

## Gearing up: Increased military spending is expected to augment private sector gains

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# IBISWorld Industry Report 33641a Aircraft, Engine & Parts Manufacturing in the US

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# About this Industry

## Industry Definition

Companies in this industry manufacture and overhaul complete aircraft, develop prototypes and convert aircraft. The industry also includes the manufacture, conversion and overhaul of aircraft engines and propulsion systems. Additionally, the industry makes related parts and auxiliary equipment. For information on guided missiles, space vehicles and related equipment, which are excluded from this industry, see Space Vehicle and Missile Manufacturing industry (IBISWorld report 33641b).

## Main Activities

### The primary activities of this industry are

Manufacturing and rebuilding aircraft  
 Manufacturing aircraft engines and engine parts  
 Manufacturing aircraft auxiliary parts

### The major products and services in this industry are

Aircraft  
 Aircraft engines and engine parts  
 Other aircraft parts and auxiliary equipment

## Similar Industries

### 33631 Automobile Engine & Parts Manufacturing in the US

This industry manufactures aircraft engine intake and exhaust valves, pistons and engine filters.

### 33632 Automobile Electronics Manufacturing in the US

This industry manufactures electrical equipment for aircraft engines and aircraft lighting fixtures.

### 33641b Space Vehicle & Missile Manufacturing in the US

This industry manufactures guided missiles and space vehicles.

### 48819 Aircraft Maintenance, Repair & Overhaul in the US

This industry provides repair services for aircraft and aircraft engines, including overhauling, conversion and rebuilding.

### 54171 Scientific Research & Development in the US

This industry conducts research and development, which may include the aerospace sector (except prototype production).

## Additional Resources

### For additional information on this industry

[www.aia-aerospace.org](http://www.aia-aerospace.org)  
 Aerospace Industries Association  
[www.faa.gov](http://www.faa.gov)  
 US Federal Aviation Administration  
[www.usitc.gov](http://www.usitc.gov)  
 US International Trade Commission

# Industry at a Glance

Aircraft, Engine & Parts Manufacturing in 2017

## Key Statistics Snapshot

Revenue	Annual Growth 12-17	Annual Growth 17-22
<b>\$240.4bn</b>	<b>3.8%</b>	<b>0.8%</b>
Profit	Exports	Businesses
<b>\$18.0bn</b>	<b>\$128.3bn</b>	<b>1,454</b>

**Market Share**

The Boeing Company  
**33.9%**

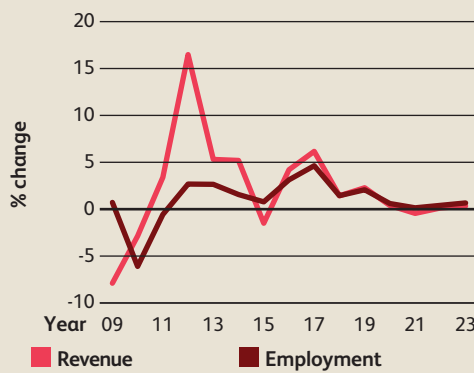
GE Aviation  
**8.5%**

Lockheed Martin Corporation  
**7.7%**

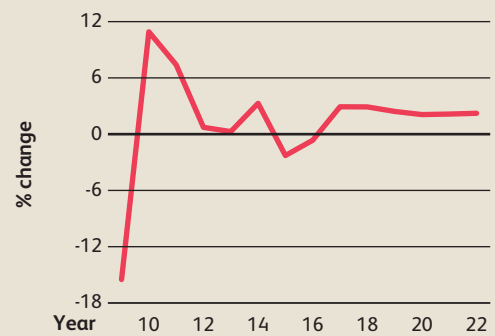
United Technologies Corporation  
**6.7%**

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Revenue vs. employment growth

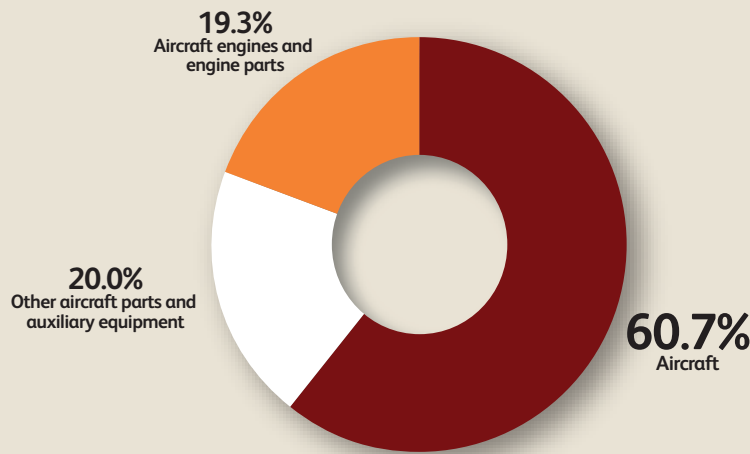


Demand from air transportation



SOURCE: WWW.IBISWORLD.COM

Products and services segmentation (2017)



SOURCE: WWW.IBISWORLD.COM

**Key External Drivers**

Demand from air transportation

Federal funding for defense

Non-NATO defense spending

Trade-weighted index

p. 4

## Industry Structure

Life Cycle Stage	Mature	Regulation Level	Heavy
Revenue Volatility	Medium	Technology Change	High
Capital Intensity	Medium	Barriers to Entry	High
Industry Assistance	Medium	Industry Globalization	High
Concentration Level	Medium	Competition Level	Medium

FOR ADDITIONAL STATISTICS AND TIME SERIES SEE THE APPENDIX ON PAGE 46

# Industry Performance

Executive Summary | Key External Drivers | Current Performance  
Industry Outlook | Life Cycle Stage

## Executive Summary

The Aircraft, Engine and Parts Manufacturing industry has changed significantly over the five years to 2017. Industry players develop and manufacture planes, rotorcraft, engines and related components for the civil and defense markets. During the five-year period, the industry's commercial segment rapidly grew, with demand increasing due to climbing global air travel and fleet replacement. On the other hand, the defense segment has been hit by declining US defense spending, partially offsetting strong commercial demand. Nonetheless, due to surging

have expanded their fleets, the primary driver of demand in the United States and other developed nations has been the replacement of aging aircraft with newer, more fuel-efficient planes.

On the other hand, recent trends have stalled industry growth. In particular, the combination of slowing global economic growth, potential overbooking, reduced demand for fuel-efficient planes due to lower oil prices and a temporary transition period to newer aircraft has caused civil aircraft orders and deliveries to fall. Combined with continued weakness in the defense market, this caused industry revenue to fall 1.5% in 2015.

Over the five years to 2022, industry revenue is forecast to rise at an annualized rate of 0.8% to \$249.6 billion. Global and domestic demand for commercial aircraft will continue to drive revenue growth. Moreover, the defense market is anticipated to pick up as production of key industry platforms, such as the F-35, picks up. Nonetheless, the civil segment will continue to encounter headwinds from a possible downcycle in aircraft orders while the defense segment endures budget uncertainty. Consolidation will also continue, especially in the supply chain, as continued, relatively high demand encourages a larger formation of suppliers that have the necessary capacity to handle these increases.

## Strong global and domestic demand for commercial aircraft will drive growth

commercial demand, industry revenue is expected to increase at an annualized rate of 3.8% to \$240.4 billion over the five years to 2017, including an increase of 6.2% this year alone.

Over the past five years, demand for civil aircraft has surged. In particular, rapid economic growth in emerging markets increased global air travel traffic, which increased demand for industry exports of large commercial aircraft. Moreover, the US economic recovery also led to increased domestic air travel, helping US demand for commercial aircraft to rebound. While US airlines

## Key External Drivers

### Demand from air transportation

When demand for air transport increases, so does the need for more aircraft. In addition, air transport operators may wish to increase their competitive edge by purchasing newer, more fuel-efficient models, a strategy that also increases demand for manufacturers. The opposite is true when demand for air transport falls. Demand from air transportation is

expected to increase in 2017, representing a potential opportunity for the industry.

### Federal funding for defense

Public expenditure on defense and military vehicles indicates demand for industry products. When military spending rises, a portion of that increase typically goes toward industry products.

# Industry Performance

## Key External Drivers continued

Federal funding for defense is expected to increase in 2017.

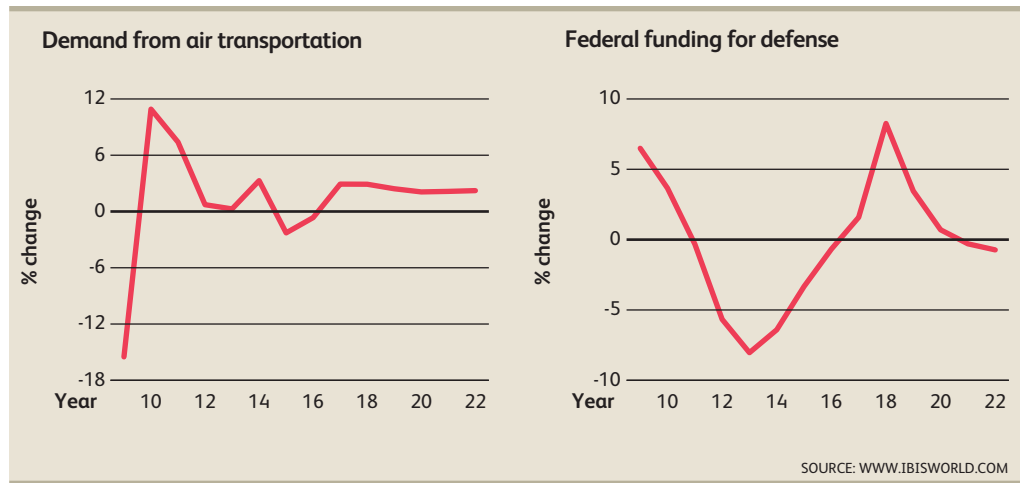
### Non-NATO defense spending

Non-NATO defense spending is the sum of global military spending, excluding the 29 members of the North Atlantic Treaty Organization. Therefore, this driver excludes spending by most Western and developed states, focusing more on developing nations. When non-NATO spending increases, the market for industry exports climbs. Non-NATO

defense spending is expected to increase in 2017.

