



Freedom Motors & Total Addressable Market (TAM)

EXECUTIVE SUMMARY

When Internal Combustion Engines (ICE) or IC Engines are mentioned, the usual response is that the world is moving towards electric vehicles so there is no future market for this sector. But there is so much more to the IC engines than the cars and EV industry.

Rising energy demand from manufacturing and construction industry is providing impetus to the industrial engines. The urban infrastructure is propelling the demand for a reliable and consistent source of power generation to ensure uninterrupted and efficient operations in the industrial, as well as the commercial sector.

The global engine market is expected to touch new growth heights on account of the development of new generation agriculture equipment, manufacturing, forestry, material processing, military, mining and utility vehicles, and locomotives, boats, and ships, which are expected to expand the usage of modern engines. The sale of aftermarket engine products is also likely to rise as the world's stocks are increasing.

The World Economic Forum predicts that across all transport modes by 2030 petrol, diesel and biofuel will account for 80% of energy consumption, compared with 3% each for gas and electricity, 8% for jet fuel, and 6% for 'other'. According to Bloomberg Business the Alternative Fuel and Hybrid Vehicle Market to Reach \$7,976.0 Billion, Globally, by 2030 at 34.5% CAGR [\[Click Here\]](#).

Freedom Motors Rotapower® engines are fuel flexible (can operate on a variety of commercial fuels) and have the best in class power to weight ratio. Rotapower® engines have a strategic and significant advantage over the traditional piston driven Internal Combustion Engine (ICE).

FM, using its previous acquisitions of Outboard Marine Corporation (OMC) and majority of the General Motors Corporation (GMC) rotary engine division, as the basis and foundation, further developed the engine technology and made it commercially viable. Freedom Motors and its technology partner, Moller International, together hold 12 engine related mechanical patents, 5 design patents in total and many other technological patents making up to 49 in total. FM has many trade secrets and 8 patents in process or ready to be processed.

Features:

Fewer Moving Parts

- Only 2 moving parts in a single rotor 4-stroke Rotapower® engine. Compares to 7 parts for 2-stroke and 25 parts for a 4- stroke piston engine with a similar instantaneous output torque.
- Charge or air-cooled rotor design eliminates many engine components typical of existing rotary engines.
- Can be disassembled and reassembled in less than 30 minutes.
- Fewer moving parts means longer life and lower direct and indirect cost.

Reduced Fuel Consumption

- Specific Fuel Consumption ~0.4 lb./HP-hr. for the 4-stroke Rotapower engine with the potential to achieve 0.31 lb./HP-hr. from the 5-stroke version that extracts residual energy from the exhaust based on NASA predictions and test results to date.
- Compares to 0.45 lb./HP-hr. for the average commercial 4-stroke piston engine and ~ 0.35 lb./HP-hr. for the best 4-stroke gasoline fueled automotive engine.

Very Low Emission Levels

- Carbon Monoxide (CO) and unburned hydrocarbon (HC) emissions are two orders of magnitude better than 2-stroke, and one order of magnitude better than many industrial or commercial 4-stroke piston engines.
- NOx emissions much lower than 4-stroke piston engines.

Proven Multi-Fuel Performer

- Demonstrated on gasoline, natural gas, alcohol (methanol and ethanol) and propane, Spark-ignited diesel, kerosene, and jet fuel. Methanol and ethanol represent the ideal fuels for the Rotapower® engine, as to horsepower and torque output, cooling characteristics, fuel economy and environmental effects,
- Pre-production is underway of a hydrogen fueled version to fulfill FM's \$60+ million with OneH2

Low Vibration Levels

- Perfect radial balanced allows rigid mounting, which can become an integral part of the chassis.
- Instantaneous torque characteristics identical to 6 cylinders 4-stroke piston engine (two-rotor model).

Modular Design

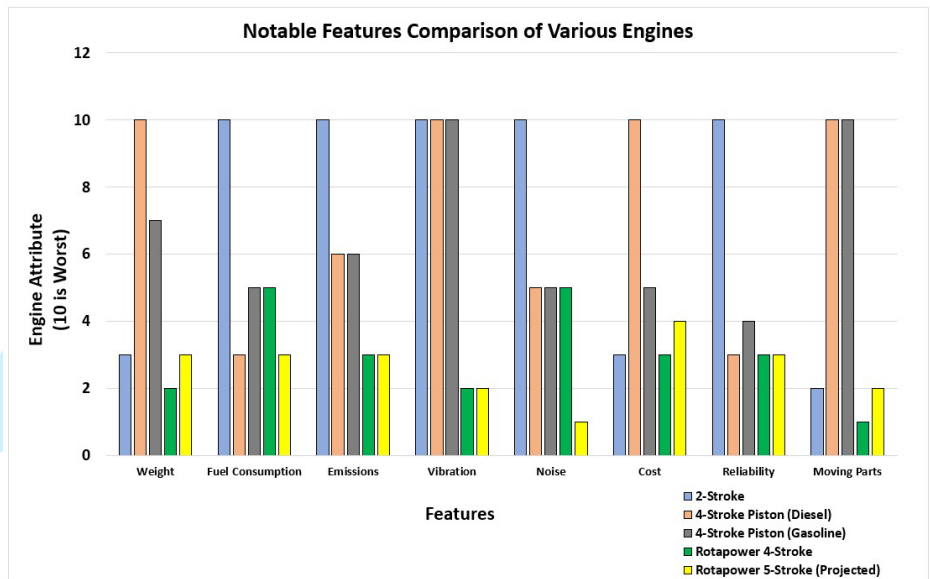
Stacking of rotors easily extends range of available power.

Fuel Consumption Comparison

Engine Type	Specific Fuel Consumption (SFC)	
	LB per hp-hr	Grams per kw-hr
2-Stroke recreational piston engine	0.65	395
Mazda rotary engine	0.52	316
OMC rotary engine	0.6	365
4-Stroke commercial piston engine	0.45	274
Rotapower engine – carbureted	0.43	262
Rotapower engine – direct fuel injection	0.4	243
Diesel fueled Audi 2.5 L TDI	0.31	188
Rotapower engine – 5-Stroke version (Projected)	0.31	188

Rotapower® Improvements to Extend Engine Life

- Freedom Motors incorporated patented improvements into its designs:
 - Parallel cooling for rotor (Patent #5413877).
 - Unique oil injection and lubrication system (Patent #6325603).
 - Complimentary cooling towers (Patent #6164942).
- Cooling approach eliminated end-loading the roller bearing and side-thrust on the rotor.
- Lubrication patent placed lubricating oil precisely where it was needed.
- Trade secrets to be implemented in production:
 - 20,000+ hour life seal and wear surface life.
 - Rotor housing grind finish eliminates need to lap housing.
 - Lower cost plasma coatings for rotor housing.
 - Lubricating oil uniquely able to address the needs of the Rotapower® engine.

