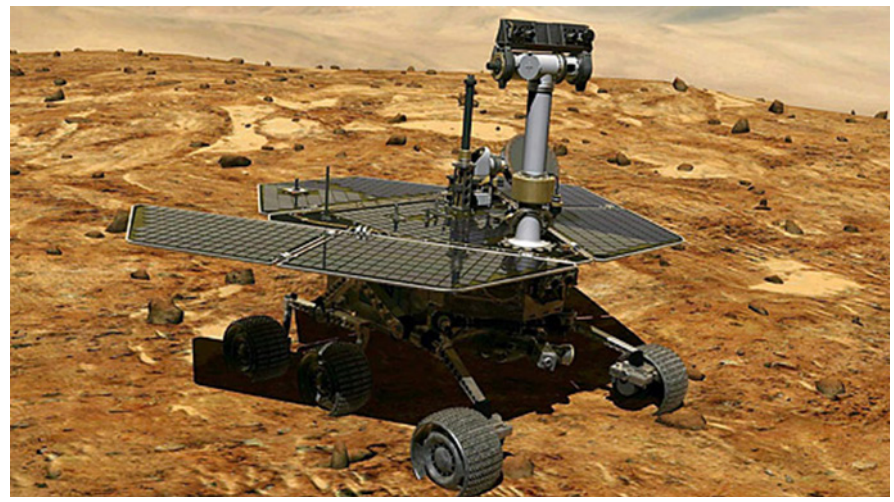
The guidelines are made from a low-friction material that will not snag or get tangled in the bottom features.

Alternatively, instead of the nacelle and guide ropes, a more heavily armed 'snake' could be mounted on the balloon, combining the functions of the two. This is a convenient scheme for making direct surface measurements.

Affixing the balloon allows him to stay in one place and conduct atmospheric observations. Such stationary balloons are known as "aerostats".

One of the tricky aspects of operating planetary balloons is commissioning them. Balloons normally enter the planet's atmosphere through an "aeroshell," which is a flat, conical heat shield.

After re-entering the atmosphere, a parachute pulls the balloon assembly out of the aero envelope and the aero envelope drops. Then the balloon assembly unfolds and inflates.



After the success of the Venus VEGA balloon, Brahmon focused on a more ambitious balloon mission to Mars, carried on a Soviet spacecraft.

Atmospheric pressure on Mars is about 1/150th that of Earth. In such a thin atmosphere, a balloon with a volume of 5,000 to 10,000 cubic meters (178,500 to 357,000 cubic feet) can carry a payload of 20 kilograms (44 lb), but a volume of 100,000 cubic meters (3,600,000 cubic feet). the balloon you have).) he could carry 200 kilograms (440 lbs).

The Frenchman had already conducted extensive experiments on the Sun Montgolfier, making more than 30 of his flights from the late 1970s through his early 1990s. Montgolfier flew at an altitude of 35 kilometers, where the atmosphere was as thin and cold as Mars, spent 69 days in the air, and circled the

Earth twice. Early concepts for Martian balloons featured a "double-balloon" system in which a sealed balloon filled with hydrogen or helium was attached to the Sun's Montgolfier. Light gas balloons were to lift Montgolfier from the ground at night. During the day, the sun warmed Montgolfier and raised the balloon array.

Finally, the group settled on his 5,500 cubic meter (196,000 cubic feet) cylindrical sealed helium balloon made of his aluminized PET

