MECH BUZZ

DEPARTMENT OF MECHANICAL ENGINEERING, VASAVI COLLEGE OF ENGINEERING, HYDERABAD

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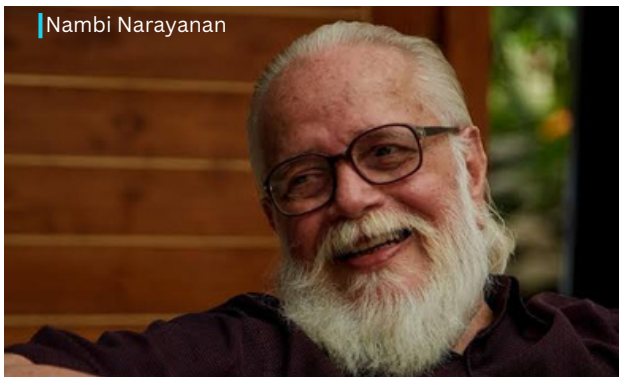
Vikas Engine

The Vikas Engine, fueled by liquid, remains a staple of Indian rockets to this day. Nambi Narayanan, aged 82, received the Padma Bhushan for developing the Vikas Engine, propelling India's PSLV rockets. Nambi Narayanan chose the engine's name as a tribute to Dr. Vikram A Sarabhai. The design was based on the licensed version of the Viking engine with the chemical pressurization system. Initially, the first Vikas engines used some French components, but they eventually replaced them with locally made ones. It is used in the Polar Satellite Launch Vehicle (PSLV) and the Geosynchronous Satellite Launch Vehicle (GSLV) series of expendable launch vehicles for space use. The first engine built from the acquired technology was tested successfully in 1985 by Nambi Narayanan and his team at ISRO. They named it Vikas. The engine runs on 40 metric tons of unsymmetrical dimethyl hydrazine (UDMH) and nitrogen tetroxide (N2O4). It can generate up to 725kN of thrust. An upgraded version of the engine has a chamber pressure of 58.5 bar.

Two new types of Vikas engines, HTVE (High Thrust VIKAS Engine) and HPVE (High-Pressure/High-Speed VIKAS Engine), have gained particular interest. On July 14, 2021, ISRO successfully conducted the third long-duration hot test of the Vikas liquid propellant engine for the Gaganyaan program, India's first manned space mission. The test was performed on the core L110 liquid stage of the human-rated GSLV MkIII vehicle, meeting engine qualification requirements for the mission.


Nambi Narayanan

The Story of Vikas Engine

In the 1960s and 70s, ISRO scientists debated whether to focus on developing solid-fueled or liquid-fueled engines. Most of the organization believed solid engines were the better choice since the technology seemed more attainable, while pursuing liquid-fueled engines was viewed as chasing an elusive goal.

Most advanced rockets in the world rely primarily on liquid-fuelled engines. If solids are used, they are only for initial thrust at lift-off. Princeton-postgraduate ISRO scientist Nambi Narayanan impressed upon the organization the need to urgently develop liquid-fuelled engines, given they were the future of rocketry and advanced nations were achieving more with them. Sarabhai permitted the deputation of young Nambi to Princeton and ensured bureaucratic hurdles were cleared before he left. In 1973, ISRO launched an experimental rocket (LP-006) using a 600kg thrust liquid engine. Though small compared to the 60-ton engines of the US and USSR, the success of this test steered ISRO toward a deal with the French to co-develop a 60-ton liquid-fuel engine. The engine was an improved version of a smaller French Viking series model. From 1974 to 1980, 100 Indian scientists learned to jointly develop the Viking-3 Engine and then returned to India. But that was just half the story.

Finally, it was in 1993 that the PSLV lifted off for the first time, but the mission was a failure after it encountered an error mid-flight. However, most of the critical systems on-board the rocket was validated despite the failed mission. However, nearly a year later in October 1994, the PSLV lifted off majestically and had proven the rocket's capability to lift 1000kgs to orbit.