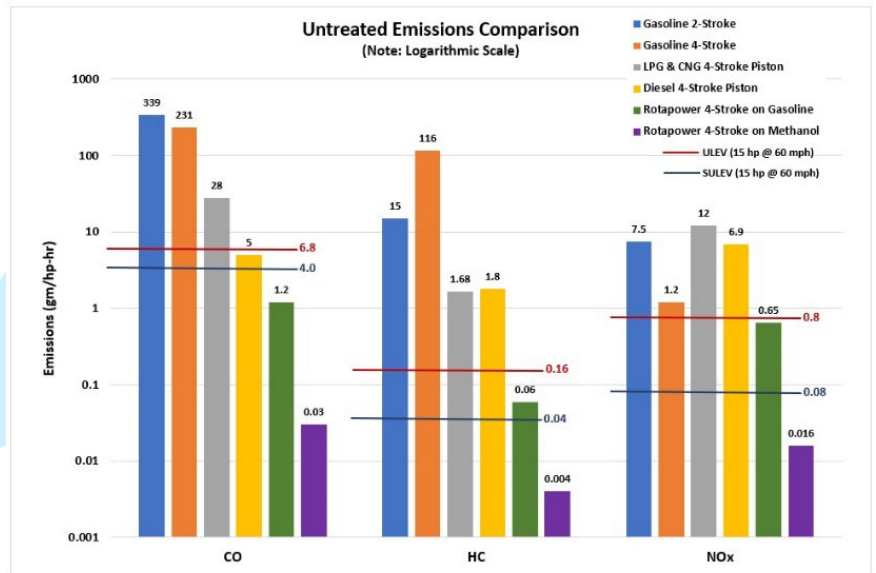


Rotapower® Improvements to Reduce Fuel Consumption and Emissions while Increasing Power

- Unique intake port arrangement of fuel/airflow and airflow that leads to a 15% increase in power and a 4% reduction in fuel consumption in the 4-Stroke Rotapower® engine.
- Fuel/air intake timed by rotor position so that the charge enters the intake stroke near the leading edge of the rotor creating a stratified charge. Results in a 15% reduction in fuel consumption and near zero toxic emissions.
- A specific combination of engine displacement, engine RPM and brake mean effective pressure (BMEP) that allows the Rotapower® engine to operate on the Otto cycle while using diesel fuel.
- One-way airflow valve with very low-pressure loss.
- 5-Stroke version of the Rotapower® engine that increases power by up to 50%, reduces exhaust noise by over 90%, reduces exhaust temperature by nearly 50% and potentially reduces fuel consumption by up to 20%.

Rotapower® Engine Emissions

- Tests carried out in conjunction with the Institute of Transportation Studies (ITS) at the University of California at Davis and witnessed by members of the California Air Resources Board (CARB).
- The Rotapower® engine using gasoline as a fuel achieved hydrocarbon, carbon monoxide, and nitrous oxide emission levels well below those required to meet the Ultra-Low Emission Vehicle (ULEV) standards for California
- This was accomplished without exhaust after-treatment (catalytic converter) which had not been previously achieved with any other engine technology. Using ethanol resulted in emissions well below the Super Ultra Low Emission Vehicle (SULEV) California standards again without exhaust after-treatment.

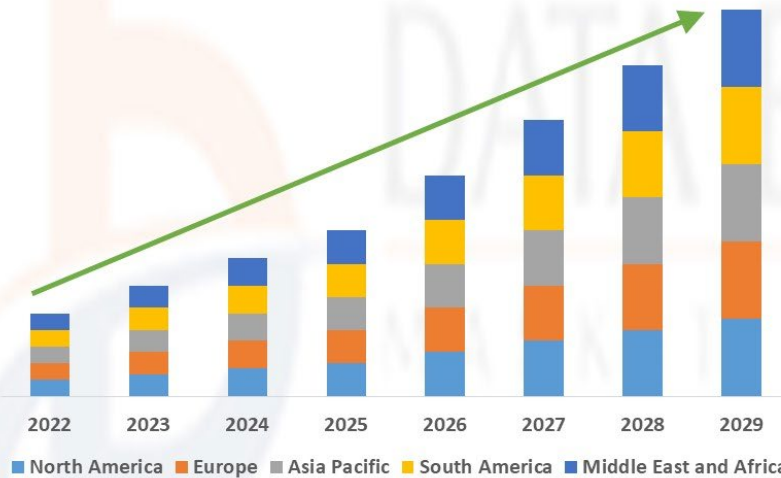


Piston engine data from EPA report No. NR-0106
 Rotapower engine data verified by California Air Resource Board (CARB) and Dr. Andrew Burke of the Institute of Transportation Studies (ITS), University of California, Davis

TOTAL ADDRESSABLE MARKET

The (ICE) market is segmented on the basis of fuel, end-use and application. The growth amongst these segments will help analyze growth segments in the industries and provide a valuable market overview and market insights. The global internal combustion engine market size was estimated at 169,603.7 thousand units in 2021 and is projected to register a compound annual growth rate (CAGR) of 9.3% from 2022 to 2030 [\[Click Here\]](#). Demand for the product is increasing across the industry such as agriculture, construction, mining, and power generation. The lack of EV infrastructure availability worldwide is also responsible for the uptake of the ICE market.

Global Internal Combustion Engine (ICE) Market is Expected to Account for USD 93,615.18 Billion by 2029



DMCA Protected © Data Bridge Market Research- All Rights Reserved.

Source: Data Bridge Market Research Market Analysis Study 2022

Global Internal Combustion Engine (ICE) Market, By Regions, 2022 to 2029



DATA BRIDGE MARKET RESEARCH



Industries where the IC engines (2 and 4 stroke) that are poised to have a modest CAGR gain are

1. Industrial
2. Construction
3. Marine
4. Agricultural
5. Gardening
6. Generators
7. Motorcycles
8. Recreational Products
9. Automobiles/Trucks
10. Military

In addition to these there are emerging markets like Electric Vehicles (EV) range extenders and Advanced Air Mobility (AAM) or Urban Air Mobility (UAM).

Freedom Motors has done extensive study jointly working with JP Morgan and KPMG to seek TAM data in order to develop a Regulation A document [[Click Here](#)]. The study laid out the worldwide engine production for automotive and non-automotive purposes and further categorized it by application.

This study concluded that the Rotapower® engines have a significant advantage over the 2 and 4 stroke IC engines specifically in the non-automotive category. The following competitive advantages are articulated in the document.