### Trade-weighted index

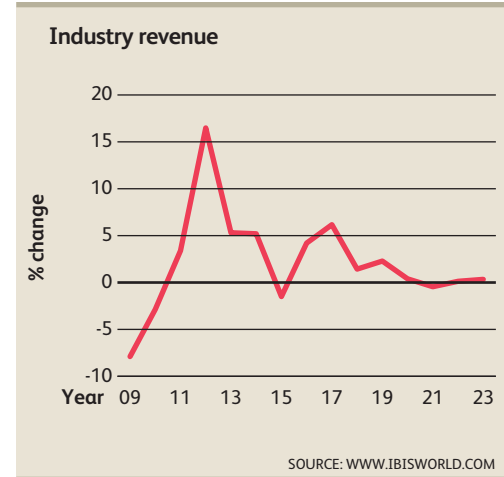
The trade-weighted index (TWI) measures the value of the US dollar against the currencies of its largest trading partners. A decreasing TWI leads to lower export prices and higher import prices. Therefore, industry operators benefit from a weak US dollar for stronger export demand. The TWI is expected to increase in 2017, posing a potential threat to the industry.



# Industry Performance

## Current Performance

The Aircraft, Engine and Parts Manufacturing industry, for the most part, performed strongly over the past five years. Participants in this industry produce aircraft, aircraft subsections, engines and parts for both military and commercial purposes. More than half of the products sold are for commercial customers, but the most expensive and sophisticated items are made for military services, with the US Department of Defense buying the lion's share of these goods. During the five-year period, the industry rapidly grew due to growing global, and eventually domestic, demand for commercial aircraft. On the other hand, falling US defense spending caused the industry's defense segment to contract, partially offsetting gains from the commercial segment. Nonetheless, demand for commercial industry products was



strong enough to overcome challenges of the defense segment. Therefore, over the five years to 2017, industry revenue is expected to climb at an annualized rate of 3.8% to \$240.4 billion, including a 6.2% jump in 2017.

## Commercial segment soars

Over the past five years, the industry's performance has been defined by growth in the commercial segment and weakness in the defense segment. In the years after the recession, demand for commercial aircraft surged. In particular, global demand for commercial aircraft caused US manufacturers such as The Boeing Company to dominate commercial aircraft manufacturing (especially large commercial aircraft). The industry is very trade-oriented, with exports expected to account for 53.4% of industry revenue in 2017. Consequently, rapid economic growth in emerging markets has caused global air travel to climb, with foreign airlines demanding US commercial aircraft. As a result, industry exports are expected to climb at an annualized rate of 4.7% to \$128.3 billion during the five-year period. This trend is readily apparent in countries such as China, where rapid economic growth and an under-flown population has boosted industry exports.

Domestic demand for the industry's commercial products also increased over the past five years. As the US economy recovered from the recession, domestic air travel began to increase. The number of domestic and international trips by US residents increased at respective annualized rates of 2.8% and 2.1% over the five years to 2017. With increasing demand, US airlines were in a better position to purchase industry products. According to the Federal Aviation Administration, the US mainline carriers' large commercial aircraft fleet is expected to climb from 3,946 aircraft in 2015 to 5,339 in 2036, an average of 66 new aircraft per year. However, this growth is low compared with international demand. Additionally, the majority of demand from the United States and other developed nations comes from the replacement of aging aircraft with newer, more fuel-efficient models. This trend has been further boosted on a global scale as airlines have sought to mitigate volatile fuel prices, which often

# Industry Performance

## Commercial segment soars continued

make up their largest expense. Moreover, the overall increase in commercial aircraft manufacturing has trickled down to engine and parts manufacturers, with much of the new improvements to aircraft fuel efficiency coming from next-generation engines.

However, while increased aircraft production led to higher demand for related parts, it also increased industry imports, which are expected to rise at an annualized rate of 3.4% to \$45.1 billion over the five years to 2017. Most US imports are aircraft parts, engines and subsections used as inputs in manufacturing. For example, Boeing's new 787 airliner sources many of its subsections, such as wings, from Japan. France is another major importer, because the country is home to Airbus, a major manufacturer of large commercial aircraft and helicopters, as well as CFM International, GE Aviation and Safran's joint venture. Canada is another hub for aerospace production, with many US manufacturers setting up subsidiaries there to take advantage of the country's membership in the North American Free Trade Agreement, its research and development incentives and proximity to the United States. Canada is a major producer of helicopters, as well as regional and business aircraft and engines.

While overall demand for industry commercial aircraft has climbed during the five-year period, recent trends are expected to, at least temporarily, reverse this growth. After years of record aircraft orders and deliveries, the global commercial aircraft market has begun to normalize. The slowdown in global economic growth caused by tempering

emerging market performance has led to a reduction in new aircraft orders and deliveries, as airlines focus on taking on planes already ordered. Similarly, as operators like Boeing transition to the production of next-generation aircraft, demand for current models declines as customers wait for newer planes, which reduces current production. On the other hand, the decline in oil prices has made older used aircraft more price-competitive to operate, moderating demand for production of new, fuel-efficient models. In particular, demand for wide-body aircraft has declined the most as slowing air travel demand reduced the need for such capacity. In addition, increased range and capacity on newer narrow-body aircraft are encroaching on the wide-body market. Consequently, industry revenue slumped in 2015, declining 1.5%.

The industry also continues to encounter difficulty in the regional and business aircraft segment. Sales of large corporate jets have increased because large corporations with increasing profit over the past five years purchase them. However, small private jets have had weaker sales because they rely on smaller companies and less-wealthy individuals, who were hit harder by the recession. Moreover, the recent slowdown in emerging market has become another headwind for the segment. In addition, sales of commercial helicopters have recently declined as the fall in oil prices caused oil and gas production to slow, decreasing demand from the key oil and gas market.

## Defense segment nosedives

The industry's defense segment has moved in the opposite direction of the commercial segment. The winding down of combat operations in the Middle East and attempts to reduce the deficit (i.e. sequestration) have reduced military

**While domestic demand for military aircraft declined, international demand boomed**



# Industry Performance

## Defense segment nosedives continued

spending. Over the five years to 2017, federal funding for defense is expected to fall an annualized 3.4% to \$540.9 billion, representing a drastic drop from near-highs in 2009. In particular, according to the fiscal 2017 budget request, US military outlays on aircraft are expected to have declined an annualized 2.1% during the five-year period. Consequently, industry defense contractors' revenue began to fall, and overall industry growth has slowed in recent years. However, those with long-term contracts for top priority programs, such as the F-35 stealth fighter, have been less impacted.

While domestic demand for military aircraft declined, international demand boomed. Geopolitical tensions in Asia and the Middle East, combined with emerging market growth, has caused nonwestern military spending to rise. Non-NATO defense spending is expected to climb at an annualized rate of 2.9% over the five years to 2017. Notably, US allies such as Saudi Arabia and South Korea have used their increased budgets to buy US military equipment, including aircraft and parts. This has contributed to the industry's boom in exports, while helping defense contractors offset weak domestic demand.

## Other trends

Over the five years to 2017, the industry has experienced consolidation. In the commercial segment, suppliers have increasingly merged to deal with the higher production volume of next-generation aircraft. Notably, to spread the cost and risk involved in developing these sophisticated products, original equipment manufacturers (OEMs) are demanding that their suppliers share in the risk. Moreover, after supply chain disasters on programs such as Boeing's 787, OEMs want to deal with fewer suppliers. This trend has created a domino effect in which OEMs' immediate suppliers (i.e. segment integrators) have become larger and taken on more responsibility and as a result, have demanded the same from their suppliers, encouraging merger and acquisition (M&A) activity down the supply chain. Moreover, OEMs have squeezed the supply chain to lower prices, further adding incentives for M&A activity.

In addition, defense contractors have been acquiring commercial aerospace businesses to diversify away from a weak defense market or spinning off their military-related divisions. In particular, M&A activity has been most prevalent

**Defense contractors have been acquiring commercial aerospace businesses to diversify**

among smaller defense companies, as the government is unlikely to approve mergers between already highly concentrated OEMs. Nonetheless, this has not prevented OEMs from shuffling their various divisions between themselves, with United Technology Corporation recently selling off its Sikorsky unit (a helicopter company) to Lockheed Martin Corporation. A more constrained defense budget has also meant contractors have been forced to increasingly cooperate or leave entire defense segments. Because of increased M&A activity, industry enterprise growth is expected to be slow, with the number of businesses climbing at an annualized rate of 1.9% to 1,454 over the five years to 2017. Moreover, defense segment restructuring and increased emphasis on automation is expected to slow employment growth despite increased



# Industry Performance

## Other trends continued

overall demand. Therefore, during the five-year period, industry employment is expected to grow at an annualized rate of 2.5% to 376,856 workers. Nonetheless,

increased demand for commercial aircraft and defense segment restructuring are projected to keep profit margins steady near 7.5%.

## Industry Outlook

Over the next five years, the Aircraft, Engine and Parts Manufacturing industry will continue to grow, albeit at a slower rate. Rising domestic and international demand for air travel will create further demand for more commercial aircraft and associated parts. In addition, airlines will seek to replace older models with newer, more fuel-efficient ones. However,

more-tempered commercial aircraft demand and weak US military spending will continue to pressure industry players. Nonetheless, increased military hardware exports and a leveling off of the defense budget should ease some of this pressure. Therefore, over the five years to 2022, industry revenue is forecast to climb at an annualized rate of 0.8% to \$249.6 billion.

## Civil segment moderates

Industry operators can expect a more tempered market compared with the previous five years. Many of the same issues that caused revenue to decline in 2015 will return, including more-normalized demand after years of recorded commercial aircraft orders, the impact of slower emerging market economic growth and lower oil prices and the transition to next-generation aircraft slowing current production. Demand for wide-body commercial aircraft will especially be hurt by these factors. In particular, moderate growth may turn negative if the global economy slows down further. The rapid expansion of airlines in emerging markets may cause these airlines to create too much supply, leading to higher price competition and lower profit. Therefore, in the long run, many of these airlines may fail, with at least some curtailing their aircraft orders just as industry players ramp up production to fulfill their growing backlogs. Consequently, aircraft manufacturers might introduce too much supply into the market, lowering aircraft prices and forcing an industry slowdown.

Nevertheless, the worst-case scenario is unlikely to occur. Therefore, over the

**Industry operators can expect a more tempered market compared with the previous five years**

five years to 2022, demand for commercial aircraft, especially large commercial aircraft, will continue to drive industry growth. In the United States and many developed nations, airlines will continue to replace older aircraft with new, more fuel-efficient ones. Moreover, as the economy continues to grow and consumer incomes rise, US air travel will grow, with the number of domestic and international trips by US residents forecast to increase at annualized rates of 1.9% and 3.7%, respectively, during the five-year period. As a result, airlines, especially mainline carriers, will expand their fleets. Nonetheless, despite stronger domestic demand and slowing economic growth in emerging markets, foreign airlines will still be the industry's primary growth market. Airlines in Asia, the Middle East and Latin America are anticipated to continue expanding their fleets to serve

# Industry Performance

## Civil segment moderates continued

their increasingly wealthy and under-flown markets. As a result, industry exports are forecast to climb at an annualized rate of 0.8% to \$133.6 billion over the five years to 2022. The increase in US aircraft production and air travel is

also projected to increase the supply of imported parts, components and complete aircraft, with the value of industry imports increasing an annualized 0.7% to \$46.6 billion during the five-year period.