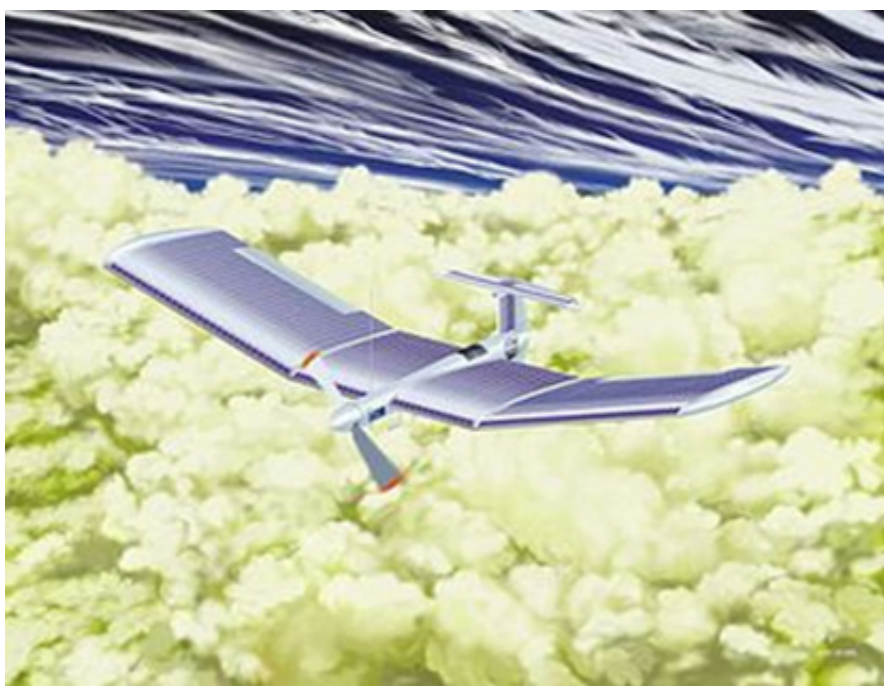
film. Hot air balloons rise during the day and descend at night as they cool. The total mass of the balloon assembly was 65 kg (143 lb), including a 15 kg (33 lb) nacelle and 13.5 kg (30 lb) instrumentation guideline. The balloon was scheduled to operate for 10 days. Unfortunately, considerable development work was done on the balloon and its subsystems, but financial difficulties in Russia halted Mars exploration in 1992-1994 and 1996. Mars balloons were ruled out of the project due to cost concerns.

PLANETARY AIRCRAFTS

Winged aircraft concepts have been proposed for robotic exploration of the atmospheres of Mars , Venus, Titan and even Jupiter.
The main technical challenges of flying on Mars are:

1. Understanding and modeling low Reynolds number and high subsonic Mach number aerodynamics.

2. Appropriate and often unconventional airframe design and construction of aircraft structures.



3. Master deployment dynamics from the aeroshell of a descending entry-level vehicle.

4. Integrate a non-air breathing propulsion subsystem into the system.
His ARES aircraft concept was selected for detailed design study as one of his four finalists in the 2007 Mars Scouts of His Program Opportunity, but the final Phoenix was not selected for his mission. In the design study, both half-size and full-size aircraft were tested in Martian atmospheric conditions.

- Ekta Das
SE MME

4


16
Lenovo
MISSION WINNOW
8 eighteen
V-Power
MAHLE
AMD 21
WEICHAI

Teams

TEAM MAVERICKS RACING

Formula Student is the world's biggest competi- tion for engineers. Every year, competitions are held all across the globe. Founded by the 'Society of Automotive Engineers' in 1981, the first com- petition in Europe took place in 1998. At present, there are more than 600 teams from universities all over the world competing with their self-con- structed race cars.

MISSION:

The goal is to develop and provide a platform for student engineers to build and learn. It offers a unique way to test students' theoretical knowledge in a practical context. Students gain and develop skills such as engineering, project management, and teamwork.The winner is not necessarily the team with the fastest car, but the one with the best package regarding construction, performance, fi- nancial planning, and sales argument.

Team Mavericks Racing was born in 2016 as a brainchild of engineering students of TCET (Thak- ur College of Engineering and Technology), we as a team of dedicated students taking care of project planning, management, and execution involving car designing, fabrication, and testing. Team Mav- ericks Racing, the official Student Formula Team of TCET, Mumbai designs and manufactures Stu- dent Formula Style Vehicle and represents TCET, Mumbai in Formula Imperial Event which is or- ganized by ISIE India.

AIM:

The main aim is to design and fabricate a more efficient and economical student formula vehicle that also runs on New/Renewable Energy. We are aiming to participate in Formula Bharat in 2023 with our new team being recruited, the research and work for the same are in progress.

The main innovation that the team will be incor- porating this year will be the autonomous feature, being one of the very few formula student teams working on an autonomous feature in India, the experience and guidance are also very minimum.

The goal is to build a formula student vehicle from scratch capable of autonomous driving on a track made up of orange and blue cones. The entire pro- cess of building such a vehicle, starting from the car model and the embedded hardware platform to the end-to-end machine learning pipeline neces- sary for automated data acquisition, labeling, and model training. The end-to-end machine learning pipeline allows a deep learning model to take input from the hardware platform and control the movement and behavior of the vehicle

TEAM ECLIPSE RACING

VISION:

Team Eclipse is a group of young automotive enthusiasts who have a common goal of de- sign- ing and developing an ergonomically refined sin- gle-seater Formula Race Car and compete in var- ious Formula Student competitions around the globe.