COMPETITIVE ADVANTAGES

The Rotapower® rotary engine combines the attributes of both the two and four-stroke piston engines in a low cost design, solving the problems of fuel consumption and emissions that have limited the use of rotary engines. Historically, the charged cooled rotor rotary engine had a low cost but unimpressive fuel consumption and emissions (OMC and Fichtel-Sachs approach) or high cost with acceptable fuel consumption and emissions (Curtiss-Wright, John Deere, and RPI approach). Mazda rotary engines operated between these two extremes without a clearly defined set of attributes. The Rotapower® engine has retained the simple low cost approach of the original OMC design and, through patented and proprietary technology, has been able to lower fuel consumption and emissions and extend life by an order of magnitude.

In the automotive market, previous rotary engines (Mazda and NSU) have had somewhat poorer fuel consumption than four-stroke piston competitors. Despite their lower weight, emissions, and cost, this limitation caused the automotive companies to be unwilling to re-tool their engine and chassis plants to use these engines. In addition, the existing emissions from recreational and small commercial engines were not a major concern. The following developments now make the Rotapower® engine a highly competitive alternative powerplant.

- The Company's patented rotor cooling and porting arrangement has reduced both emissions and fuel consumption while also lengthening engine life by lowering thermal stresses within the engine. This technology together with lower internal energy losses by using roller bearings and charge rotor cooling has made the Rotapower® engine's fuel consumption competitive with the four-stroke piston engine.
- Pollution is now becoming such a dominant issue that two-stroke engines are disappearing completely worldwide while four-stroke piston engines must significantly reduce their exhaust emissions.
- The low levels of CO, HC, and low NOx emissions from the Rotapower® engine makes it possible to require minimum after treatment of the exhaust.

COMPARISON WITH A TWO-STROKE ENGINE

Recent advances have potentially improved the fuel consumption and emissions characteristics of two-stroke engines by utilizing a sophisticated fuel injection system. Those systems are expensive, offsetting the cost advantage the two-stroke has historically enjoyed (estimated by CARB responses to add at least 35% to engine cost). The two-stroke will remain handicapped by high vibration, high fuel consumption, noise, and emissions. The only Wankel rotary type engine of a similar design to the Rotapower® engine that was put into volume production, was the OMC rotary. A major design goal in the OMC development was to be cost-competitive with the two-stroke engine it was designed to replace. OMC achieved this goal with their rotary engine which proved to be far more reliable than the two-stroke engine it replaced.

The Rotapower® engine equivalent of a two-stroke engine:

- Produces more power for a given weight and size:
- Two-stroke engines are capable of producing approximately one horsepower per pound of engine weight while the Rotapower® engine has produced over two horsepower per pound of engine weight.
- Produces much lower emissions:
- In recent tests observed by CARB, the Rotapower® engine produced 3 g/hp-hr of combined HC and NOx emissions. This compares with over 300 g/hp-hr for carbureted two-stroke engines and 40 g/hp-hr for direct injected two-strokes. While the Rotapower produced negligible amounts of particulates, the direct injected two-stroke produced large quantities of carcinogenic particulates. Measured CO emissions from the Rotapower engine were .07% of those from the two-stroke engine.
- Is free from vibration:
- The Rotapower® engine has only rotary motion (like the turbine engine) and, with perfect balance, is free from vibration.
- Has better fuel economy:
The best commercial two-stroke engines achieve a specific fuel consumption of .6 lb/hp-hr. Tests to date have shown the Rotapower® engine using less than .45 lbs./hp-hr.
- Is quieter:
Two-stroke engines cannot tolerate much exhaust back-pressure, hence muffling these engines is difficult without a very large muffler. The Rotapower® engine uses a four-stroke cycle, which is more tolerant of exhaust back-pressure.
- Is more reliable:
Two-stroke engines use roller bearings, as does the Rotapower® engine. However, in the two-stroke engine very large reversing stresses are induced as a result of the reciprocating motion. Roller bearings do not tolerate reversing motion and the associated stress well.

COMPARISON WITH A FOUR-STROKE PISTON ENGINE

There has been little innovation in this category in the last 30 years. The only trend is a gradual switch from gasoline to diesel engines. Existing gasoline commercial engines are heavy relative to the power they generate. These engines are also rated for relatively low speeds. The most efficient way to gain power-to-weight advantage is by operating at higher speeds, but those conditions cause vibration and durability problems for reciprocating engines since balancing is very difficult, especially if they have four or fewer cylinders.

The Rotapower® engine is uninhibited by valves, has no reciprocating parts, and its rotor rotates at one-third of the output shaft RPM, so it thrives on higher speeds without sacrificing durability or smoothness. It is therefore particularly effective in applications where portability or compact size is important.

The Rotapower® engine equivalent of a four-stroke piston engine:

- Produces much more power for a given weight and size:

Very few four-stroke piston engines can produce more than one-half horsepower per pound versus over two horsepower per pound of engine weight for the Rotapower® engine.

- Produces lower emissions:
Under contract from CARB, Southwest Research Institute tested emissions produced by small four-stroke piston engines. These results were compared with emissions from the Rotapower® engine as observed by CARB and the Institute of Transportation Studies (ITS) in University of California, Davis. In this comparison the Rotapower engine produced .6% as much HC, .08% as much CO, and 9.7% as much NOx as the small four-stroke piston engines tested by SRI.
- Is cheaper to produce:
Four stroke piston engines cost 25 to 30% more than simple two-stroke engines. OMC produced their four-stroke rotary engine, on which the Rotapower® engine is based, for the same cost as their two-stroke engines. OMC stated that, had they produced their rotary engine in similar volumes to their two-stroke engines, the cost would have been even lower.
- Is free from vibration:
The Rotapower® engine has pure rotary motion and therefore free of vibration.
- Has similar or better fuel consumption:
In order to preserve the exhaust valve life, small four-stroke piston engines use a rich fuel-air mixture running typically at close to .6 lb/hp-hr. The Rotapower® engine's freedom from valves allows it to run well at very lean mixtures, which in addition to lower fuel consumption, also helps lower emissions.
- Is more reliable:
With only a very small percentage of the moving parts of a four-stroke piston engine and only rotary motion, the Rotapower® engine is inherently more reliable. Wankel rotary engines produced in the late 1960's by Ingersoll-Rand have accumulated over 34,000 working hours without an overhaul. Many OMC rotary engines operated for well over 2000 hours without an overhaul. The Rotapower® engine uses higher quality seals and bearings than the OMC engine and has been able to demonstrate a seal life of over 10,000 hours.

SMALL ENGINES MARKET

One of the most important attributes of Rotapower® engines is its flexibility to operate on various fuels. Freedom Motors have successfully tested and operated Rotapower® engines on ethanol, methanol, hydrogen, natural gas, propane, gasoline, diesel, and biogas. It is certain that Rotapower® engines are capable of operating on many more fuels than tested.

