MANA ARMS MAGAZINE

JAN 2025 VOL-32

.......Empowering Minds

JAN 2025

EDITORIAL BOARD

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CONVERSION TABLES

5.1 Mass (M)

	gm	kg	lb_m	slug
1 gram =	1	0.001	2.205×10^{-3}	6.852×10^{-5}
1 kilogram =	1000.0	1	2.205	6.852×10^{-2}
1 $pound_m$ =	453.6	0.4536	1	3.108×10^{-2}
1 slug =	1.459×10^{4}	14.59	32.17	1

5.2 Length (L)

	cm	m	km	in	ft	mi
1 centimeter =	1	1.0×10^{-2}	1.0×10^{-5}	0.3937	3.281×10^{-2}	6.214×10^{-6}
1 meter =	100.0	1	1.0×10^{-3}	39.37	3.281	6.214×10^{-4}
1 kilometer =	1.0×10^{5}	1000.0	1	3.937×10^{4}	3281.0	0.6214
1 inch =	2.540	2.540×10^{-2}	2.540×10^{-5}	1	8.33×10^{-2}	1.578×10^{-5}
1 foot =	30.48	0.3048	3.048×10^{-4}	12	1	1.894×10^{-4}
1 mile =	1.609×10^{5}	1609.0	1.609	6.336×10^{4}	5280.0	1

5.5 Force (MLT^{-2})

	dyne	gf	kgf	nt	lb_f
1 dyne =	1	1.020×10^{-3}	1.020×10^{-6}	1.0×10^{-5}	2.248×10^{-6}
1 gram-force =	980.7	1	0.001	9.807×10^{-3}	2.205×10^{-3}
1 kilogram-force =	9.807×10^{5}	1000.0	1	9.807	2.205
1 newton =	1.0×10^{5}	102.0	0.1020	1	0.2248
1 $pound_f$ =	4.448×10^{5}	453.6	0.4536	4.448	1

5.6 Pressure ($ML^{-1}T^{-2}$)

	atm	dyne/ cm^2	inch of water	in Hg	kgf/m^2	nt/m^2	lb_f/in^2	lb_f/ft^2
1 atmosphere =	1	1.013×10^{6}	406.8	29.92	1.033×10^{4}	1.013×10^{5}	14.696	2116.0
1 dyne per cm^2 =	9.869×10^{-7}	1	4.015×10^{-4}	2.953×10^{-5}	1.020×10^{-2}	0.1	1.450×10^{-5}	2.089×10^{-3}
1 inch of water at 4°C *	2.458×10^{-3}	2491.0	1	7.354×10^{-2}	25.40	249.1	3.613×10^{-2}	5.202
1 inch of mercury at 0° C*	3.343×10^{-2}	3.386×10^{4}	13.597	1	345.4	3.386×10^{3}	0.4912	70.74
1 kilogram-force per m^2 =	9.678×10^{-5}	98.07	3.937×10^{-2}	2.896×10^{-3}	1	9.807	1.422×10^{-3}	0.2048
1 newton per m^2 =	9.869×10^{-6}	10.0	4.015×10^{-3}	2.953×10^{-4}	0.1020	1	1.450×10^{-4}	2.089×10^{-2}
1 $pound_f$ per in^2 =	6.805×10^{-2}	6.895×10^{4}	27.68	2.036	703.1	6.895×10^{3}	1	144.0
1 $pound_f$ per ft^2 =	4.725×10^{4}	478.8	0.1922	1.414×10^{-2}	4.882	47.88	6.944×10^{-3}	1

* Where the acceleration of gravity has the standard value 9.80556 m/sec^2.