Formula Student is an International Stu- dent Competition in which students have the challenge to design and build a single-seater Formula Race Car and compete against other teams from all over the world at one of the Formula Students Competition.

The competition is not won solely by the team with the fastest car, but rather by the team with the best overall package of design, performance, finances, and sales planning.

MISSION:

This year, we are committed to designing and building our own Formula Student Race Car by favoring good engineering practices.

We are a group of people who believe in extensive hard work and teamwork, Here at Eclipse Racing, we strive to learn and test our theoretical knowledge in a practical context.

Experience, build, learn and grow is and always will be the primary goal of Team Eclipse Racing

TEAM TECHNOCRATS

VISION:

We aspire to set a benchmark in the National and International Student-Vehicle Competi- tions spe- cialising in All Terrain Vehicles.

We seek to become the paradigm of a student team through our permanent commitment and our teamwork to build a superior vehicle every year.

To participate and excel in various design, stat- ic and dynamic events around the globe.

MISSION:

The aim of Team Technocrats is to design and engineer an All-Terrain Vehicle with structur- al superiority, dynamic stability and manoeu- vrabil- ity through rough terrains:

To showcase our skills at a national level.

To build a bridge between imagination and real engineering through designing & manu- facturing.

To gain practical and hands-on experience in the design of an automobile.

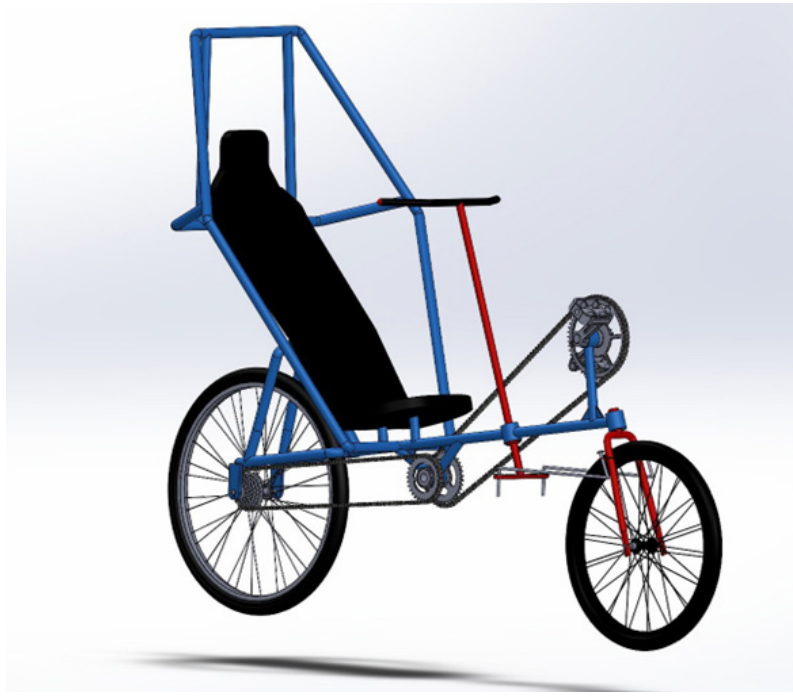
To develop leadership, teamwork, prob- lem-solv- ing and critical thinking skills

EXPERIENCE:

The HPVC 2021 was held online globally amid the Covid-19 pandemic. The significant phase of manufacturing had to be skipped. Knowing this fact, Team Photon devoted its time to re- search on HPVs and their subsystems. Since the compe- tition was online, the ideas were boundless and conceptual designing played a major role. For the same, team members had to learn CAD and sim- ulation software such as SolidWorks, Fusion 360, and ANSYS.