Freedom Motors is focused on the small engines market. The small gas engine market is expected to witness a CAGR of more than 4 % during the forecast period, 2022-2027 [\[Click Here\]](#). Due to the COVID-19 pandemic, the market studied witnessed a negative impact, owing to the subdued activities in the end-user industries. However, the market has been showing signs of recovery since early 2021, which was likely due to the economic rebound in the majority of the countries. Factors such as the increasing use of construction equipment powered by gas generators, the decline in natural gas prices, low environmental impact, and increasing flexibility and efficiency

of gas-driven energy generation are expected to drive the small gas engine market demand during the forecast period.

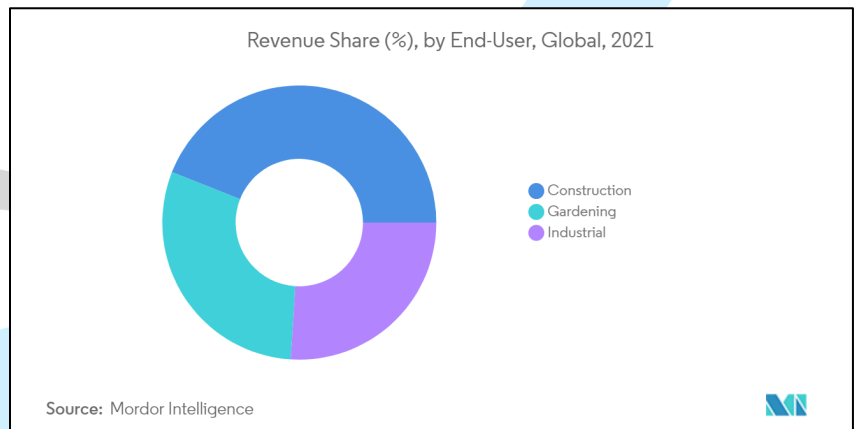
However, the cost of the small gas engine is likely to hamper the market. Consumers are buying cheap equipment from merchandisers or retailers at low prices. Such scenarios are pushing the Chinese products available at lower prices but are of low quality. This price war has forced manufacturers to a point where they have lost the ability to sell their engines at a premium [\[Click Here\]](#). This is a significant advantage for Freedom Motors due to very low manufacturing costs and when manufactured in countries in Asia, the cost of Rotapower® engines can be very competitive.

The following are the market drivers contributing to the growth [\[Click Here\]](#).

- The growth of the construction activities surges the demand for outdoor power equipment, which is likely to dominate the small gas engine market due to the nominal maintenance costs and reduced product costs.
- Due to emission legislation, the major manufacturers are investing in new technical avenues, such as micro-hybridization engines, biofuels engines, etc., which are expected to provide opportunities for market growth.
- Asia-Pacific is expected to dominate the small gas engine market, with most of the demand coming from countries like China and India.

Key Market trends [\[Click Here\]](#)

- A gas engine is an internal combustion engine that runs on natural gas or other gases, such as coal gas, producers' gas, biogas, and landfill gas. Higher flexibility and quick-startup of the gas engine also result in a shift from other drivers to gas engines among the users, especially in the small size capacity range (20 – 640 cc) in recent times.
- Any construction activity requires electric power to run the various machinery and equipment. The sites cannot avail of grid supplies as the concerned project's power infrastructure might not be fully developed to support the power requirement of the construction phase, thus creating a need for efficient small gas engines.
- In recent years, due to the increasing demand for efficient and low carbon engines along with technological advancements, companies are investing and adopting advanced small gas engines that require low maintenance and reduced product costs.



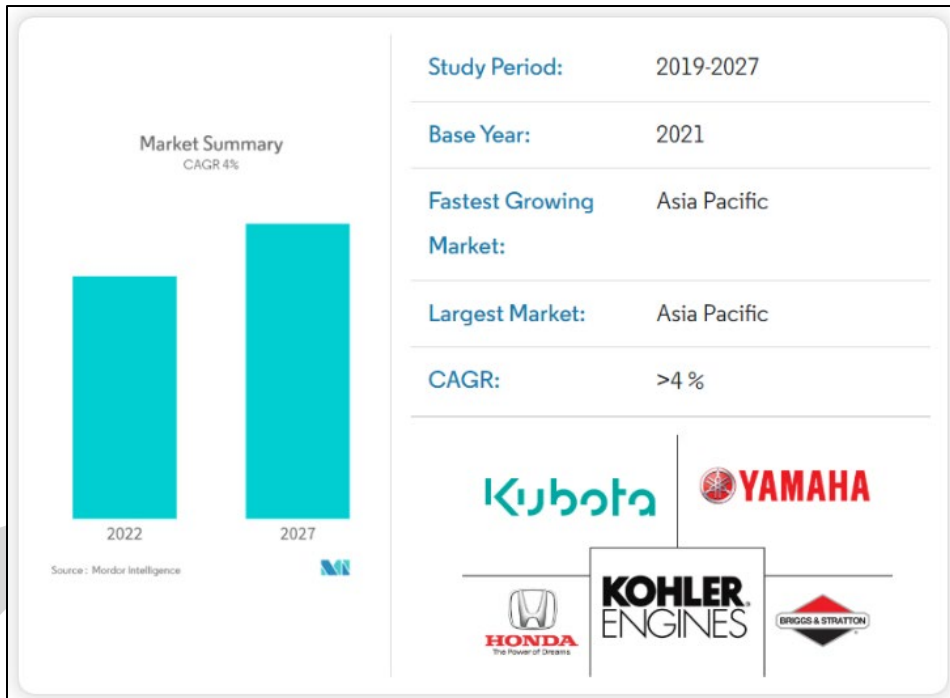
- The construction sector remains one of the most significant end users of small portable engines during the forecast period.
- Moreover, the fast-paced economic growth, coupled with urbanization activities in the developing nations, such as China, India, and Indonesia, has led to phenomenal growth in the construction industry over the past several years, thus driving the demand for the small gas engine market during the forecast period.
- Moreover, the increasing number of construction project activities globally and concerns related to the environment and economy of the projects are expected to drive the demand for the small gas engine market

Asia-Pacific to Dominate the Market [\[Click Here\]](#)