C.AkshayKumar
(1602-21-736-067)

4 of the Fastest Cars in the World:
And They Are Street Legal

What puts the “hyper” in hypercar? Hypercars are the most high-performance automobiles in the world: You’ll know a hypercar by its innovative design, extreme engineering, and hefty price tag. There’s an unwritten rule that a hypercar should go from 0 to 60 mph in under 3 seconds and feature around 1,000 horsepower or more.

The Swedish **Koenigsegg Agera RS** holds the top production car speed record, reaching **277.87 mph** on a public road in Nevada on November 4, 2017. Only 25 handcrafted units were made between 2015 and 2018, with each valued at around $10 million!
Its advanced aerodynamics and stability management make it a technology powerhouse. Fully homologated, the Agera RS is available for sale worldwide.

The **Bugatti Chiron Super Sport** is rare, but you do have a chance of spotting one on the street.
In May 2024, Bugatti announced the end of the Chiron era, with the last Chiron Super Sport assembled in Molsheim, France. However, Bugatti promises a new era of unmatched performance is coming soon.

9FF, a small German car tuning company founded by **Jan Fatthauer**, is breaking records with its high-performance vehicle conversions.
Specializing in transforming stock Porsche into street-legal racing machines, **9FF’s GT9** boasts up to **1,400 hp** for public road use. Fatthauer’s ability to extract over 1,000 hp from a series engine has earned him

The newest addition to the market is Los Angeles□based Czinger Vehicles, a family business founded in 2019 by **Kevin Czinger** and **Lukas Czinger**. Their **Czinger 21C** outperforms much of its European competition, beating McLaren’s lap times and earning the title of the **"American Koenigsegg."** Besides being one of the fastest street-legal cars, the 21C aims for sustainability, with Kevin Czinger prioritizing eco-friendly production.

- Bharadwaj Aditya Singh
(1602-21-736-004)

The Team Torque

Rohan Aaron said, "Team Torque is the **sole official buggy-building team** from Vasavi College of Engineering. We aim to construct a car from the ground up and enter it in competitions each year. We have visited **Supra**, **Baja**, and **ATVC**. Our usual event is ATVC Baja, and the team representing Vasavi College of Engineering is called Team Torque. The team comprised **28 mechanical engineers**, utilizing the practical application of all the concepts they have learned in the classroom at the project lab. Team Torque has been in existence **since 2019**. We are the fifth team to compete, and I'm happy to report that we've improved this year thanks to senior leadership guidance and teamwork. We drive an **all-terrain buggy**. This 4x4 truck is quite powerful. Its four-wheel drive system is designed for all-terrain roads. It's a chassis where one person may sit and feel safe and confined. It is a **310 cc** engine with **9.1 horsepower**. It also has a **3.1 reduction gearbox** and **H-amp suspension**. Its construction allows it to traverse any uneven terrain while maintaining stability and keeping the driver safe. I am delighted to announce that we were placed **third in India in the ATVC design evaluation competition**. I am pleased with the design team. It was led by **Hari Krishna Sai,** and out of over 60 teams that competed, we came in third place. We are not a legacy team, but we are happy to report that we placed third in a competition in **Pune**.".

"There were days where when we have gone three or four days without seeing our homes!"

"In all honesty, I would say that the core members were very supportive despite the odd disruption. I am proud of them because they manage teamwork, academics, and projects exceptionally well for every team, especially the six heads. There have been occasions when we have spent the night on campus and times when we have gone three or four days without seeing our homes together, and we have postponed it. I'm glad to report that team members give up their time, talents, riches, and everything else and that we genuinely support them in carrying out their responsibilities."

" We Structured it Well "

"The team was divided into five departments: The braking department was led by Abhilash and Rohan Aaron. The steering department was led by Om Kadem. The suspension department was led by Satvik Gotri. Hari Krishna Sai was in charge of the designing department, and Varun was in charge of the transmission department. In addition to this, Sathwik is in charge of the management department. We needed to support one another to reach the final result because they were all interconnected. "

" Some folks Weren't Supportive"

"There have been challenges. The first was with the team; although we had a supportive group, there were those who weren't as supportive as we would have liked. I don't want to point the finger at them, but it would have helped if they had stayed a little longer, and I do value every team member who has worked hard. "

" Yes ,There were Conflicts !"