1 foot = $\frac{1200}{3937}$ meter	1 millimicron (m_μ) = 10^{-9} m	1 yard = 3 ft
1 meter = $\frac{3937}{1200}$ feet	1 light-year = 9.4600 x 10^{12} km	1 rod = 16.5 ft
1 angstrom (A) = 10^{-10} m	1 parsec = 3.084 x 10^{13} km	1 mil = 10^{-3} in
1 micron (μ) = 10^{-6} m	1 fathom = 6 ft	
1 nautical mile = 1852m = 1.1508 statute miles = 6076.10 ft		

5.3 Density (ML^{-3})

	slug/ft^3	lb_m/ft^3	lb_m/in^3	kg/m^3	g/cm^3
1 slug per ft^3=	1	32.17	1.862 x 10^{-2}	515.4	0.5154
1 pound$_m$ per ft^3=	3.108 x 10^{-2}	1	5.787 x 10^{-4}	16.02	1.602 x 10^{-2}
1 pound$_m$ per in^3=	53.71	1728.0	1	2.768 x 10^4	27.68
1 kilogram per m^3=	1.940 x 10^{-3}	6.243 x 10^{-2}	3.613 x 10^{-5}	1	0.001
1 gram per cm^3 =	1.940	62.43	3.613 x 10^{-2}	1000.00	1

5.4 Speed (MT^{-1})

	ft/sec	km/hr	m/sec	mi/hr	knot
1 foot per second =	1	1.097	0.3048	0.6818	0.5925
1 kilometer per hour =	0.9113	1	0.2778	0.6214	0.5400
1 meter per second =	3.281	3.6	1	2.237	1.944
1 mile per hour =	1.467	1.609	0.4470	1	0.8689
1 knot =	1.688	1.852	0.5144	1.151	1
1 knot = 1 nautical mile/hr			1 mi/min = 88 ft/sec = 60 mi/hr		

STUDENT ARTICLE

U.SAI KUMAR
24MQ5A0347

JAGUAR LAND ROVER

Jaguar Land Rover Automotive PLC is the holding company of Jaguar Land Rover, also known as JLR, and is a British multinational automobile manufacturer which produces luxury vehicles and SUV and has its head office in Whitley, Coventry, United Kingdom. The principal activity of Jaguar Land Rover is the design, development, manufacture and sale of vehicles bearing the Jaguar and Land Rover marques. Both marques have long histories prior to their merger – Jaguar going back to the 1930s and Land Rover to the 1940s – first coming together in 1968 as part of the British Leyland conglomerate, later again independent of each other, and then as subsidiaries of BMW (in the case of Land Rover), and Ford Motor Company (Jaguar).

In 2000, Rover Group was broken up by BMW and Land Rover was sold on to Ford Motor Company, becoming part of its Premier Automotive Group. Jaguar Land Rover has been a subsidiary of Tata Motors since they founded it as a holding company for the acquisition of Jaguar Cars and Land Rover from Ford in 2008.

History

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Rover were transferred to it. The consequence was that Jaguar Land Rover Limited became responsible in the UK for the design, manufacture and marketing of both Jaguar and Land Rover products.

In addition to the Jaguar and Land Rover marques, JLR also owns the rights to the dormant Daimler, Lanchester and Rover marques. The latter was acquired by Land Rover, whilst still under Ford ownership, from BMW in the aftermath of the collapse of MG Rover Group; BMW had retained ownership of the marque when it broke up Rover Group in 2000, then licensed it to MG Rover.

Products

Jaguar Land Rover currently sells vehicles under the Jaguar and Land Rover marques

- **NOx emissions ratings**

In March 2019, Jaguar Land Rover became the first European car producer to submit new cars from its marques to AIR Index to receive NOx emissions ratings.

AIR Index ratings for JLR cars (Euro 6 allows up to 80 mg/km NOx emission)

Model	Year	Fuel	NOx measured (mg/km)	AIR Index rating
Jaguar E-Pace HSE 2.0l 180 hp	2019	Diesel	14	A
Land Rover Range Rover Evoque TD4 2.0l 180 hp	2019	Diesel	17	A
Land Rover Discovery 3.0 TD6 HSE	2018	Diesel	33	A
Land Rover Discovery Sport 2.0l 180 hp	2019	Diesel	34	A