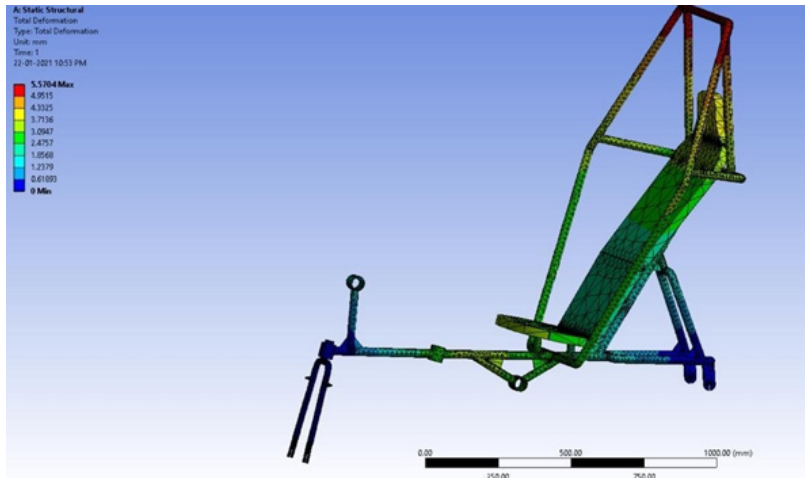
After getting a generalized idea of HPV by the de- sign reports and other research doc- uments/papers, the team finalized to go with a Semi-recumbent bike. The team further re- searched by dividing individual domains. Fea- tures of the vehicle and subsystems were con- cluded by brainstorming ses- sions and debates on a virtual platform.

The team came up with several iterations to design one of the challenging HPV Enhance- ments and optimizations were done and final- ly “ZARF” was designed, implying the barri- ers and difficulties the world overcame and its interminable spirit. It sig- nifies the global response to our fight against the coronavirus pandemic.



LEARNING OUTCOMES:

Our prior achievement was to learn and grow, participating in such a competition, allow- ing us to experience teamwork, negotiation, and prob- lem-solving. Apart from design- ing, technical writing, CAD, members of the team enhanced their leadership, presentation, time management, and innovative skills. Even though we faced sev- eral hurdles with the support of all members, good leadership, and determination our team finally paved its way to success.



NIRMAAN HYPERLOOP

INTRODUCTION:

Elon Musk, CEO of Tesla and SpaceX, introduced the Hyperloop as a concept in a white paper in 2013. It is an ultra-high-speed land transportation system for passengers and goods. The system con- sists of sealed and partially evacuated tubes that connect mobility hubs in large metropolitan ar- eas, as well as pressurised vehicles, commonly re- ferred to as pods, that can travel at extremely high speeds thanks to contactless levitation and propulsion systems, as well as low aerodynamic drag. When compared to present connections, the door- to-door journey time for medium-range distances can be significantly reduced using this method. Furthermore, the system seeks to be climate-neu- tral by operating entirely on electricity. The whole system is energy efficient and very nature friend- ly as the pollution by this will be non-existential, where the pollution by the trains and airplanes are a big concern till date. This fifth mode of transport can cut travel time to a fraction of what is pres- ent today. A journey from Mumbai to Delhi could last a mere 70 minutes as opposed to the current 140 minutes possible via airplanes. That is half of what people have to wait before getting to their destination.

THE TEAM:

The Nirmaan Hyperloop Team at Thakur college
of engineering and technology is a student orga- nization dedicated to furthering the collective re- search of the Hyperloop concept and our aim is to participate in competitions that attempt to bring in innovative solutions to crucial life problems and aim to implement science to its fullest. We are in- volved in the 2022 SpaceX Hyperloop Pod Com- petition and European Hyperloop Week, which was first initiated to accelerate the development of the Hyperloop concept and allows over 100 Hy- perloop teams from across the world to test their pods and compete. The team “NIRMAAN HY- PERLOOP” which has taken interest in the space technologies and innovations for a new better and brighter tomorrow could not step down from the opportunity to indulge in this one of a kind com- petition for the implementation of constructing a pod successfully and generate hope for the future of the technology by fulfilling all the necessary criteria required to win any competition, around the globe. We have had the opportunity to com- municate with competition winners as well as in- dustry leaders in the field of Hyperloop to get a better understanding of the systems.

TEAM AERONIX

ABOUT:

Team Aeronix is an Aero designing unit initiated in TCET by aviation enthusiasts in the year 2020. The team aims to design, fabricate RC Aircraft and participate in Aeromodelling competitions.

VISION:

Being an Aero designing team, we focus on com- ing up with ingenious ideas that would not only enhance our learnings in the field of aviation but also reflect as a step of development in the emerg- ing aviation future. We aspire to stand as a source of impetus and vector through which all the cur- rent, as well as future members, learn and soar.