It is common, in fact, to say that disagreements occurred even among the heads. There were moments when our viewpoints, opinions, and thoughts diverged.
You have to adjust your opinions to accommodate other people's ideas and timeliness because not everyone will agree with what you have to say.

"The night before the Competition."

The biggest issue was the transportation problem. While the buggy was getting transported from Hyderabad to Pune, we had to fix the vehicle as it nearly broke. In addition, there was a braking system problem that we had to fix the night before the competition. We worked through the night until 4:00 am, covered in grease. I'm glad to report that the breaking mechanism proved effective and that all five systems performed admirably in the competition, securing third place.

"My team has my utmost pride."

"To finish the job, many of them spent the night at the campus. On some days, we spent three to four days away from our houses. I'm glad to report that team members supported one another in their assigned responsibilities and gave up their time and skills.Aside from that, we shared the same objective, which is to construct a buggy from the ground up. My team and I held the belief that success is achievable if one is willing to put in the necessary talent, hard effort, and dedication."

"The best option is to speak with seniors."

"Interact with seniors who were a part of the Team Torque. Since they have more experience than you in creating a buggy from scratch. "

"It costed 4.98 lakhs."

"The project costed us 4.98 lakhs. The management and team members have assisted us in retrieving this money. "

Special Thanks to Rohan Aaron (Captain, Team Torque)

Interviewed by A.Shashank (MechBuzz , Editorial Member)

"Inside the Engineering: How an F1 Car Powers Speed And Performance"

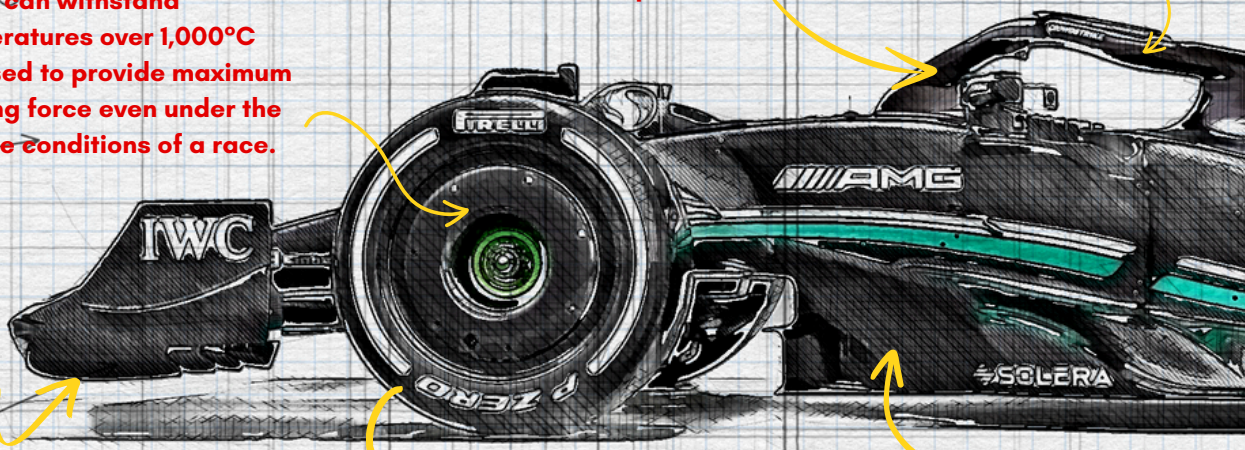
Presenting the Mercedes-AMG F1 W15 E Performance car for the 2024 F1 season

A Formula One car or F1 car is a single-seat, open-cockpit formula level racing car designed under the regulations and legalities of the Fédération Internationale de l'Automobile.
The pinnacle of engineering excellence meets the world's fastest drivers in a sport where lap times are measured to within a thousandth of a second and races which stretch longer than two hours in searing 60 degrees Celsius heat.