## Defense segment levels out

Over the next five years, the industry's defense segment will continue to be under pressure. Federal funding for defense is forecast to be nearly stagnant. In particular, if defense funding continues to be restricted, more of the industry's military programs are expected to be cut, delayed or scaled down. On the other hand, it increasingly looks like the worst of industry's program cuts are over, especially given rising global geopolitical tensions increasing the need for military aircraft. According to President Donald Trump's fiscal 2018 budget request, the combined outlays on aircraft procurement by the Air Force, Army and Navy are projected to increase at an annualized rate of 1.7% during the five-year period. In particular, a smaller number of high-value contracts will become increasingly important for defense contractors, including the F-35 stealth fighter, the KC-46 tanker and the development of the B-21 stealth bomber (which was recently awarded to Northrop Grumman Corporation). Moreover, the Pentagon is anticipated to bolster investment in the next generation of UAVs, while also upgrading their current fleet of aircraft. Lastly, the incoming Trump administration has called for far

**With a still-uncertain domestic defense market, operators will continue to focus on exports**

greater defense spending, which, combined with a Republican-controlled Congress, is likely to raise funding for industry defense programs.

However, with a still-uncertain domestic defense market, industry players will continue to focus on exports. Continued geopolitical tensions in the Middle East, Asia and Europe will fuel increased military spending outside the western world, with non-NATO defense spending forecast to climb an annualized 4.9% to \$1.1 trillion over the five years to 2022. A good portion of this spending is expected to come from US allies buying US military aircraft and components, contributing towards the industry's growing exports and helping mitigate any potential weakness in domestic demand. However, because many of the industry's largest foreign buyers are dependent on oil revenue (i.e. Saudi Arabia), the recent fall in oil prices may reduce the pace of arms procurement in the long run.

## Profit and other trends

Profit is set to climb as worldwide demand for commercial aircraft increases industry revenue. However, suppliers will still be under pressure to consolidate and create the necessary capacity to meet rising demand for

commercial products and lower costs. On the other hand, fewer large military contracts and defense spending uncertainty will be what drive merger and acquisition activity in the defense segment. In some subsegments, there

# Industry Performance

## Profit and other trends continued

won't be enough demand for multiple companies to operate the same product line, which will result in operators leaving certain fields or acquiring companies to diversify into the civil sector or other defense segments. Any further weakening in the defense market, coupled with more government emphasis on costs, will encourage contractors to consolidate to gain market share. However, because the defense sector is already heavily consolidated, antimonopoly agencies may not welcome further consolidation.

Therefore, collaboration between competitors on certain projects will rise. Because of consolidation in the supplier and defense sectors, IBISWorld forecasts the number of operators to remain nearly stagnant despite climbing commercial sales, with the number of companies increasing at an annualized rate of 1.2% to 1,542 over the five years to 2022. Additionally, demand in the commercial segment will encourage companies to hire more workers, with industry employment forecast to rise at an annualized rate of 0.9% to 394,715 workers during the same period.

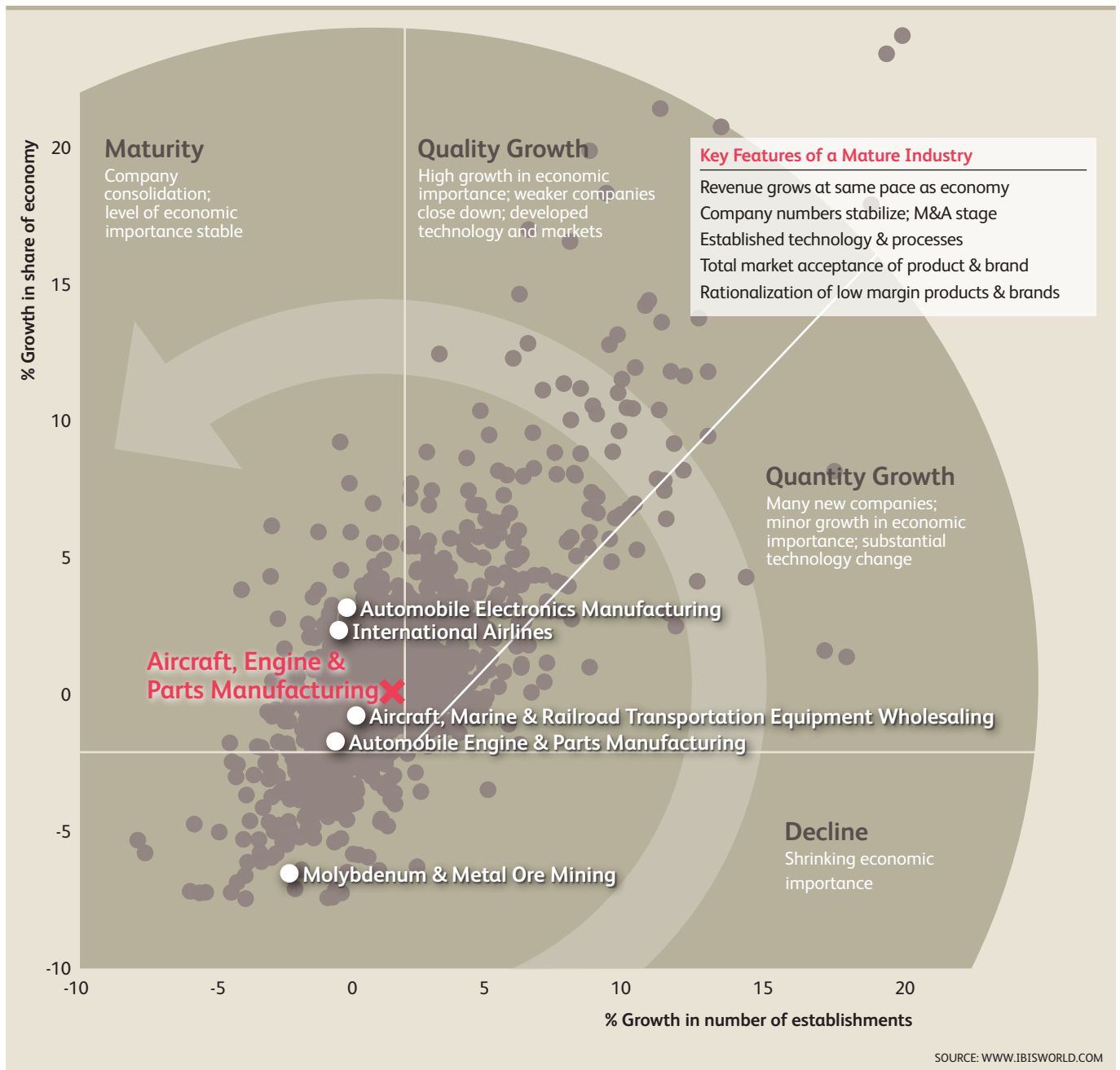
# Industry Performance

## Life Cycle Stage

Industry revenue typically grows in line with GDP

Parts of the industry are going through consolidation

The commercial segment will expand, while the defense segment will lose revenue



# Industry Performance

## Industry Life Cycle

This industry is **Mature**

IBISWorld analysis reveals that the Aircraft, Engine and Parts Manufacturing industry is in the mature phase of its life cycle. Over the 10 years to 2022, industry value added (IVA), which measures an industry's contribution to the economy, is forecast to rise at an annualized rate of 2.2%, which is higher than GDP's growth of 2.1%. Because demand for air travel typically moves in line with economic growth, demand for aircraft and associated parts also moves along with GDP. In addition, military spending, which is a major industry revenue source, is usually associated with the amount of taxes the government can collect. During good economic times, tax receipts rise and defense spending can be increased; on the other hand, during recessions, tax income drops, and the defense budget may be cut to reduce the deficit.

Overall, while the commercial segment will continue to grow on the back of strong global demand for air travel, the defense segment is forecast to continue facing uncertainty. With federal funding for defense pressured, the market for certain combat aircraft and related

programs might not be big enough to support multiple players. Consequently, operators might exit certain subsections of the market or increase cooperation with each other in order to pull resources together and reduce risk. The last time military spending dropped was in the 1990s, and it resulted in increased consolidation in the defense sector.

However, this time it has been the suppliers that have consolidated. In particular, suppliers of aircraft parts have gone through a number of mergers and acquisitions as pressure to reduce supply chain complexity mounts. Today the aerospace market's supply chain is notoriously complex, with over a thousand small to medium size suppliers serving only a couple of original equipment manufacturers (OEMs). This has created numerous cost overruns for OEMs because of difficulties in dealing with such a fragmented supply chain. Consequently, suppliers have merged to reduce complexity and achieve advantages associated with economies of scale, such as improved efficiency and ability to take on more production.

# Products & Markets

Supply Chain | Products & Services | Demand Determinants  
Major Markets | International Trade | Business Locations

## Supply Chain

### KEY BUYING INDUSTRIES

33641a	<b>Aircraft, Engine &amp; Parts Manufacturing in the US</b> Operators within the industry trade among themselves, with aircraft manufacturers often purchasing parts from aircraft parts manufacturers.
42386	<b>Aircraft, Marine &amp; Railroad Transportation Equipment Wholesaling in the US</b> Some aircraft parts and engines may be sold through wholesalers.
48111a	<b>International Airlines in the US</b> Airlines from the international-scheduled air transportation industry acquire planes to service passengers.
48111b	<b>Domestic Airlines in the US</b> Airlines from the domestic-scheduled air transportation industry acquire planes to service passengers.
48121	<b>Charter Flights in the US</b> The nonscheduled air transportation industry purchases various aircraft to service both commercial and military clients.

### KEY SELLING INDUSTRIES

21229	<b>Molybdenum &amp; Metal Ore Mining in the US</b> Because titanium is noted for its strength, lightness and resistance to corrosion, it is increasingly used in new composite materials in manufacturing commercial airplanes.
33111	<b>Iron &amp; Steel Manufacturing in the US</b> Steel is used in the manufacture of many aircraft parts and engines.
33361a	<b>Engine &amp; Turbine Manufacturing in the US</b> Engine, turbine and power transmission equipment are an integral part of an aircraft.
33411a	<b>Computer Manufacturing in the US</b> This industry provides computer equipment to aircraft manufacturers.
33411b	<b>Computer Peripheral Manufacturing in the US</b> This industry provides computer peripheral equipment to aircraft manufacturers.
33441a	<b>Semiconductor &amp; Circuit Manufacturing in the US</b> This industry provides electronics and avionics to aircraft manufacturers.
33441b	<b>Circuit Board &amp; Electronic Component Manufacturing in the US</b> This industry provides circuit boards and electronic components to aircraft manufacturers.