FUTURE PLANNING:

The team initially began with the aim to partici- pate in RC Aircraft designing competitions, but as we are diving into the aviation content, we also aim to step into the emerging aviation ideas. This would not only grow our knowledge but also help the future members of the team to expand. We aim to keep learning, growing, and soaring. Aviation is a huge field, and we are on our way to explore more and participate in many more competitions. Above & Beyond Always. The team initially began with the aim to partici- pate in RC Aircraft designing competitions, but as we are diving into the aviation content, we also aim to step into the emerging aviation ideas. This would not only grow our knowledge but also help the future members of the team to expand. We aim to keep learning, growing, and soaring. Aviation is a huge field, and we are on our way to explore more and participate in many more competitions. Above & Beyond Always.

5

Events

Seminar on "Career opportunities in Government, Defence and Paramilitary Sectors"

Event Name: Seminar on Career opportunities in Government, Defence and Paramilitary Sectors

Date: 12th August 2022

Semester: Odd

Venue: TCET's Seminar Hall 1

Duration: 02:30pm – 04:00pm

Aim:

- The purpose of the seminar was to inform students about different wings of armed forces, paramilitary organisations and various inter-service military institutions.
- To provide knowledge about the admission process and its eligibility criteria.
- To guide students about the scope of work after getting recruited in these services.
- To inform students about working opportunities in Indian Research and Development organisations namely ISRO and DRDO.
- To inspire the students to have a career in the defence forces which promises one of the most prestigious and respected positions in the country.

Participants:

Department	Year	No. of attendees
Mech	TE	70
	BE	6
Civil	TE	52
	BE	-

Groundwork:

- The TE and BE students of the Mechanical and Civil departments were informed about the seminar through an official digital message.

- A Google form for feedback was created.

- Arrangements were Speaker's audio/visual aids in Seminar Hall 1.

Description:

- ASME-TCET, in collaboration with ASCE-TCET, organised a Seminar on Career opportunities in Government, Defence and Paramilitary sectors for TE and BE students of TCET's Mechanical and Civil Department

- The Speaker for the session was Cmdr. Vijay Pratap Singh, currently working as an Adjunct Professor for Students' Personality Development, Industry linkages and Programme controller of "Defence, Paramilitary & Govt Career Academy" in TCET.

- The Speaker was welcomed by Mr Siddhesh Siddappa (HOD Mechanical dept.) sir and Mrs Seema Jagtap (HOD Civil dept.) ma'am.

- The Speaker introduced the numerous wings of the armed forces and research departments of India to cater to every individual's needs and aspirations.

- The interactive lecture was done on the following topics:

    - Defence Sector of India
    - Three primary wings of armed forces (Army, Navy and Air Force)
    - Paramilitary Forces
    - Central Armed Police Forces (BSF, SSB, Indo-Tibetan Border Police)
    - NSF, RPF, Indian Forest Service
    - Research and Development organisations (ISRO and DRDO)
    - Intelligence Agencies (IB, RAW, etc)
    - Agniveer

- Students were informed about the individual admission processes and eligibility criteria.

- Questions were asked by students to which Speaker gave satisfactory answers.

- At the end of the session, a QR code for the feedback form was displayed and students present filled it accordingly.

Outcome:

Students were able to learn about the job opportunities in the Defence sector in India. Seminar proved to help understand the admission processes and the eligibility criteria to be inducted into such services. It motivated students to join the Defence sector as a carrier field in future.

Conclusion:

- The participants that took part in the seminar gave us positive feedback in which 84% of students agreed that it
  improved their understanding of the topic.

- The feedback response also highlighted the willingness of students to attend such future Seminars.

- Overall, the seminar was a success due to the efforts of core members of the ASME and ASCE committees of TCET. The event as a whole provided valuable knowledge which will prove to be useful for the students.

Seminar on "Converting Innovation to Start-Up"

Academic Year: 2022 - 2023

Quarter: 3rd Quarter

Type: Seminar on "Converting Innovation to Start-Up"

Theme: Guidance

Start Date: 30th September, 2022

End Date: 30th September, 2022

Number of Students: 167 students

Number of Faculty: 12 Faculties from the Mechanical Department, 1 Faculty each from Computer department, Electrical
department and Civil Department of TCET. Total 15 faculties.

Mode of session Delivery: Offline mode in Seminar Hall - 1

The objective of the event:

1. The purpose of the seminar was to encourage students to create startups of their own and to innovate and develop
unique products and services.

2. To provide knowledge and insights on setting up of startups in India.

3. To motivate students to carry out extensive research work in the field of their choice and how to efficiently use the
research facilities available in the college.