The Halo is a titanium safety device that protects the driver's head from flying debris or impacts

Made of carbon fibre, glass, silicon etc. the steering wheel consists a total of 25 buttons and switches and, of course, the clutch and the shift paddles

Carbon brake discs and pads, which can withstand temperatures over 1,000°C are used to provide maximum braking force even under the intense conditions of a race.



The front wing is a highly engineered component designed to optimize aerodynamic efficiency. It features multiple adjustable flaps and endplates that manage airflow across the car on straights as well as corners

The car uses Pirelli tires with tailored compounds to offer high grip and durability, essential for both speed and endurance during a race

The W15's floor is meticulously designed to maximize ground effect, creating suction that enhances downforce for better performance at high speeds.

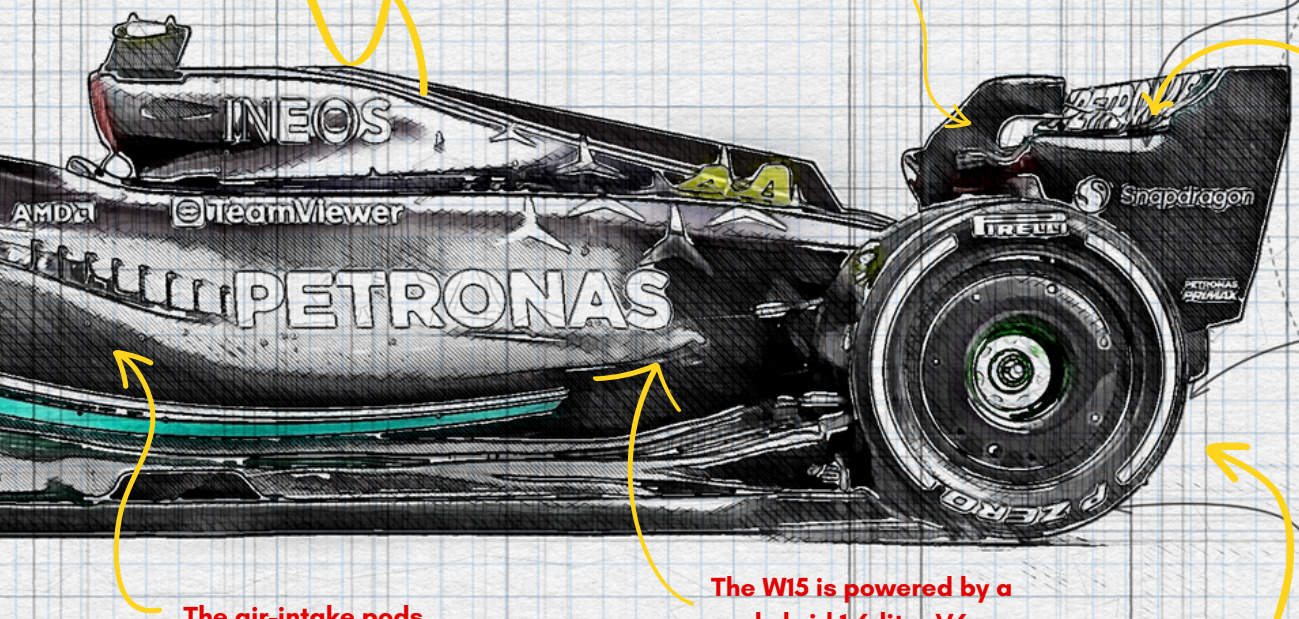
These cars have a fierce heart a 1.6-liter turbocharged V6 hybrid engine that generates around 1,000 horsepower, allowing the car to accelerate from 0 to 100 km/h in under 2.6 seconds.
Formula 1 cars can reach lighting speeds over 350 km/h and I am sure you will miss it in a blink of an eye on a race track like the recent Baku Street circuit where the highest top speed recorded was 372.499 km/h in 2016.