- **Future electrification**

In September 2017, Jaguar Land Rover announced that all new Jaguar and Land Rover models launched from the 2020 model year will have an all-electric or hybrid powertrain option. In October 2017, JLR announced that its electrification programme will start with the Range Rover Sport P400e for the 2018 model year, a plug-in hybrid model due in the showrooms in late 2017.and be followed by the launch of a plug-in hybrid Range Rover due in 2018 for the 2019 model year. Jaguar Land Rover paid $49.5 million in fines for missing its American Corporate Average Fuel Economy targets over the 2009–13 model years. At the beginning of June 2019, JLR and BMW announced that they will collaborate "to develop next generation electric drive units". On 5 July 2019, JLR confirmed that they intended to build an all-electric XJ luxury saloon car, at their Castle Bromwich plant. [78] The car was expected to be launched in 2020. [79] On 15 February 2021, CEO Thierry Bolloré announced that development on the all-electric XJ saloon has been cancelled due to poor sales of saloons in general, as people around the world are preferring crossovers, SUVs, and pickup trucks over saloons, coupes, convertibles, estates, hatchbacks, and compact cars, especially in the Americas, Oceania, Africa, and the Middle East. In February 2021, JLR announced that the entire Jaguar range will become all-electric for the 2025 model year. The company also stated that it will introduce its first all-electric Land Rover vehicle in 2023 as a 2024 model year. JLR also stated that it will end production and sales of diesel-powered Land Rover vehicles in 2026, with production and sales of petrol-powered Land Rover vehicles ending in 2030. This will lead to Jaguar Land Rover becoming 100% all-electric by the 2030s. CEO Thierry Bolloré clearly stated that this is to help JLR comply with the incoming more stringent emission standards and the phase-out and banning of fossil fuel vehicles by 2030 from Europe, India, China, South Korea, Japan, United States, etc. due to climate change and air pollution. This also comes after the United Kingdom passed legislation in February 2020, that will ban new sales of all fossil fuel vehicles from the UK by 2030. Bolloré also stated that all the upcoming electric vehicles being introduced by JLR and other car manufacturers should also become more mainstream and eventually overtake fossil fuel vehicles.

CH.SRINIVAS
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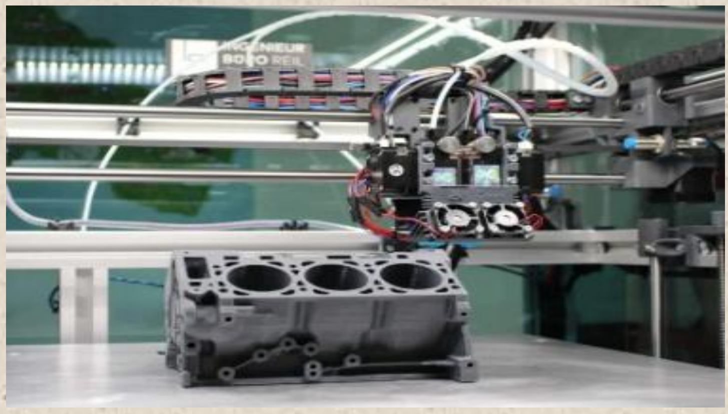
ALUMNI ARTICLE



Additive manufacturing, often referred to as 3D printing, is a process that builds objects layer by layer from a digital design. It contrasts with subtractive manufacturing, where material is removed to create an object. Additive manufacturing is used for prototyping, tooling, and the production of low-volume end-use parts.

Key aspects of additive manufacturing:

Layer-by-layer building:

Objects are constructed by depositing or solidifying material in thin layers.

Digital design:

The process starts with a 3D digital model created using CAD software or scanned from an existing object.

Variety of materials:

Additive manufacturing can utilize various materials, including plastics, metals, ceramics, and composites.

Customization and complexity:

It enables the creation of complex geometries and customized parts that are difficult to produce using traditional manufacturing methods.

Rapid prototyping:

Additive manufacturing facilitates the creation of physical prototypes quickly and economically.

Industrial applications:

It's used for tooling and fixtures, prototyping, and the production of low-volume end-use parts in various industries

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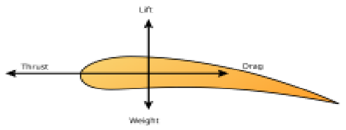
FACULTY ARTICLE



Forces of flight on a powered aircraft in unaccelerated level flight

Dr.D.RAJA RAMESH

Aerodynamics is the study of the motion of air, particularly when affected by a solid object, such as an airplane wing. It involves topics covered in the field of fluid dynamics and its subfield of gas dynamics, and is an important domain of study in aeronautics.

The term aerodynamics is often used synonymously with gas dynamics, the difference being that "gas dynamics" applies to the study of the motion of all gases, and is not limited to air. The formal study of aerodynamics began in the modern sense in the eighteenth century, although observations of fundamental concepts such as aerodynamic drag were recorded much earlier.