## Products & Services

The United States is the largest aircraft manufacturer in the world, with leading companies in large commercial aircraft, combat aircraft, helicopters, unmanned aerial vehicles and engines segments. Over the past five years, strong demand from emerging market airlines for new commercial aircraft, the replacement of older aircraft with newer models. On the other hand, the wind down of US combat operations in the Middle East and the overall decline in defense spending has led to decline military aircraft sales. As a

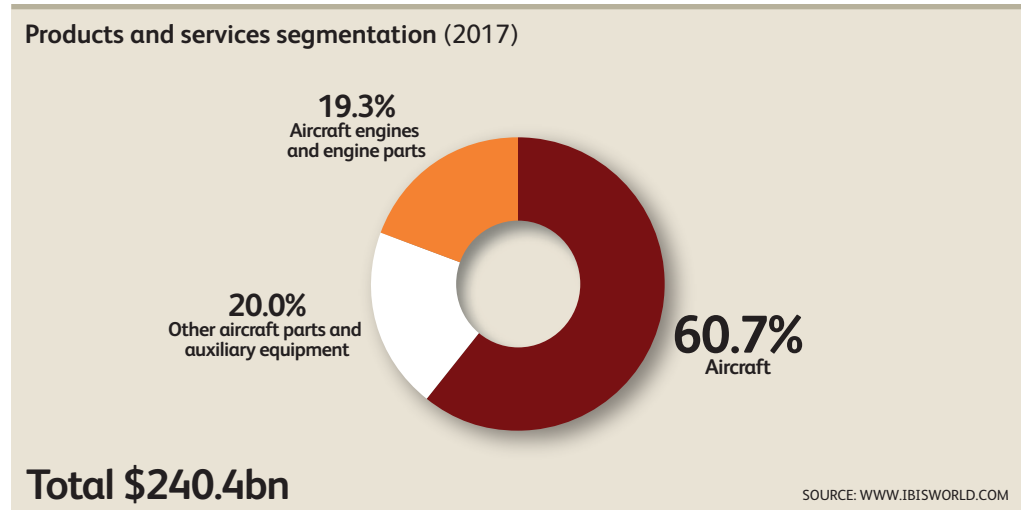
result, the industry's civil products' share of revenue is estimated to climb over the past five years. Meanwhile, defense-related products' share of revenue is set to shrink during the period.

### Aircraft

Aircraft manufacturing dominates the industry, accounting for an estimated 60.8% of industry revenue. The segment broadly includes civilian and military aircraft as well as modifications to completed aircraft. Civilian aircraft

# Products & Markets

## Products & Services continued



include large commercial aircraft (LCA), medium or regional aircraft, business jets, helicopters and ultra-light aircraft. The LCA market (led by Boeing) includes freighters that are built for logistic air transport. LCA manufacturers supply to nearly all of the commercial passenger airlines and freight and logistics companies that provide air transportation.

In addition, aircraft manufacturers are contracted to undertake military aircraft manufacturing for governments. Overall, military aircraft account for over a third of complete aircraft production. Military aircraft can include fixed or non-fixed wing aircraft. This segment can be further broken down into a variety of aircraft, such as bomber, attack, fighter, tanker, cargo, trainer and rotary. Moreover, the industry is increasingly investing in unmanned aerial vehicles (UAVs), especially for military purposes. UAVs are aircraft that can be remotely controlled or flown autonomously based on preprogrammed flight plans. However, following a massive boom in demand, UAV revenue has dropped over the past five years.

### Aircraft engines and engine parts

Military and civilian aircraft engines, engine parts and engine modification accounts for 19.3% of industry revenue.

Examples of aircraft engines include turbine, shaft, jet and rocket engines. Civilian-related manufacturing accounts for over half of this segment's revenue, while defense-related sales have dropped. In recent years engine fuel efficiency has increased as often high oil prices and environmental concerns have created demand for more fuel efficient and clean means of propulsion. Besides improving efficiency, manufacturers have also used more composite material to reduce weight and maintenance costs. Sales of engines and engine parts are expected to increase as a percentage of industry revenue as new fuel-efficient commercial aircraft require the industry's newest engine models.

### Other aircraft parts and auxiliary equipment

Other aircraft parts and auxiliary equipment include: civilian and military aircraft subassemblies and parts, aircraft mechanical power transmission equipment, propellers, helicopter rotors, research and development of parts (excluding engines), and landing gear. Because many aircraft parts wear and tear after use and have to be replaced, sales in this segment heavily depend on the



# Products & Markets

## Products & Services continued

amount of flying time aircraft receive. Some items, such as subassemblies have become more advanced as composite material use has increased,

while others, like fasteners are more-standardized and experience little innovation. The segment is estimated to make up 20.0% of industry revenue.

## Demand Determinants

Demand for the Aircraft, Engines and Parts Manufacturing industry is mainly dependent on activity among airlines and other air transportation providers. When airlines need to expand their fleets to accommodate a growing number of passengers, demand for products within the industry increases. Similarly, if airlines' capacities fall, industry operations will experience a drop in the number of orders. Demand is also driven by other factors, such as the introduction of new and more efficient models or involvement in war.

### Civil demand

Demand for industry civil products depends on several factors, many of which are macroeconomic in nature. Many airlines improve or expand their aircraft fleet based on the level of demand from passengers. Passenger numbers are generally influenced by the consumers' propensity to spend on vacations and air travel, as well as the necessity to fly to remote locations. An increase in disposable income will lead to greater spending on air travel opposed to other products. Conversely, when incomes fall, people tend to deter any expenditure on discretionary services, such as air travel. Changes in passenger travel have historically been proportional to changes in GDP. When the economy is growing at a solid rate private and business travel tends to go up.

In particular, due to the industry's export orientation, global air travel is a key part of demand for aircraft. Rapid economic growth in emerging markets has allowed a new segment of the global population to be able to afford air travel.

As a result, foreign airlines have rapidly expanded their capacity, driving demand for industry exports.

Related to demand for air travel, airlines financial position determines demand for commercial aircraft. Notably, increased airline profit, which are partially driven by air travel volumes, allow airlines to finance more aircraft. When airline profitability drops, so does their ability to continue financing aircraft purchases.

Interconnected to airlines financial condition are interest rates and the price of fuel. Increased interest rates make aircraft financing more expensive, decreasing demand for industry products. Similarly, increased fuel prices may decrease airlines' profit, thereby also decreasing demand for commercial aircraft.

On the other hand, commercial aircraft are very costly, long-lived capital goods. As a result, purchases are typically based on expectations of long-term growth in air transport and replacement of older aircraft, rather than short-term conditions. Therefore, in response to higher fuel prices or even price volatility, airlines will typically increase purchases of newer, more fuel-efficient, aircraft in order to reduce operating costs. That is why there has been an uptick in demand for new airliners such as the 787 and in development planes like the 777X because these aircraft are far more fuel efficient and cleaner than older generation planes. Moreover, airline companies in the developed world have increased purchases of new models as their relatively old fleet of planes come to the end of their life-cycle. The development of new planes may also increase demand for new industry products because older generation aircraft

# Products & Markets

## Demand Determinants continued

depreciate faster. On the other hand, the recent fall in fuel prices has reduced some incentives to buy new generation aircraft. Demand for slightly older used aircraft has increased because their lower price compensates for their reduced fuel efficiency amid lower fuel costs.

However, airlines are only buyers of commercial planes, general aviation and helicopters often have other demand determinants. General aviation aircraft such as business planes mostly rely on demand for wealthy individual and corporations. Similarly, helicopters are often sold for business travel. They are sold to civil government bodies, the oil and gas industry and other operations that take place in remote locations.

### Volatile demand for military aircraft

Another driver of demand for industry products is defense spending. National defense is considered to be one of the main roles of government and as a result, governments often allocate a significant amount of their budget to the armed services and relevant equipment. In turn, the defense budget itself is determined by a range of factors such as economic conditions, geopolitical tensions, war and technological advancements.

The United States has the world's largest defense budget, spending more on military aircraft than any other nation. This demand is possible due to the

nation's large economy, which allows for high spending, as well as global geopolitical commitments, which require a large air force. Recent geopolitical issues such as increased instability in the Middle East and tensions in Europe and Asia have driven US military demand for industry products. However, actual war and conflict are the largest drivers of demand for the industry's military products. For instance, when the United States entered the Afghan and Iraq wars, demand jumped. Combat operations also increase demand for parts as aircraft suffer from wear and tear.

The improvement and release of new aircraft models and defense systems also typically leads to a surge in demand. Worldwide military forces constantly upgrade their aircraft and defense equipment to counter new threats. For instance, the development of more advanced and integrated air defense systems has been a driving factor for the development of the Air Force's B-21 stealth bomber.

The United States does generally sell military equipment and vehicles to its allies. Demand military exports is driven by geopolitical tensions, foreign economic growth and other factors to could lead to increased defense budgets around the world. However, strong export restrictions and regulations also limit industry defense exports.