The 20 teams, each with their own unique legacies and histories, battle fiercely to win the coveted ***World Constructors' Championship***. Every race is a test of innovation, teamwork, and precision as they compete for points on circuits across the globe.

The W15 body is made of Carbon fibre composite including engine cover, sidepods, floor, nose, front wing, and rear wing

The rear wing generates significant downforce while minimizing drag and also features a dual-element structure with adjustable flaps that allow for fine-tuning based on track conditions

The DRS, when activated, lifts the upper rear wing flap open, creating a gap that allows air to flow more freely through the wing giving the car less drag and a small speed boost



The air-intake pods cool the engine and electronics, designed with aerodynamic efficiency in mind to reduce drag while maintaining critical cooling

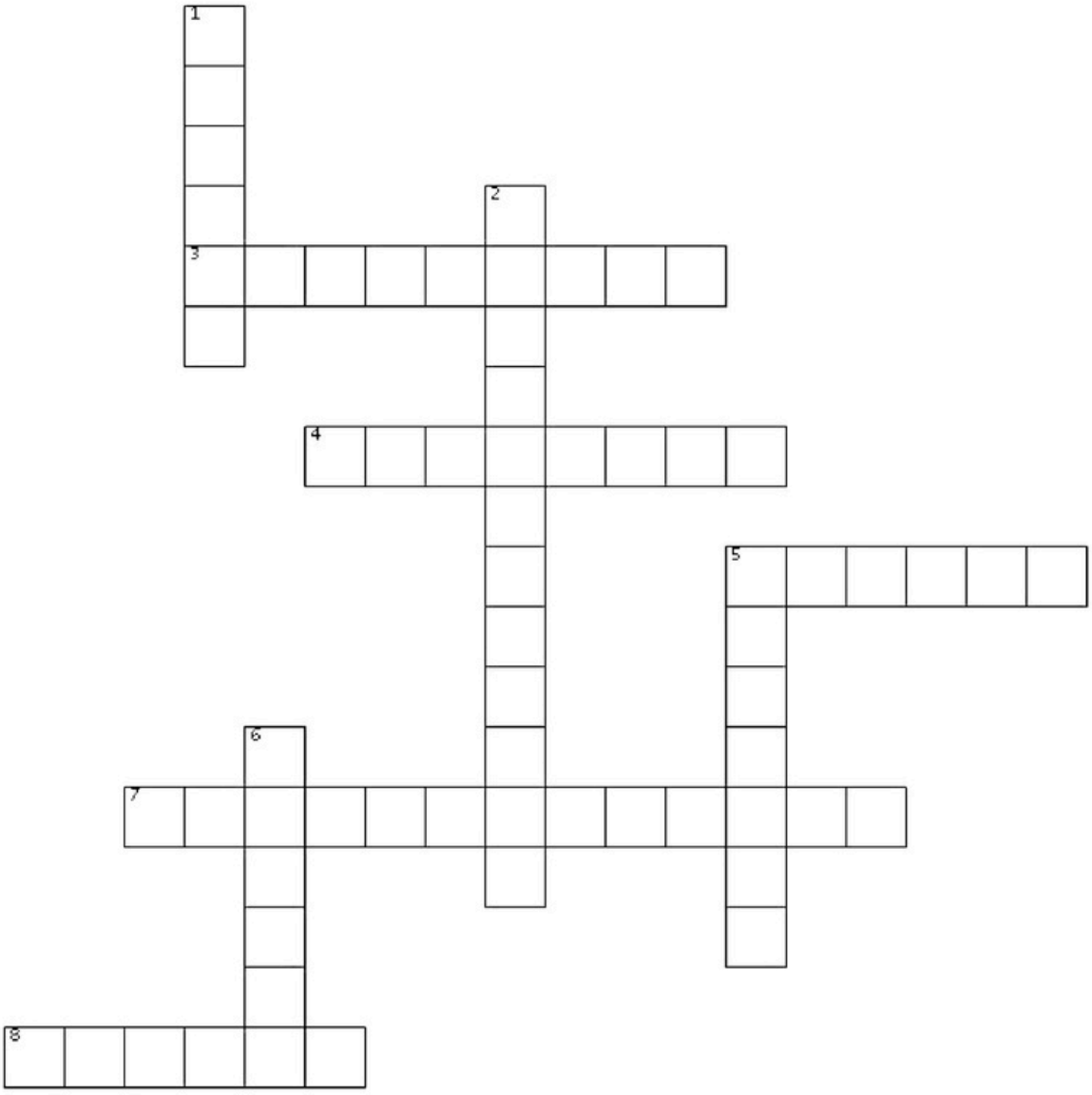
The W15 is powered by a hybrid 1.6-liter V6 turbocharged engine generating a whooping 1000 HP with the red needle reaching 15,000 RPM