Most of the early efforts in aerodynamics were directed toward achieving heavier-than-air flight, which was first demonstrated by Otto Lilienthal in 1891. Since then, the use of aerodynamics through mathematical analysis, empirical approximations, wind tunnel experimentation, and computer simulations has formed a rational basis for the development of heavier-than-air flight and a number of other technologies. Recent work in aerodynamics has focused on issues related to compressible flow, turbulence, and boundary layers and has become increasingly computational in nature.

Fundamental concepts

Understanding the motion of air around an object (often called a flow field) enables the calculation of forces and moments acting on the object. In many aerodynamics problems, the forces of interest are the fundamental forces of flight: lift, drag, thrust, and weight. Of these, lift and drag are aerodynamic forces, i.e. forces due to air flow over a solid body. Calculation of these quantities is often founded upon the assumption that the flow field behaves as a continuum. Continuum flow fields are characterized by properties such as flow velocity, pressure, density, and temperature, which may be functions of position and time. These properties may be directly or indirectly measured in aerodynamics experiments or calculated starting with the equations for conservation of mass, momentum, and energy in air flows. Density, flow velocity, and an additional property, viscosity, are used to classify flow fields.

Conservation laws

The assumption of a fluid continuum allows problems in aerodynamics to be solved using fluid dynamics conservation laws. Three conservation principles are used:

Conservation of mass Conservation of mass requires that mass is neither created nor destroyed within a flow; the mathematical formulation of this principle is known as the mass continuity equation.

Conservation of momentum The mathematical formulation of this principle can be considered an application of Newton's Second Law. Momentum within a flow is only changed by external forces, which may include both surface forces, such as viscous (frictional) forces, and body forces, such as weight. The momentum conservation principle may be expressed as either a vector equation or separated into a set of three scalar equations (x,y,z components).

Conservation of energy The energy conservation equation states that energy is neither created nor destroyed within a flow, and that any addition or subtraction of energy to a volume in the flow is caused by heat transfer, or by work into and out of the region of interest.

Together, these equations are known as the Navier–Stokes equations, although some authors define the term to only include the momentum equation(s). The Navier–Stokes equations have no known analytical solution and are solved in modern aerodynamics using computational techniques. Because computational methods using high speed computers were not historically available and the high computational cost of solving these complex equations now that they are available, simplifications of the Navier–Stokes equations have been and continue to be employed. The Euler equations are a set of similar conservation equations which neglect viscosity and may be used in cases where the effect of viscosity is expected to be small. Further simplifications lead to Laplace's equation and potential flow theory. Additionally, Bernoulli's equation is a solution in one dimension to both the momentum and energy conservation equations.

The ideal gas law or another such equation of state is often used in conjunction with these equations to form a determined system that allows the solution for the unknown variables.

Aerodynamics in other fields

Engineering design

Aerodynamics is a significant element of vehicle design, including road cars and trucks where the main goal is to reduce the vehicle drag coefficient, and racing cars, where in addition to reducing drag the goal is also to increase the overall level of downforce. Aerodynamics is also important in the prediction of forces and moments acting on sailing vessels. It is used in the design of mechanical components such as hard drive heads. Structural engineers resort to aerodynamics, and particularly aeroelasticity, when calculating wind loads in the design of large buildings, bridges, and wind turbines.

The aerodynamics of internal passages is important in heating/ventilation, gas piping, and in automotive engines where detailed flow patterns strongly affect the performance of the engine.

Environmental design

Urban aerodynamics are studied by town planners and designers seeking to improve amenity in outdoor spaces, or in creating urban microclimates to reduce the effects of urban pollution. The field of environmental aerodynamics describes ways in which atmospheric circulation and flight mechanics affect ecosystems. Aerodynamic equations are used in numerical weather prediction.

Ball-control in sports

Sports in which aerodynamics are of crucial importance include soccer, table tennis, cricket, baseball, and golf, in which most players can control the trajectory of the ball using the "Magnus effect".

MOTIVATIONAL TIP

SUCCESS TIP

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SRI VASAVI INSTITUTE OF ENGINEERING & TECHNOLOGY(A)

Department of Mechanical Engineering

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