Benefits in terms of Learning/Skill/Knowledge: The session was highly informative and engaging. The keynote speaker explained students about the formation, workings and sustaining of Startups in India. The topics included essential seven core elements required to make a Startup. As the title of seminar suggest the main focus of the session was to help students find ways to convert their innovative idea into budding startups, the flowchart and methods were discussed. The speaker also shared about the importance of collaborative work and networking and how LinkedIn and other such platforms can be highly useful to contact company professionals. The

seminar achieved its purpose of making all students of S.E, T.E and B.E of Mechanical Department by imparting knowledge and motivating them to come up with companies of their own and create employment for others.

6

Future Of Global Mobility

Future Of Global Mobility

As we look up to the future, we see many industries undergoing enormous change. The transportation sector is a perfect example of an industry grappling with rapid changes in technology and customer expectations. In particular, these changes are being driven by three major trends: electrification, automation, and servitization.

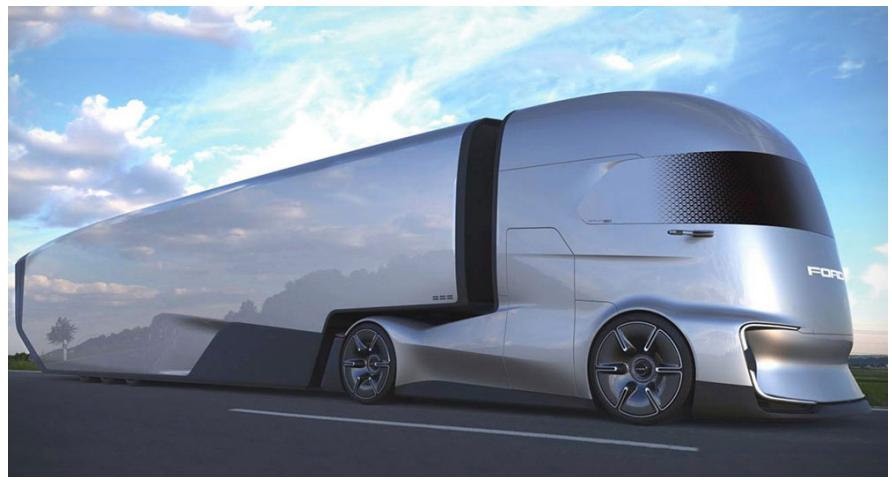
But it's important to note that these three trends won't just transform the movement of people. How we move goods will also change. Therefore, the rapid advancements taking place in transportation will affect most businesses, regardless of sector – essentially, any business with a supply chain that relies on the movement of goods should be aware of these three trends.

Let's dig into the three trends in a little more detail

TREND 1: ELECTRIFICATION

We know that transportation is a major cause of greenhouse gas emissions. In the US, transportation generates around 28 percent of total greenhouse gas emissions, with these emissions largely coming from the burning of fossil fuels (particularly gasoline and diesel) to run cars, trucks, ships, planes, and trains. We urgently need to transition to greener vehicles – which is where electrification comes in.

When it comes to cars, electric vehicles (EVs) appear to be reaching a tipping point. As of 2020, EVs accounted for just 6 percent of global automotive sales, but that is projected to grow to 13 percent by 2025 and 22 percent by 2030. Over time, stricter national emissions targets, greater urban populations, improvements in charging infrastructure, and the declining cost of the lithium-ion batteries that power EVs (already down 80 percent since 2010) will combine to encourage mass adoption of EVs.



And it's not just cars that are going electric:

· Indian ride-sharing company Ola has invested massively in e-scooters. The company's e-scooter plant in India is gearing up to produce 10 million electric scooters a year, making it the world's largest e-scooter facility.

· Companies like Daimler are investing in electric truck technology. For example, Daimler's 250-mile range eCascadia and 230-mile range eM2 trucks are due to go into production in 2022.

· Norway has been running electric car ferries since 2015, and the country now aims

to run an all-electric fleet by 2023.

TREND 2: AUTONOMOUS, CONNECTED VEHICLES

Autonomous vehicles provide an incredible opportunity to revolutionize the way people and goods are transported, improve road safety and ease congestion on our busy roads. They may even change the way our cities are built – if you think about it, huge parking lots will be a thing of the past, as driverless vehicles will be able to drop us at our destination and come back for us later.