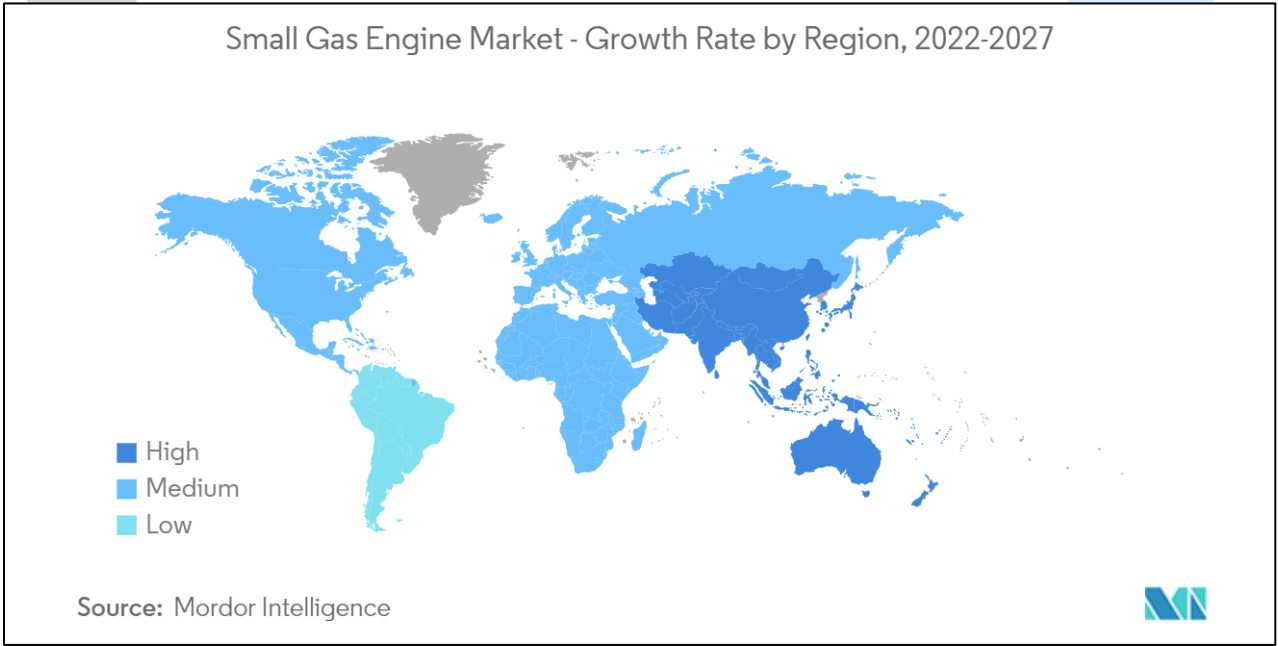
- The Asia-Pacific region is expected to be one of the significant markets for small gas engines. Due to the rising industrialization and urbanization, major countries in the Asia-Pacific region are witnessing substantial growth in the end-user industries, such as the construction and industrial sector.
- According to the Indian government's estimate, the country needs an investment of about USD 4.5 trillion to build sustainable infrastructure by 2040. The Union Budget 2022-23 of India highlights a 35.4% increase in public capital investment. The rise in CAPEX has increased from nearly INR 5.54 lakh crore in 2021-22 to around INR 7.50 lakh crore in the 2022-23 budget. It aims to strengthen the country's infrastructure, thus positively impacting the small gas engines in the construction sector during the forecast period.
- The Indian government has adopted a strategic policy toward clean energy usage with a vision to create a gas-based economy in the country. The gas pipeline infrastructure in India increased from 12,028 km in 2012 to 17,016 km as of June 2020. It is expected to lead to widespread growth in natural gas production. Furthermore, the country has set a target to raise the share of gas in its primary energy mix to 15% by 2030. Such policy-level initiatives are likely to boost the natural gas sector, in turn increasing the adoption of small gas engines in the coming years.
- Major countries in the region are also investing heavily in smart green buildings. This leads to the need for lawns or gardens to be maintained near buildings. With this, landscaping businesses and countries in the Asia-Pacific region are expected to create demand for outdoor-powered equipment. As the small gas engine offers low maintenance cost, outdoor power equipment is expected to be frequently rented and gain much attention from homeowners. This, in turn, is likely to drive the small gas engine market in Asia-Pacific during the forecast period.

Therefore, based on the above-mentioned factors, Asia-Pacific is expected to dominate the global small gas engine market.

Market Snapshot [\[Click Here\]](#)

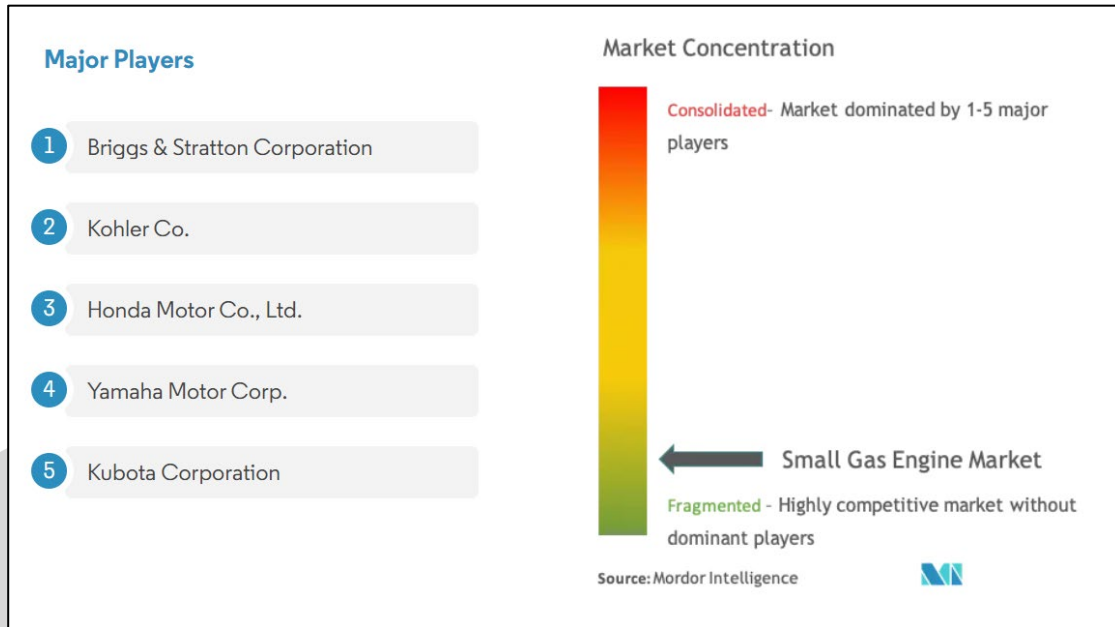


Small Gas Engine Market - Growth Rate by Region, 2022-2027



Competitive Landscape [\[Click Here\]](#)

The small gas engine market is moderately fragmented. Some of the key players in this market include Briggs & Stratton Corporation, Kohler Co., Honda Motor Co. Ltd, Yamaha Motor Corp., and Kubota Corporation.