The diffuser works with the exhaust gases to manage airflow under the car, increasing downforce by enhancing the ground effect

The aerodynamics are fine-tuned using ***computational fluid dynamics (CFD)*** and ***wind tunnel testing***, ensuring minimal drag and maximum downforce at high speeds. The chassis, made from pre-preg carbon fiber composites, offers unparalleled strength-to-weight ratio, while the suspension ensures precise control under high G-forces during cornering.

-Shaik Md Ashfaq 3/4
Editorial member, MechBuzz

Cross-Word Time



ACROSS

3. it means relating to the production or use of very low temperatures
4. the study of the relationship between force and motion
5. the twisting force that tends to cause rotation
7. the creation of new products, either from raw materials or components
8. a piece of equipment, consisting of a wheel and a rope, that is used for lifting heavy things

DOWN

1. the study which deals with the determination of behaviour and the properties of the light
2. technology combining electronics and mechanical engineering
5. a machine that transforms fluid or air energy into usable work or electricity
6. the part of a vehicle that produces power to make the vehicle move

Quiz Time

1. What is the term used for "Degree of Randomness"?
(a) Enthalpy (b) Energy (c) Entropy (d) Exergy

2. What is the SI unit of specific volume?
(a) Kg/m3 (b) N-m/s (c) m3 /Kg (d) ft3 /lb

3. Under ideal conditions of temperature and pressure, what state of matter does sound travel the fastest in?
(a) Solid (b) Liquid (c) Gas (d) Equal in all states of matter

4. _____ were once commonly used as refrigerants but have been phased out due to their negative effects on the ozone layer.
(a) Hydrocarbons (b) Hydrofluorocarbons. (c) Chlorofluorocarbons. (d) All the above

5. Which of the following automotive manufacturers also produce aircraft engines?
(a) Bugatti (b) Aston Martin. (c) Rolls-Royce (d) Lamborghini

6. _____ theorem states that "If three forces acting at a point are in equilibrium, then each force is proportional to the sine of the angle between the other two forces."
(a) Bell's Theorem (b) Carnot's Theorem. (c) Eulers's Buckling Theorem (d) Lami's Theorem

7. Which of the following metals do not show ductile to brittle transition in cold temperatures?
(a) Chromium (b) Aluminium (c) Molybdenum (d) Tungsten

8. 72 : 9 :: 37 : _____
(a) 9 (b) 10. (c) 11 (d) 12

9. A train crosses a man who is running in the same direction at a speed of 2m/s in 10 seconds. The same train crosses a tunnel in 54 seconds. If the speed of the train is 72kmph, find the length of the tunnel?
(a) 1000m (b) 964m (c) 921m (d) 900m

10. Pointing towards a girl, a lady said, "This girl is the only daughter of my son's father-in-law". How is the girl related to that lady?
(a) Niece. (b) Granddaughter (c) Daughter-in-Law (d) Daughter