## Major Markets

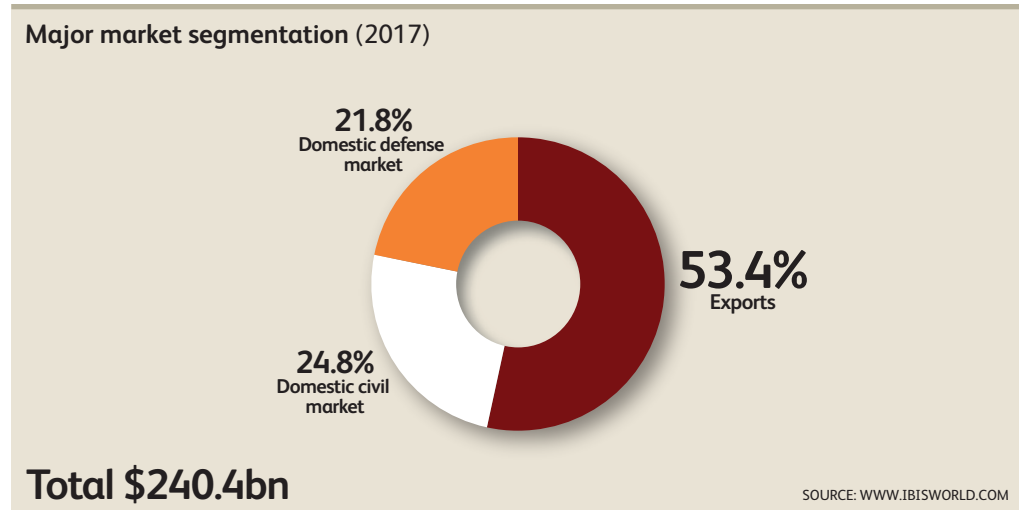
### Exports

The export market is estimated to account for 53.4% of industry revenue. Most revenue generated by this market is made up of commercial aircraft sales to foreign airlines, leasing companies, manufacturers and parts distributors. Because US companies like Boeing hold such a strong position within the commercial aircraft market, any increase in demand by international

airlines for new aircraft typically leads to increased demand for US planes. Defense related exports only make up 7.9% of total exports because of restrictions on the export of advanced weaponry. In addition, combat aircraft are extremely expensive, with few nations able to afford them. Over the five years to 2017, export's share of revenue has increased as demand from emerging markets climbed. More and more people

# Products & Markets

## Major Markets continued



within these markets can afford air travel and as a consequence, airlines operating abroad have begun to purchase more commercial aircraft in order to meet demand. In addition, initially increasing fuel prices have stimulated demand for more fuel-efficient aircraft and engines. Military related exports have also risen as tensions in the Middle East and Asia have led to more defense spending by relevant nations. US based defense contractors are also looking to exports to offset pressured Department of Defense (DoD) spending.

### Domestic civil market

The domestic civil market accounts for 24.8% of industry revenue. It is primarily composed of airlines, but also includes leasing companies, aircraft manufacturers, distributors, corporations, wealthy individuals and civil government agencies. After delaying orders for new aircraft due to the poor economic condition, domestic airliners have recently begun buying new planes (particularly fuel-efficient ones) in order to meet rising demand for air travel and reduce fuel costs. Original equipment manufacturers (OEMs) purchase parts from industry suppliers to assemble their

aircraft. As global demand for commercial aircraft increased, so has demand for parts, with OEMs struggling to meet end market demand. Consequently, this market's share of industry revenue has climbed over the five years to 2017.

Wealthy individuals and various businesses are another source of demand in the domestic civil market, especially when it comes to general aviation and helicopter markets. Initially sales of general aviation aircraft struggled as the impact of the recession and the bad publicity of using corporate jets forced companies to cut down on their fleets. Sales to small businesses and individuals dropped the most as these markets were hit hardest by the economic downturn. On the other hand, sales of larger jets performed better as they relied on large corporations that fared well after the recession. Contrastingly, sales of civil helicopters initially did well as increasing US oil and gas production led to strong demand from the sector's companies (helicopters are used to ferry employees and equipment to distant production sites). However, the recent plunge in oil prices has tempered oil and gas production, resulting in decreasing helicopter sales.

# Products & Markets

## Major Markets continued

### Domestic defense market

The domestic defense market accounts for 21.8% of industry revenue. The United States has by far the largest defense budget in the world and as a result, it is the biggest consumer of defense related industry products. Most US defense manufacturers derive more than half of their revenue from sales to the DoD or defense-related government organizations. The US Navy is currently the largest domestic defense market as it invests in F/A-18 and F-35 fighters, maritime patrol craft, helicopters and UAVs for both itself and the Marine Core.

The US Air Force (USAF) is the second largest market for industry domestic defense sales. While the USAF has the largest aircraft fleet in the military, it is currently buying a smaller number of planes than the Navy. Lastly, the US Army is the smallest defense market. Due to the ground-based nature of this branch, the army maintains a relatively small aircraft fleet mostly consisting of helicopters, UAVs and some small transport planes. Over the past five years, the wind down of military operations in the Middle East and the overall decline in US defense spending has caused this market to shrink.

## International Trade

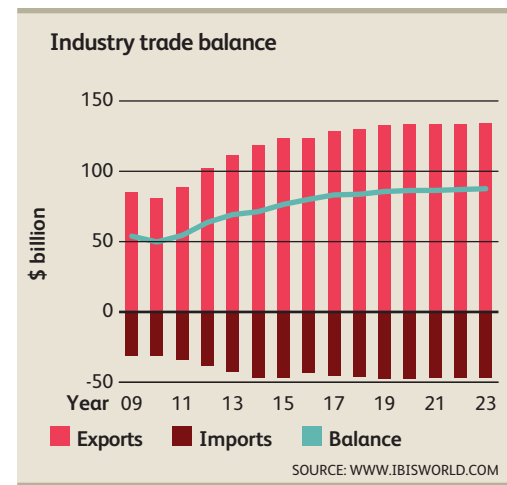
Level & Trend  
Exports in the industry are **High and Increasing**

Imports in the industry are **High and Increasing**

International trade plays a key role in the Aircraft, Engine and Parts Manufacturing industry. 53.4% of industry revenue is derived from exports, while an estimated 28.7% of domestic demand is satisfied by imports.

### Exports

The United States aerospace industry is the largest in the world. The Boeing Company is one of only two major large commercial aircraft (LCA) manufacturers (Airbus being the other) and US defense companies produce some of the most advanced military aircraft on the market. The industry's biggest export is fully completed aircraft, particularly commercial aircraft. Due to its dominance in the LCA market, any pick up in global demand for airlines typically leads to increased sales for Boeing and because the vast majority of its planes are built in the United States, export rise. US companies also dominate the aircraft engine market, with over half of the world's commercial aircraft using US company built engines. In addition, because US combat aircraft are among the best in the world, foreign governments regularly buy them. In recent years rising global demand for air travel and tensions in the Middle East and Asia have led to strong demand for industry export,



both commercial and military. IBISWorld estimates that over the five years to 2017, industry exports will grow at an annualized 4.7% to \$128.3 billion.

The industry's biggest export market is China, representing 10.1% of exports. The other major export markets are France (9.4%), the United Kingdom (8.1%) and Canada (7.6%). These countries are home to airlines that purchase US-built planes. Some of them also have close military relationships with the United States, with their armed forces regularly buying US military equipment. Moreover, they mostly have advanced aerospace sectors

# Products & Markets

## International Trade continued

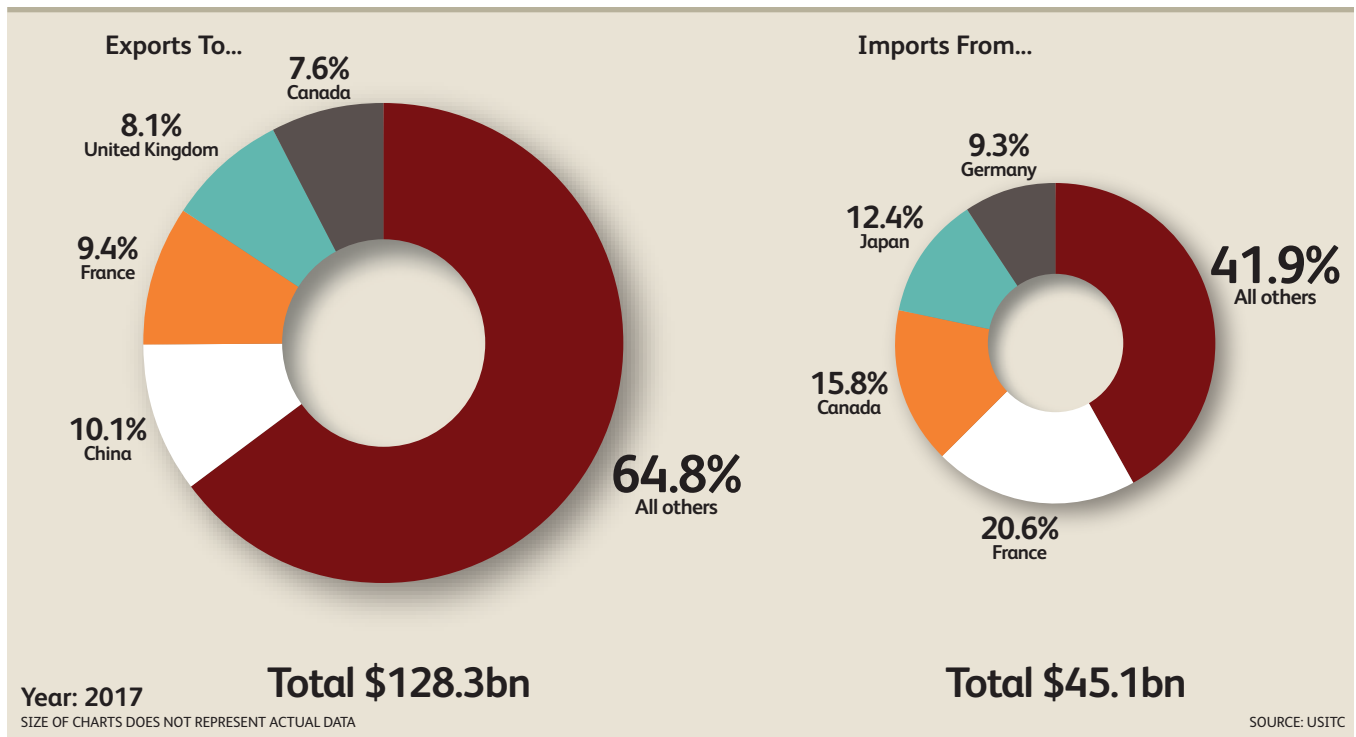
that frequently import US inputs for their own manufacturing.

Forecasts for Chinese demand of US aircraft have turned ever-more optimistic over the past few years. For example, Boeing predicts that Chinese airlines' plane purchases will total more than \$1.0 trillion over the next 20 years as the country builds its domestic and international fleets to accommodate tourism and business travel. Boeing says this represents more than 6,800 aircraft through 2035, with China's air passenger traffic expected to grow an annualized 6.4% during the 20-year time horizon. While trade tensions pose a threat to US-China relations more broadly, they have yet to dampen expectations for exports in this industry.