Rising Demand for Urban Green Spaces Trending the Small Engine Market [\[Click Here\]](#)

The global small engine market was valued at US\$ 7,732.3 million in 2013 and is anticipated to be valued at US\$ 4,127.2 million by 2018 end. The small engine market is expected to grow at a substantial CAGR of 4.0% between 2018 and 2026 and is estimated to reach a global value of US\$ 5,628.2 million by 2026 end.

The demand for mainstream products installed with small engines is significantly impacted by unpredictable power-outages that can lead to substantial variations in, and uncertainties regarding, financial results from period to period. Sales of small engines is subject to consumer buying patterns and the demand for a wide range of small engine applications, such as portable generators, which are affected by power outage events caused by blackouts, thunderstorms, hurricanes, storms, and other power grid reliability issues. The impact of these outage events on sales can vary depending on the frequency, location, and severity of the outages. Among city planners and real estate agents, the demand for landscaping in commercial as well as residential areas by dwellers has increased, which directly fuels the demand for small engines.

Approximately, more than 60% of people tend to pay more for an apartment or residential space with a gardening area. The demand for landscaping is rising in order to provide an aesthetic appeal to commercial and residential properties. Landscaping benefits include restoring native plants to residential landscapes, adding plants indoors to improve air quality and human productivity.

Moreover, gardening/landscaping is a preferred leisure outdoor activity. According to the facts and figures presented by National Gardening Association, more than 90 million U.S. households (27 Million of whose members are over age 54) participate in some type of garden and lawn activity. Most of the gardeners agree that gardening is good for the mind, body, and soul. Thus, the ageing population will also drive the demand for gardening equipment and small engines collectively.

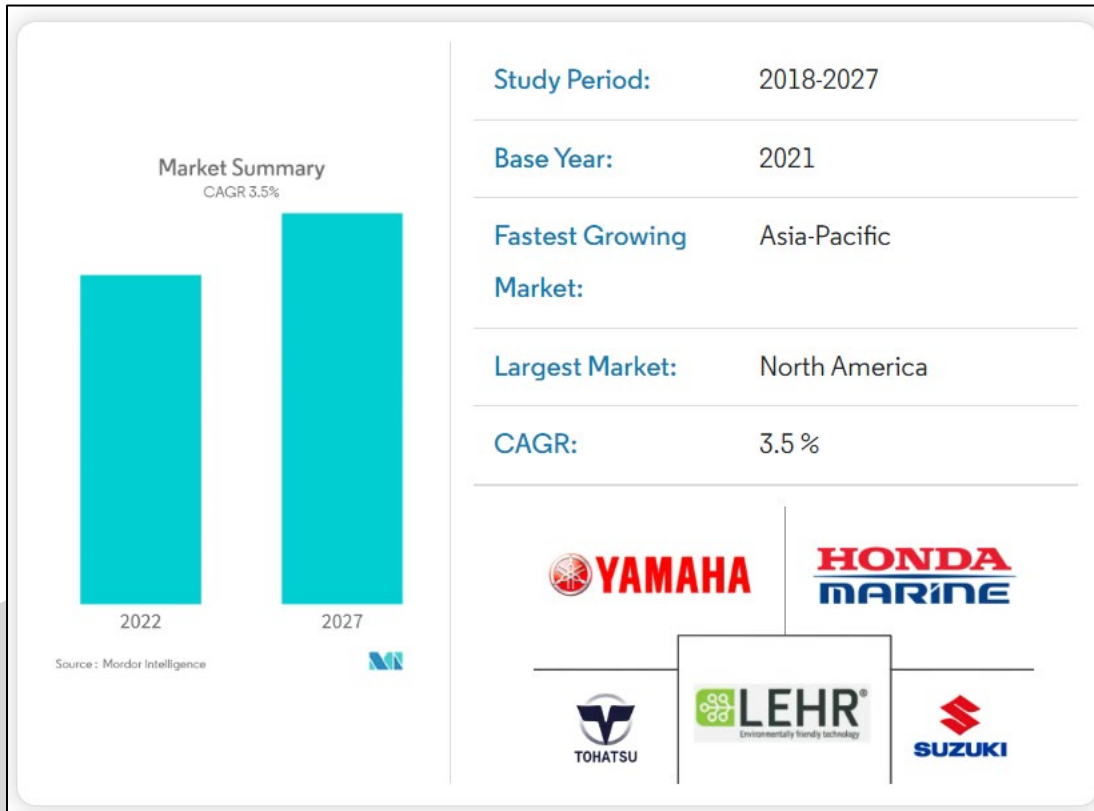
The accommodation, hotel and restaurant sector is set to directly benefit from the growth of the tourism industry. Growing consumer preference for environment-friendly accommodations and garden restaurants have led to infrastructural changes that demand outdoor power equipment. This trend is highly likely to augment the demand for outdoor power equipment in the hospitality sector.

At a macro-level, volatile market environment, prominence of the online market and the shift in small engine manufacturing to Asia are expected to encourage new sales growth in the small engine market. The growth of small engines used for recreational activities is also expected to remain robust, underpinned by an optimistic growth forecast for regional GDP.

As GDP growth accelerates, income and consumer confidence levels also rise, which further boosts the demand for small engines. The 101-300 CC segment, expanding at a CAGR of 5.8% over the forecast period, is projected to gain 340 BPS by 2026. The 301-600 segment is pegged to be an attractive segment in terms of market share, owing to the high sales of small engines in North America and Europe.

OUTBOARD MOTOR MARKET [\[Click Here\]](#)

The Outboard Motor Market is segmented by Application Type (commercial and recreational), by Thrust (Portable, mid-range, and high power), and by Geography (North America, Europe, Asia-Pacific, and Rest of the World).



The Outboard Motor market is valued at USD 9.39 Billion in 2021 and is expected to reach USD 11.54 Billion by 2027 registering a CAGR of about 3.5%, during the forecast period (2022 – 2027).

The COVID-19 outbreak had a significant impact on boat manufacturing industry and caused a decline in recreational activities around the world which led to the negative effect on outboard motor sales. As the economies are slowly recovering from the pandemic, it is expected that the market will register healthy growth in the coming years.