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less." **-Marie Curie**

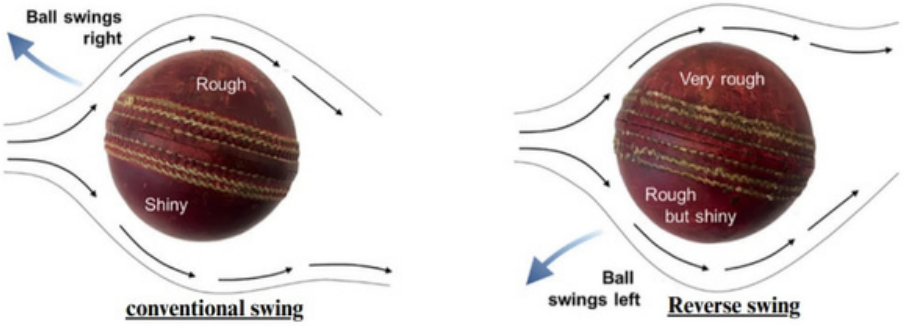
Swing Mechanics of a Cricket ball

Cricket, one of the world's most popular sports, has evolved from a simple rural game in 16th century England to an international phenomenon. While many cricketers and fans are aware of swing bowling- a technique in which a fast bowler delivers the ball in a way that causes it to curve sideways in the air, the science behind it remains a mystery to many.

Conventional swing in cricket occurs due to the seam dividing the ball's surface into two hemispheres. When bowled above 80 mph, airflow over the seam side becomes turbulent, while the non-seam side remains laminar. This creates a pressure imbalance, with higher pressure on the turbulent side. The ball curves in the direction of the seam due to this difference.

Reverse swing happens when the ball is older and its surface is rough, typically after 25-30 overs. Unlike conventional swing, the ball swings in the opposite direction due to turbulent airflow on the smooth side caused by the rough side. This reverses the pressure differential, leading to the reverse swing.

Factors that influence ball swing-Ball Condition: A new, polished ball has a conventional swing due to laminar flow on the smooth side and turbulence on the seam side and vice versa.



Bowling Speed:Faster deliveries increase swing, and might result in "late swing" near the batsmen.

Atmospheric Conditions: Atmospheric turbulence, affected by sunlight and heat, disturbs laminar flow, making swing more likely on gloomy days.

Ball Type: Balls vary in seam heights and surface textures, which influence swing.

Laminar flow: Air travels in parallel layers with minimal mixing between them. This occurs on the smoother side of the ball.

Turbulent flow: The airflow becomes chaotic with vortices and eddies. This happens on the rougher side of the ball or when the seam disrupts the airflow.

-K.Lokesh Reddy
(1602-21-736-080)

Click Buzz..

Swayam – Yuva Fest

Yuva Fest Conducted by Swayam on 06/09/2024

Engineer's Day

Celbration of Engineer's Day on 13/09/2024

"We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe. That makes us something very special."

- Stephen Hawking

Engineers & Ethics

"We are not put on this earth for ourselves, but are placed here for each other. If you are always there for others, then in time of need, someone will be there for you."

-Jeff Warner

Being an engineer comes with an enormous amount of responsibility, never more so than in today's world with our climate-change emergency and the issues arising with advances in technologies.

There have been a lot of instances in the past where an engineer's morals and ethics were challenged, some turned out to be pivotal moments where they put their principles first and averted disasters while others ended in disastrous catastrophes, where the relentless pursuit of personal or corporate interests compromised morality.

An example where things went sour was the space shuttle challenger disaster in 1986. The night before the launch, engineers were concerned about the colder-than-normal conditions, but while one engineer refused to sign off on it, his manager did so anyway.

The chain of events that were set in motion after these moments should serve as a memory to be honest, act with integrity and lastly practice competency.

It's often been said that engineers shape our world and, as the engineering profession acts in the service of society, there is an obligation, in the face of these challenges, to help create the best-possible world.

-Shaik Md Ashfaq 3/4
Editorial member, MechBuzz

" Accept your past without regret, handle your present with confidence, and face your future without fear. "

-A.P.J. ABDUL KALAM

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