### Imports

Over the five years to 2017, imports are expected to grow at an annualized rate of 3.4% to \$45.1 billion. A recently strengthening dollar made imports less

expensive, while increasing domestic air travel pushed up demand for foreign commercial aircraft. However, most imports consist of aircraft engines and other parts and subsections. For example, Boeing's new 787 airliner sources many of its subsections from Japan, which helps explain why 12.4% of imports originate there. Exports from Canada make up 15.8% of imports, as its proximity to the United States and membership in the North American Free Trade Agreement provides its suppliers with an advantage. Moreover, many US companies set up manufacturing subsidiaries in the country. For instance, Bell manufactures most of its civil helicopters in Canada, and Pratt and Whitney's Canadian subsidiary is a leading maker of engines for business and regional plane and helicopters. In addition, Canada's Bombardier is one of the world's leading manufacturers of small- to mid-sized commercial aircraft. France is the biggest source of imports, representing 20.6%. The country is home to various manufacturers of



# Products & Markets

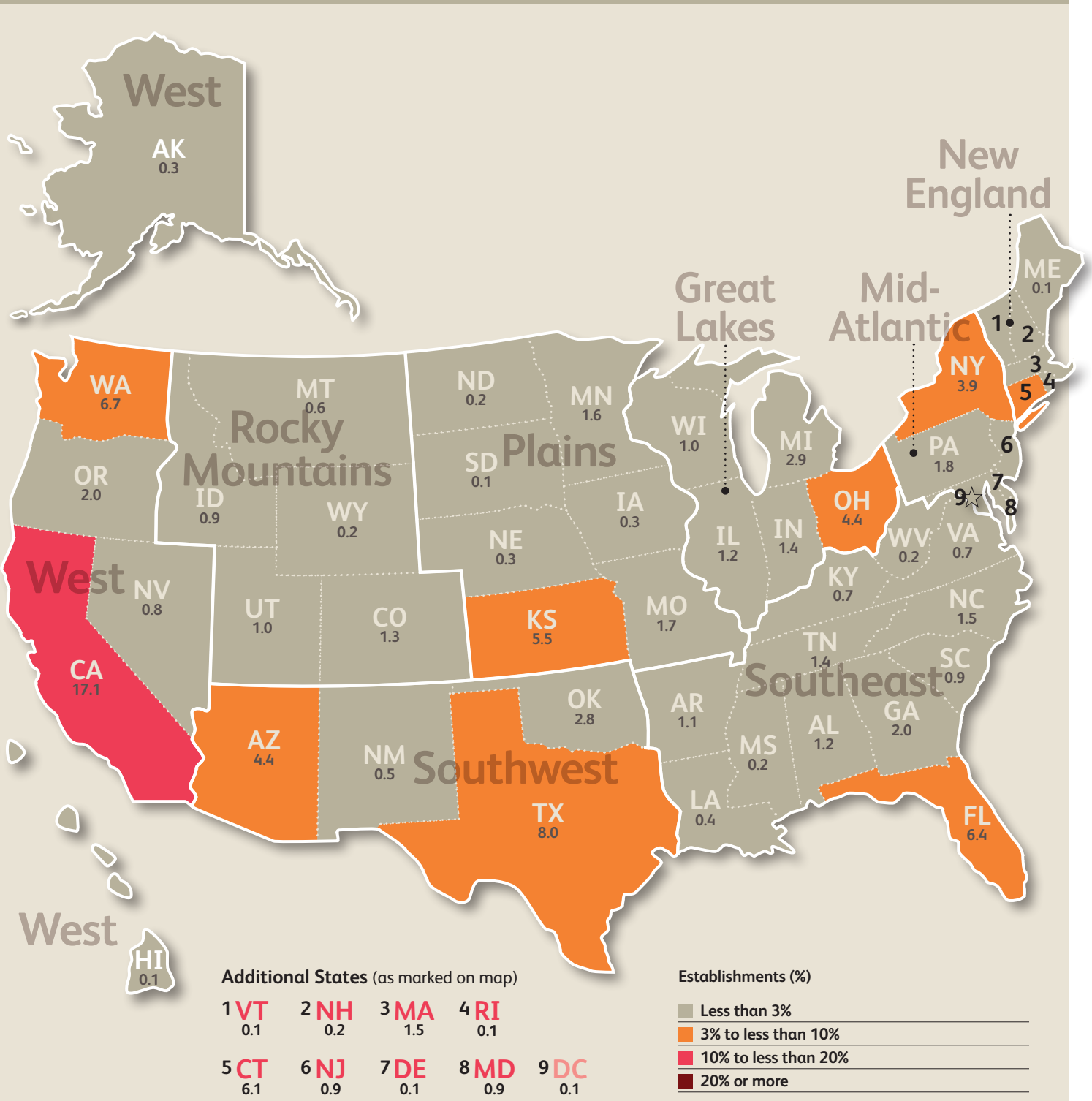
## International Trade continued

commercial and business aircraft, such as Airbus and Dassault, making aircraft its largest export to the United States. Its second-biggest export segment to the United States comprises engines and engine parts. For instance, General Electric (GE) and Safran's joint venture, CFM International, is among the top manufacturers of LCA engines in the world.

In particular, the majority of Boeing's aircraft are powered by either GE or CFM engines. Germany, which accounts for 9.3% of imports, is another major exporter to the United States, primarily exporting aircraft and engines. Like France, Germany is a base of operations for Airbus, including parts of the company's commercial airliner and helicopter production.

# Products & Markets

## Business Locations 2017



SOURCE: WWW.IBISWORLD.COM



# Products & Markets

## Business Locations

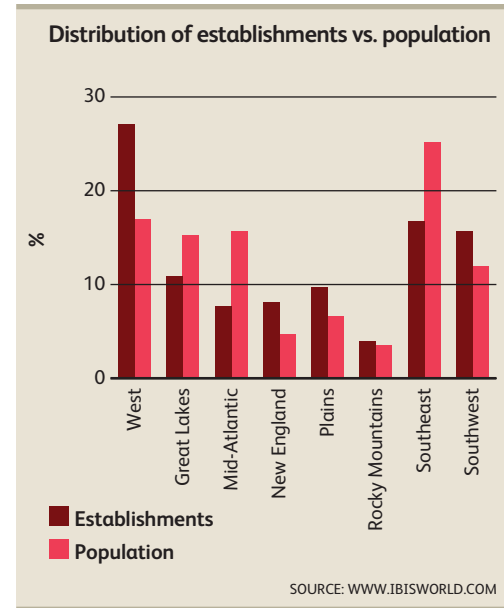
When choosing location industry operators look at several factors including, government incentives, a source of skilled labor and locations of universities that do basic research. Suppliers tend to set up facilities near major original equipment manufacturers' factories to cut down on transportation costs, thereby forming manufacturing hubs. Defense contractors commonly spread their operations across multiple states to gain support from legislatures and government officials when it comes to contracts.

### The West

The West region accounts for 27.1% of industry establishments. California has by far the largest aerospace sector in the country with multiple manufacturers having facilities there. The state has many leading industry-relevant research centers and is home to a large portion of the technology community. Washington State has the fourth largest share of establishments because it is the main base for Boeing manufacturing. Consequently, many suppliers have set up operations in the state and surrounding regions.

### The Southeast and Southwest

The Southeast and Southwest regions make up 16.7% and 15.7% of industry establishments. Most states in these regions are right-to-work states which weakens unions and lowers labor costs. In the Southeast, Florida is a major aerospace hub, accounting for 6.4% of total locations. The Southwest is



dominated by Texas, which is home to 8.0% of industry facilities. The state is also where Lockheed is manufacturing the F-35, the world's biggest defense program.

### Other regions

The Great Lakes region makes up 10.9% of industry establishments. The area has an extensive manufacturing base and is a major producer of aircraft input materials like steel. As such, companies with operations in the region can gain from lower supply transportation costs. The plains region accounts for 9.8% of location, with over half of those based in Kansas. New England has 8.1% of establishments, with Connecticut account for most of them. The Mid-Atlantic and Rocky Mountain regions make up 7.7% and 4.0% of industry facilities.

# Competitive Landscape

Market Share Concentration | Key Success Factors | Cost Structure Benchmarks  
Basis of Competition | Barriers to Entry | Industry Globalization

## Market Share Concentration

Level  
Concentration in this industry is **Medium**

The Aircraft, Engine and Parts Manufacturing industry exhibits a medium level of market concentration. With the four largest players accounting for an estimated 56.8% of total industry revenue. In the commercial aircraft segment, Boeing dominates, as it is the only US manufacturer of medium to large size airliners. The defense sector is less concentrated, but is still dominated by a handful of operators. The advanced technology and knowhow, combined with the resources and capacity required to be a successful defense contractor limits new entrants from entering the market. US engine manufacturing is primarily made up of General Electric and Pratt and Whitney. The least concentrated segment of the market is made up of aircraft part suppliers. Most original equipment manufacturers (OEMs) have spun off their supply chain operations in order to focus on aircraft development and assembly. OEMs like Boeing use hundreds of small to medium size

contractors to supply its aircraft with parts ranging from fasteners to wings.

In fact, industry concentration has increased for most of the five years to 2017, as the advantages associated with size and military spending cuts and the need to streamline the supply chain have encouraged mergers and acquisitions (M&A) activity. In particular, aerospace's notoriously complex supply chain and concerns about suppliers' capacity to meet growing demand has encouraged recent M&A. Continuing weakness in defense funding will put pressure on military contractors to merge in order to gain a bigger share of a shrinking pie, but the already high concentration in these segments, especially among OEMs, might encourage resistance from anti-monopoly regulators. As such, a large share of acquisitions conducted by defense contractors has been focused on diversifying into the commercial sector, refocusing on their core competencies or expanding their product lines.

## Key Success Factors

IBISWorld identifies 250 Key Success Factors for a business. The most important for this industry are:

### Economies of scope

Economies of scope provide more opportunities for larger businesses. Providing multiple outputs at the lowest cost, such as providing financial services with aircraft sales, improves trading opportunities and increases a business' range of customers.

### Access to the latest available and most efficient technology and techniques

The use of up-to-date technology and new products will provide a competitive edge over other players in this industry. Recently, a focus on fuel efficiency has been highly successful.

### Well-developed internal processes

Efficient inventory and cost management systems help companies

develop a competitive edge. Lower operational costs also improve profitability for operators.

### Establishment of export markets

Overseas markets represent a significant proportion of sales for businesses in this industry. Access to overseas markets can increase the scale of operations and improve productivity and profit.

### Ability to accommodate environmental requirements

The ability to accommodate increasingly strenuous environmental requirements is an essential requirement in the twenty-first century. Americans increasingly demand more environmentally friendly aircraft with lower carbon emissions.

# Competitive Landscape

## Key Success Factors continued

### Economies of scale

The ability to reap the benefits of economies of scale during production runs

is a significant success factor. Larger-scale operations can achieve significant cost savings across product ranges.

## Cost Structure Benchmarks

### Profit

Profit, defined as earnings before interest and taxes, makes up an estimated 7.5% of industry revenue. In general, many suppliers have higher profit margins than original equipment manufacturers (OEMs) despite there being only a few OEMs and over 1,000 suppliers. The complex nature of the aerospace supply chain and lack of price transparency has made it easier for some suppliers to charge more for their components. In some cases, OEMs have provided suppliers with patent rights to certain components, giving the suppliers a monopoly. Lastly, many suppliers compete in the component aftermarket where profit tends to be higher. Over the five years to 2017, profit margins have held steady as the industry rapidly expanded, while defense contractors cut costs. However, margins remain pressured due to price competition, while the government has put more emphasis on costs associated with defense contracts. Even supplier margins have come under pressure as OEMs have used new aircraft contracts to pass on risk to suppliers.