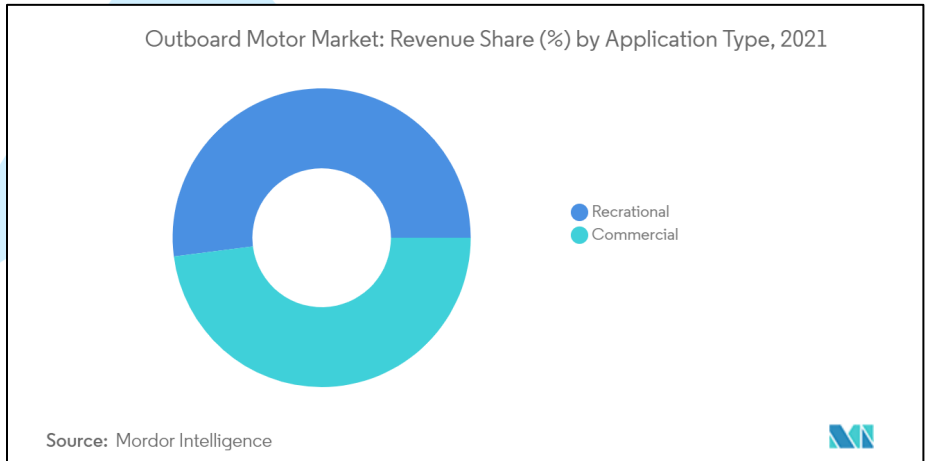
Rising water sports and boating activities across the globe is likely to increase the demand for outboard motor. According to the National Marine Manufacturers Association U.S. boat sales statistics, retail unit sales of new boats reached nearly 320,000 units in 2020, which in turn is likely to increase the sale of outboard engine and motor. For instance, the global sales of outboard engines increased with a growth rate of around 2% during the last 5 years.

Newer models that use lesser fuel, are substantially more reliable, are relatively quieter, and those that are more environment-friendly than older generations continue to enter the market. Increase in income levels of people around the world, which enables them to spend more on leisure and recreational activities will be a growth driver for the outboard motors market.

Recreation Boating is Expected to Drive Growth [\[Click Here\]](#)

The growing interest of people in outdoor recreational activities and increased participation rates across all age groups for the same are some of the major factors driving the recreational boating industry. Watersports are becoming popular not only for the excitement or adrenaline rush of getting fit but also because of several health benefits. As a result, increasing health benefits associated with water sports are supporting market growth worldwide.

Rising consumer trend towards efficient motors for fulfilling short haul operations in sailboats and canoe is anticipated to enhance the demand for outboard motors. In 2020, the coronavirus pandemic fueled the surge in recreational boat sales, which is likely to increase the demand for outboard motor and witnessing major growth during the forecast period.



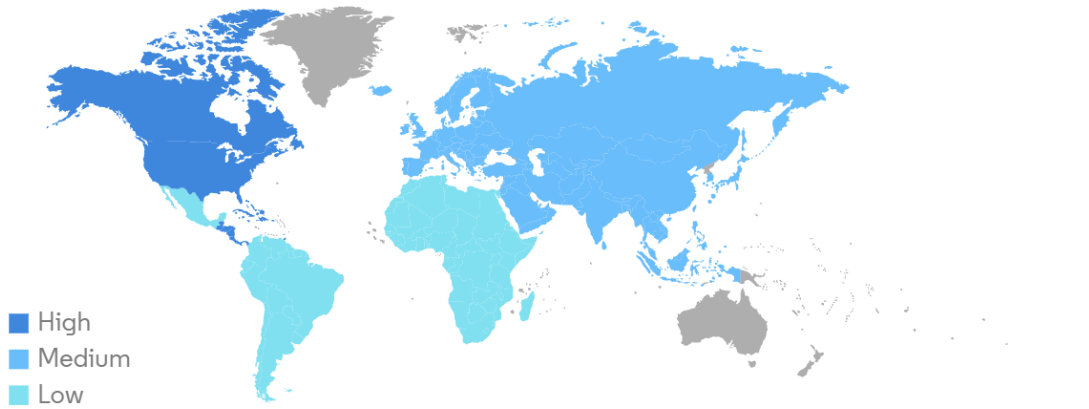
In 2020, Europe accounted for almost 20% of the worldwide outboard motor industry, given the rising tourism and a significant presence of boat manufacturers across the continent. Increased boat show attendance, as well as the introduction of new outboard motors at such events, will promote market growth.

North America is Expected to be the Market Leader [\[Click Here\]](#)

North America is dominating the outboard motor market in terms of revenue in 2021 owing to high economic growth, rise in disposable income. The increasing income levels and inclination of the people towards recreational and leisure activities is more than any other parts of the world. North America hold around 40% outboard engine market share. The USA is the largest single market for outboard engines, with sales of higher-powered outboards (200hp+) growing annually for the last seven years. According to NMMA (National Marine Manufacturers Association) in their annual Outboard Engine Sales Trends report, US outboard engine sales reached a 20-year high in 2020, which records a sale of 310,000 new powerboats in 2020.

About 35% of the total population of the United States takes part in recreational boat activities. Due to the growing stress management program and health awareness among individuals, more and more people are participating in water sports activities for relaxation. The coastline is also very big, which transpires to number of beaches and consequently creates more opportunities for the sale of outboard motors.

Outboard Motor Market - Growth Rate by Region, 2022 - 2027



Source: Mordor Intelligence



Competitive Landscape [\[Click Here\]](#)

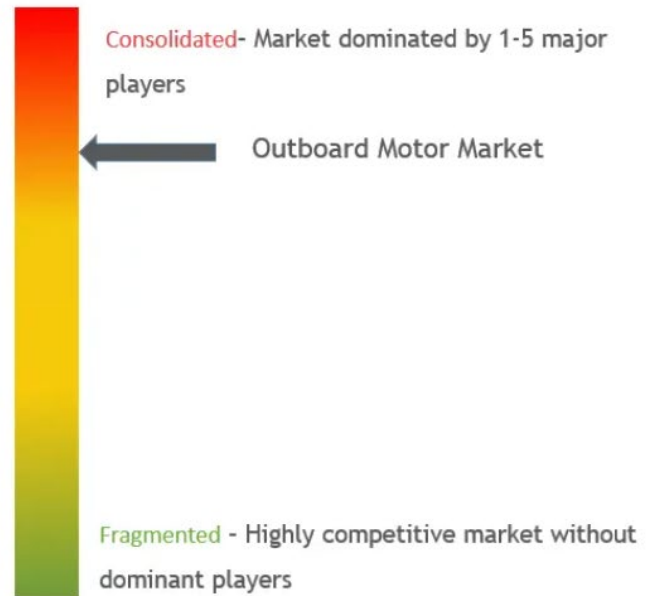
The Outboard Motors market is consolidated, with several players accounting for significant amounts of shares in the market. Some of the prominent companies in the Outboard Motors market are Yamaha Motor Co, Honda Motors Co. Ltd., Suzuki Motor Corporation, LEHR LLC, Tohatsu Corporation, and others.

Stringent emission norms and updated technologies are pushing industry players to invest in R&D projects.