That's a cool vision of the future, but where are we currently at with autonomous cars?

· Elon Musk said Tesla's autonomous vehicle technology would be capable of Level 5 autonomy – where the vehicle can carry out all driver tasks in any situation – by the end of 2021. Although Tesla representatives later said Musk was exaggerating a little and they could not guarantee that milestone would be met by the end of 2021.

· Many other automakers are working towards achieving Level 4 autonomy – where the vehicle can drive itself under certain conditions only – over the next few years.

· Yet driverless taxis are already a reality in some parts of the world. Waymo, Alphabet's autonomous taxi service, launched fully driverless rides for the general public in 2020. And in China, AutoX launched its fully driverless taxis in early 2021.

Meanwhile, in freight, several companies are working to develop autonomous trucks, including TuSimple, which is working with UPS to conduct test operations in Arizona and Texas. Currently, TuSimple trucks still have a driver on board ready to take the wheel, but the company was planning to conduct its first driverless trials in 2021 and start selling autonomous trucks in 2024.

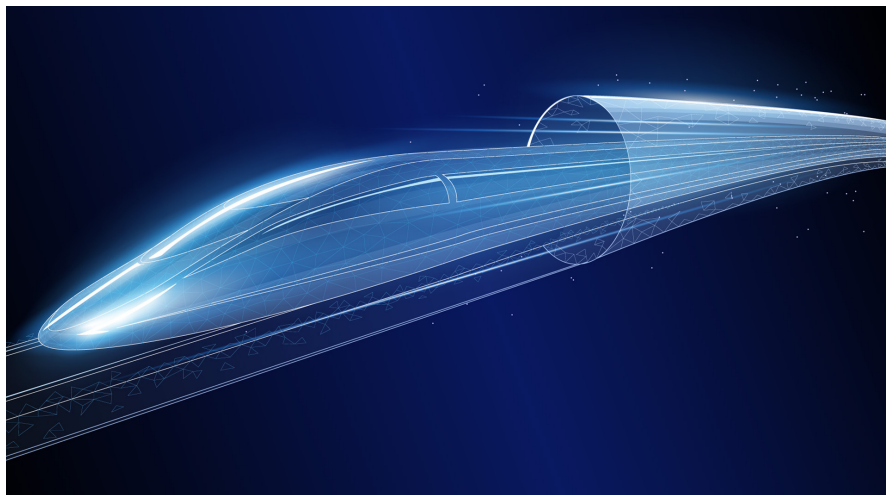
TREND 3: SERVITIZATION

Servitization is a massive trend that will affect almost all industries, and mobility is no exception. As more and more of us live in densely populated megacities, and as concern grows over the climate crisis, the days of everyone owning and running their own cars are numbered. Plus, with the rise of ride-sharing services like Uber and Didi Chuxing, transportation is now much more complex and multi-layered than the traditional private ownership model.

Increasingly, then, we'll turn to mobility-as-a-service (MaaS) providers to meet our transportation needs - think of MaaS as mobility on demand. A company like Uber could technically fall under this bracket, but the

MaaS operators of the future will offer customers multiple mobility options via a single payment channel and interface. For example, with a MaaS provider, you could borrow a car for a few hours one day, pick up an e-scooter in town later that day, and hop home on public transport – all via one platform. The key notion here is access to mobility rather than ownership. In the future, the majority of city dwellers may never need to own a car at all.

Along with this there are various other technology emerging which will transform the way we travel. The speed in which we travel today will be drastically reduced and will be much more economical.



Air travel which is by far considered one of the fastest mode of transport but, if it seems slow to you there is something new getting developed which will be more faster than the conventional air travel and it's called Hyperloop. It's just like a train in a tube but far different from conventional trains. It's a pneumatically driven train through a vacuum tunnel and since there is no resistance acting on the train there is no drag increasing the speed. Also, Hyperloop do not runs on fosil fuel which makes them good for the environment.

Advancements and developments done in various domains will make it possible for humans to make Mobility faster, greener, better and more economically than today. The future can be unpredictable but will be better than today.

The Student Editorail Committee

Faculty Incharge: Mr. Pawan Tiwari

Publication Head: Daksh Pandey

Designer	Editor
Yash Khairnar	Kunj Sharma
Prasad Jadhav	Tanushi Shah

THAKUR ®

TRUSTS

tcet

THAKUR COLLEGE OF
ENGINEERING & TECHNOLOGY

Estd. in 2001