### Purchases

Purchases form the bulk of industry expenses and include the acquisition of aircraft equipment, safety equipment and other materials (e.g., steel plates, copper tubing and aluminum, ferrous and nonferrous castings, electronic components). Raw materials used to construct or repair aircraft and their components vary depending on the specifications and size of the craft or engine being repaired or constructed. Because these costs consistently account

for about half of an average company's revenue, the industry is vulnerable to fluctuations in the price of materials and supplies. In 2017, purchases represent 49.9% of industry revenue.

### Wages

Labor costs include wages, salaries, fringe benefits and insurance and represent 13.4% of industry revenue. Industry wages are relatively high due to the need to employ skilled labor in the development of sophisticated aerospace products. Many workers have backgrounds in engineering and science and typically demand higher pay. A shortage of people in these fields has also increased wages. Over the five years to 2017, wages share of revenue has declined. Decreasing defense spending has resulted in restructuring and related layoffs in the defense segment. Moreover, operators are investing in increased automation to improve productivity. Companies like Boeing have also moved production to lower cost states, where wages are lower due to a lack of unions.

### Depreciation

An indication of the level of capital costs within the industry is reflected by the percentage of depreciation. Depreciation costs account for production machinery, communication equipment, office equipment, technology and software. The industry uses equipment and machinery that reflect the latest technology, but the costs of such investments are relatively low compared to the value of sales. Because the costs of machinery purchases are spread out, depreciation consistently registers as a marginal share of the average company's

# Competitive Landscape

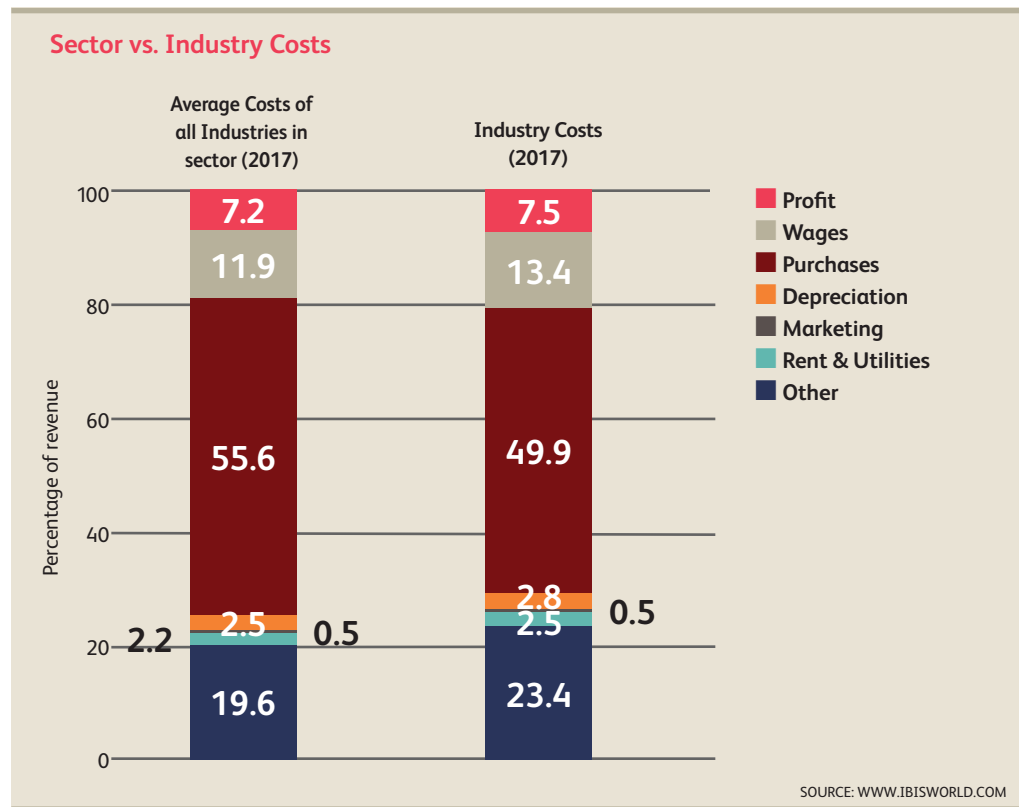
## Cost Structure Benchmarks continued

revenue; in 2017, for instance, depreciation is projected to account for only 2.8% of industry revenue.

### Other costs

Other costs include computer hardware and software, communication services,

repairs, insurance, contract related expenses, R&D and maintenance. Collectively, these costs account for 23.4% of industry revenue. Marketing and utilities and rent are also consistently marginal shares of revenue, representing 0.5% and 2.5%, respectively.



## Basis of Competition

Level & Trend  
 Competition in this industry is **Medium** and the trend is **Increasing**

### Commercial market

The commercial aircraft market supplies helicopters, general aviation, business, regional and large commercial aircraft (LCA) to buyers ranging from individual to airlines. Each one of these submarkets has its own dynamics and trends. Moreover, due to the resources and know how required, the number of competitors declines as the complexity, size and sophistication of the aircraft increases. For instance, the LCA market is a virtual duopoly made up of Boeing and Airbus.

The regional market (typically short to mid-range aircraft under 140 seats) has more competitors, with a stream of new players entering the market. The top two regional producers are Bombardier and Embraer, however, other players such as Commercial Aircraft Corporation of China (COMAC) and Sukhoi have developed regional jet aircraft as well. The business and general aviation market has even more competitors including, Bombardier (via Learjet, Challenger and Global models), Textron (via Cessna and

# Competitive Landscape

## Basis of Competition continued

Beechcraft) Embreair (via Legacy, Lineage and Phenom models), General Dynamics (via Gulfstream) and so on. Finally, the helicopter market is dominated by Bell, Sikorsky, Russian Helicopters, Airbus Helicopters and Finmeccanica.

Nonetheless, no matter the product market, manufacturers typically compete on price, product features, delivery time, aftermarket service and ability to predict market trends.

When it comes to winning new orders, having a competitive price is essential. On many occasions companies have to provide significant discounts to win contracts, especially if it means keeping aircraft production open in order to achieve economies of scale and thus, lower per unit price. Another important factor in winning contracts is the quality, features and efficiency of the aircraft. Companies with the most advanced, fuel efficient, least polluting, spacious, comfortable and easy to maintain aircraft will win the most orders. In addition, due to the sophisticated nature of industry products, manufacturers are more likely to gain and keep customers by providing high quality aftermarket services. This includes prompt part replacement, aircraft diagnostics and troubleshooting. Players have to also be able to predict market trends because of the expense and long lead-time between development and introduction of aircraft. It can easily take as many as five years and billions of dollars to introduce a new plane, requiring companies to be confident that there will be sufficient demand for the aircraft in the future. Moreover, the inability of manufacturers to deliver an aircraft on time may push the buyer to seek an alternative supplier. For example, the delays of Boeing's 787 Dreamliner production, which was two years late on its target date, caused some 787 buyers to demand compensation for the delay.

## Defense market

Defense contracts are negotiated and awarded through a tender process and price is a major factor. Even though there are only a small number of participants in this industry, competition is intense between the players whose majority of revenue comes from contracts awarded by the Department of Defense or foreign governments.

Companies that invest in new equipment, conduct research and development and provide state-of-the-art technology in aerospace products will gain a competitive advantage because the industry requires a constant stream of innovation to maintain a lead in this sector. Businesses that have established brand recognition and a positive track record with the Department of Defense will find it easier to negotiate for future projects.

Most manufacturers outsource some components to third-party providers that have greater expertise in their relative areas (e.g. engine) to ensure that the end product meets the requirement standards. Companies that can link with other providers will have an edge over others in meeting the requirements set by the buyer. In fact, more and more defense contractors are joining forces with competitors to win contracts. This allows them to split risk and reduce costs, which is becoming more important as defense spending is declining.

## Engine manufacturers

The aircraft engine market (particularly commercial engines) is essentially dominated by General Electric, Pratt and Whitney, Rolls Royce and various joint ventures involving the three and others. In terms of product features, companies that provide the most fuel efficient and easy to maintain engines can secure the most orders. Furthermore, a manufacturer that is able exclusively supply engines for an aircraft model will reduce competition. However, companies like Boeing are increasingly offering their

# Competitive Landscape

## Basis of Competition continued

planes with multiple engine selections, in turn, increasing competition. An engine supplier’s ability to provide quality aftermarket service is also essential because companies can earn as much as half of their revenue from such work.

### External competition

The Aircraft, Engine and Parts Manufacturing industry encounters strong competition from foreign based production. As explained earlier, the LCA market is dominated by Boeing and Airbus, who are highly competitive with each other. They regularly switch places as the top LCA company and invest billions into technology that can help them get an advantage. However, this duopoly is coming under increased competition from other countries. For example, the Chinese government founded its own commercial aircraft company, the Commercial Aircraft Corporation of China (COMAC). Other competitors include Russian companies like Sukhoi and Tupolov.

In the defense space, US based manufacturers endure tough competition. While, US producers dominate sales to the Department of Defense, foreign contracts are harder to win. European defense contractors like Airbus Defense, BAE Systems, Thales and Finameccanica offer highly advanced weapon systems and alternatives to US companies. For example, the Eurofighter (a fighter built by a consortium of European companies) has won out over US competition for contracts with Saudi Arabia and Sweden’s Saab recently beat Boeing for a Brazilian fighter jet contract. Russian aerospace companies also provide strong competition, especially based on ease of maintenance and price, which is important to governments in emerging markets. Lastly, defense contractors often compete based on the “offset” they provide. These can include technology transfers and component contracts for local companies.

## Barriers to Entry

Level & Trend  
Barriers to Entry in this industry are **High and Steady**

In all industry segments, the barriers to entry are formidable. High start-up costs, from land acquisitions to investment in technology, make it difficult for new entrants in this industry. Entry is more possible in the auxiliary and parts manufacturing segment; however, participants would be subject to the requirements of major players that outsource these activities.