Major Players

- 1 Yamaha Motor Co. Ltd.
- 2 Honda Marine
- 3 LEHR LLC
- 4 Suzuki Motor Corporation
- 5 Tohatsu Corporation

Market Concentration



Source: Mordor Intelligence



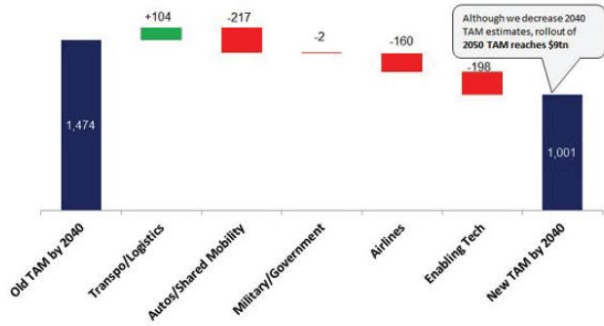
ADVANCE AIR MOBILITY (AAM) or URBAN AIR MOBILITY (UAM) MARKET

One of the significant advantages of Rotapower® engines is the ability to be used in AAM and UAM vehicles. Freedom Motors have exclusive interest in providing engines parts and engine technology to Moller International and in variety of its products.

Rotapower® engines can also be used in a variety of small to medium unmanned drone applications for building and bridge inspections, medical evac and rescue, surveillance, power transmission lines inspection, military ISR, freight carrier and more.

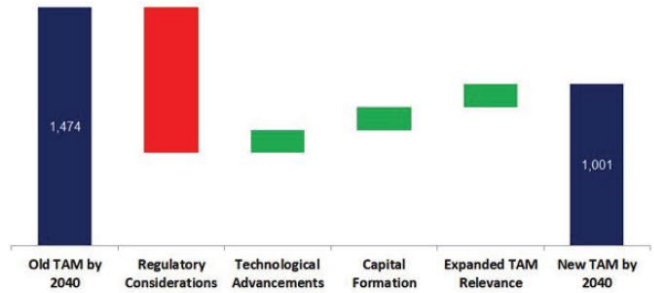
According to Morgan Stanley [\[Click Here\]](#), the Urban Air Mobility TAM base case to \$1 Trillion by 2040, but rolls out projections until 2050, when the TAM is projected to be \$9 Trillion. We don't think investors are prepared for the scope of this revolution. However, they must consider a host of regulatory factors that may slow adoption.

Key Changes to 2040 TAM by End Market (\$Bn)



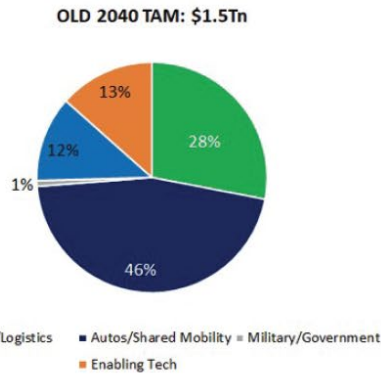
Source: Morgan Stanley Research Estimates

Key Drivers Behind Change in 2040 TAM (\$Bn)



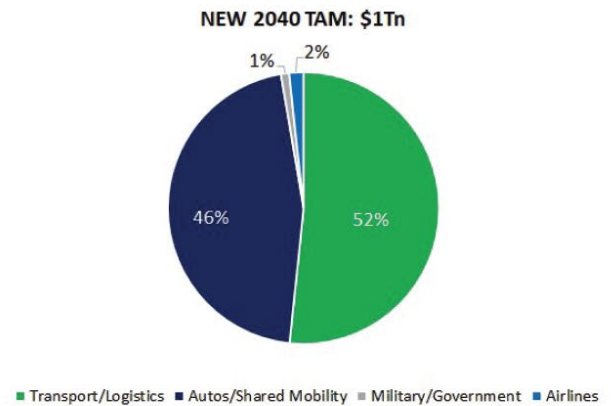
Source: Morgan Stanley Research Estimates

Old 2040 Breakout of TAM by Market (%)



Source: Morgan Stanley Research Estimates

New 2040 Breakout of TAM by Market (%)



Source: Morgan Stanley Research Estimates

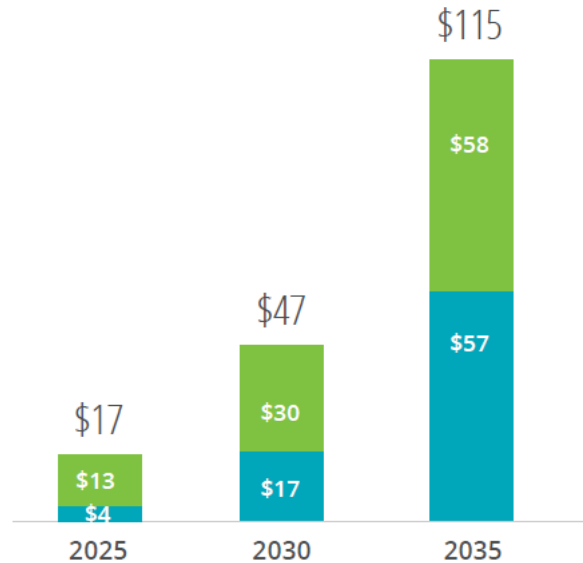
According to Deloitte [\[Click Here\]](#), AAM market poised to grow sevenfold between 2025 and 2035.

1. By 2025 it will be \$17 Billion (\$13 Billion Cargo AAM and \$4 Billion in Passenger AAM)
2. By 2030 it will be \$47 Billion ((\$30 Billion Cargo AAM and \$17 Billion in Passenger AAM)
3. By 2035 it will be \$115 Billion ((\$58 Billion Cargo AAM and \$57 Billion in Passenger AAM)

AAM market poised to grow sevenfold between 2025 and 2035

US\$ billion

■ Passenger AAM market ■ Cargo AAM market



Source: Deloitte and AIA analysis.

In addition to equipping cities with alternatives to current commuting options and inter-modal connectivity, AAM can expand access to goods and services and lead to job creation through new markets and services. With an estimated 280,000 jobs in 2035, the AAM workforce could represent about 8% of America's A&D workforce. Of the total 280,000 jobs, 234,000 are expected to be focused on the US domestic market and 46,000 on export markets.

Four jobs are likely to be created for every million dollars in AAM's direct sales revenue. Collectively, the industry could pay about US\$30 billion in wages and benefits in 2035. These jobs could provide higher-than-average compensation and support their local communities. The AAM industry could contribute US\$8 billion in taxes by 2035—US\$6 billion in federal tax revenue and US\$2 billion in state and local tax revenue. The US economy could also generate US\$20 billion in AAM exports by 2035.

Six in 10 industry leaders believe that AAM will be a more sustainable and environmentally friendly solution

to transportation. More than half of interviewed industry executives believe that beyond 2035, more than 16% of passengers using private and public transportation today will likely use AAM for commercial passenger mobility.

****END****