The industry demands skilled labor and is on the leading edge of technology, constantly striving to create new products and improve existing ones. The industry invests a great deal of time and money in research and development (R&D) on aerospace products, and much of that work is performed by professionals and related workers. In addition, many more aerospace-related professionals work in the scientific R&D

### Barriers to Entry checklist

Competition	Medium
Concentration	Medium
Life Cycle Stage	Mature
Capital Intensity	Medium
Technology Change	High
Regulation & Policy	Heavy
Industry Assistance	Medium

SOURCE: WWW.IBISWORLD.COM

services industry, where a bachelor’s degree (in some cases a master’s or doctorate) in a specialized field, such as engineering, is required. Skilled labor may be hard to come by, depending on the labor market. Usually during times of strong economic growth, demand for skilled labor is high and competition to secure the best workers increases.



# Competitive Landscape

## Barriers to Entry continued

Regulations governing the licensing of manufacturers are an absolute barrier to entry. Licenses to supply product to the government are rarely issued to foreign companies, and domestic companies must demonstrate a high level of corporate governance. Also, security clearances, which are needed for workers on certain programs, are

difficult to obtain and can delay or invalidate a worker's clearance. Defense contractors have to build relationships with lawmakers and government agencies in order to secure contracts and substantial amount of money is spent on lobbying. As such, it can be difficult for new players beat incumbents over defense contracts.

## Industry Globalization

Level & Trend  
Globalization in this industry is **High** and the trend is **Increasing**

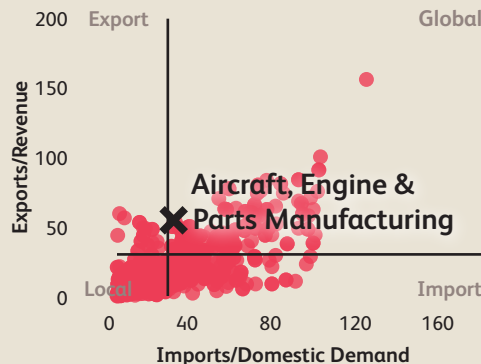
Globalization provides an opportunity to spread risk, access markets and gain access to capital. Using trade data as a proxy, the industry exhibits a high level of globalization. US-based Boeing is a major player in the global civilian aircraft industry, but along with Airbus, based in France, Bombardier, based in Canada, and Embraer, based in Brazil. Sales of civilian aircraft are global in nature, and major players in this industry have production and sales facilities worldwide. Many domestic operators, such as Boeing, set up subsidiaries overseas to increase sales and clients. For instance, Boeing provided United Arab Emirates based Mubadala Aerospace with a \$2.5 billion manufacturing contract as part of aircraft sales to the county's national carrier. Globalization is higher in the

civilian aircraft and parts manufacturing segment than in the military segment due to the need to safeguard military technology and intellectual property. IBISWorld forecasts that globalization of the military segment of the market will increase over the five years to 2022.

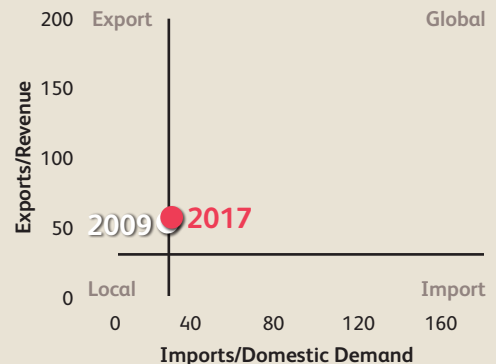
In the military segment, the United States has always been on the forefront of this industry; however, fewer new programs and a high budget deficit are driving major subsystems suppliers overseas for new launches (supported by more favorable incentives from foreign governments). Defense contractors, especially those contracted to the government, are increasingly looking toward overseas markets to sustain operations. On average, major US defense contractors derive 10.0% to 15.0% of total

International trade is a major determinant of an industry's level of globalization. Exports offer growth opportunities for firms. However there are legal, economic and political risks associated with dealing in foreign countries. Import competition can bring a greater risk for companies as foreign producers satisfy domestic demand that local firms would otherwise supply.

Trade Globalization



Going Global: Aircraft, Engine & Parts Manufacturing 2009-2017



SOURCE: WWW.IBISWORLD.COM



# Competitive Landscape

## Industry Globalization continued

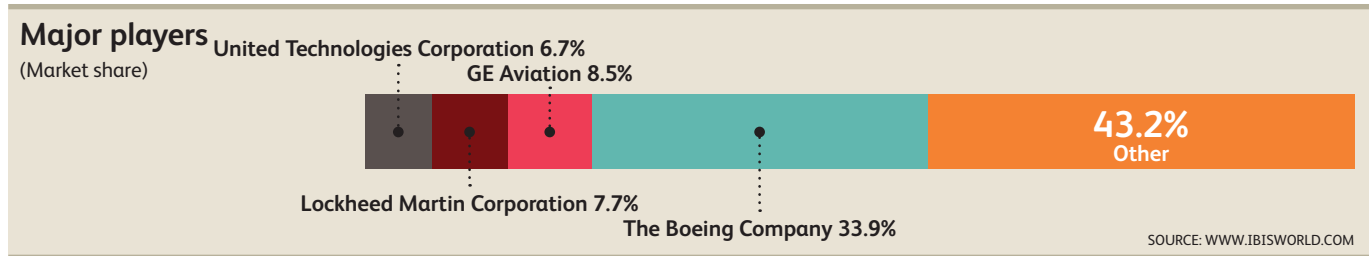
revenue from international sales. The current wave of globalization will result in greater collaboration between allied nations. This trend has already started with the United States opening

development of the F-35 to international partners. In addition, defense contracts often agree to transfer over technology or award manufacturing contracts to foreign countries if it means winning a sale.

# Major Companies

The Boeing Company | GE Aviation

Lockheed Martin Corporation | United Technologies Corporation | Other Companies



## Player Performance

**The Boeing Company**  
Market share: 33.9%

Headquartered in Chicago, The Boeing Company is the only US-based maker of large commercial jets and the second-largest defense contractor for the US government, behind Lockheed Martin. With \$94.6 billion in overall annual revenue and more than 148,000 employees in 2016, Boeing is one of the world's largest aerospace companies. The company's three main businesses are commercial airplanes; defense, space and security (BDS); and Boeing capital, with only commercial airplanes and BDS being industry-specific.

Boeing's commercial airplanes business is one of the two largest in the world (Airbus being the other), making up 68.7% of Boeing's total revenue. Its portfolio of aircraft families includes the single-aisle 737, the jumbo 747, the 767, the twin-aisle 777 and the new 787. Most of these families have multiple models and can be

built as airlines and freighters. The mid-sized 787 represents Boeing's newest generation of planes. The aircraft is made from advanced composite materials and engines that enable it to obtain a 20.0% improvement in fuel efficiency over current planes within its category. The aircraft was built with significant outsourcing, including wing construction by Japanese partners (Mitsubishi, Kawasaki and Fuji Heavy Industries). However, supply chain issues and new systems caused numerous delays in the plane's roll out, hurting the company's revenue and reputation. In 2013, fires related to the aircraft's electrical systems and battery caused a worldwide grounding of the 787. These issues, combined with high development costs, have diluted the profitability of the 787 program. Nevertheless, the efficiency of the plane, combined with surging global demand,

## Boeing (US commercial and military aircraft manufacturing) - financial performance\*

Year	Revenue		Operating Income	
	(\$ million)	(% change)	(\$ million)	(% change)
2012	64,350.0	N/C	7,779.0	N/C
2013	68,142.0	5.9	9,030.0	16.1
2014	73,400.0	7.7	9,544.0	5.7
2015	79,472.0	8.3	8,431.0	-11.7
2016	77,584.0	-2.4	6,138.0	-27.2
2017	81,367.3	4.9	5,875.8	-4.3

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

has done little to dampen orders from airlines. Moreover, the company is planning to introduce the 737 Max and 777X, which are revamps of its current models, over the coming years. These aircraft will make more use of composite materials and be equipped with new, fuel-efficient engines. At the 2013 Dubai Airshow, Boeing secured more than 200 orders for the 777X, making it the biggest aircraft launch in the company's history. At the end of 2016, the commercial airplanes segment had an order backlog of \$416.2 billion, representing a 31.2% increase from 2012 levels.

The BDS business specializes in military, intelligence and space markets, with the US Department of Defense being by far the largest customer. Operations are conducted through three segments: Boeing military aircraft (BMA), network and space systems and global services and support. However, BMA makes up 44.4% of BDS's revenue and is the only industry-specific segment. The segment manufactures military aircraft, such as the F/A-18 and F-15E fighter jets, the C-17 heavy transporter, P-8A Poseidon maritime aircraft, the AH-64 and CH-47 helicopters and many other aircraft such as tankers and unmanned aerial vehicles. In addition, BMA is a partner of Lockheed Martin Corporation in the production of the F-22 stealth fighter and with Bell Helicopter in the production of the V-22 Osprey tiltrotor aircraft. The division is also developing the KC-46 Pegasus tanker for the US Air Force.

Boeing receives much of its competitive advantage from its size and market diversification. As the world's biggest aerospace company, it has the capacity to take on multiple projects and clients simultaneously and can leverage

its economies of scale to buy inputs in bulk. By operating in both the commercial and defense sectors, Boeing can mitigate its exposure to either one. For example, as US military spending has declined, the company was able to offset declining defense sales with strong growth in its commercial segment, which is exposed to growing international demand for air travel. In recent years, the company has also gone after defense-related contracts with foreign governments. In particular, the company needs to win new orders for the F/A-18 and F-15 in order to keep open its fighter assembly line. Luckily, in 2016, the company gained approval to sell F/A-18s to Kuwait and F-15s to Qatar, potentially expanding the production lines for these fighters beyond 2020. Nevertheless, the company's C-17 production ended in November 2015. Considering these issues and problems with the KC-46, Boeing announced a major restructuring of its defense business.

## Financial performance

Over the five years to 2017, Boeing's commercial and military aircraft revenue is expected to grow at an annualized rate of 4.8% to an estimated \$81.4 billion. Strong demand for commercial aircraft has been the primary reason for such impressive performance during the five-year period. On the other hand, declining defense spending and the wind down of programs such as the C-17 has caused the military aircraft segment's revenue to decline during the same period. Moreover, despite strong revenue growth, Boeing's operating profit declined in 2016 as the 787 program struggled to make a profit and the KC-46 program costs were adjusted upwards.

# Major Companies

## Player Performance

**GE Aviation**  
Market share: 8.5 %

Based in Boston, General Electric (GE) operates in more than 40 countries and employs about 295,000 people worldwide. The company is a massive conglomerate with products and services ranging from durable consumer goods and healthcare devices to aircraft leasing. In 2016, overall annual revenue for GE totaled \$123.7 billion.

The company operates in this industry through its GE Aviation subsidiary, which manufactures and services jet engines, aerospace systems and equipment and replacement parts. The company is a top supplier of engines to both the commercial and military aircraft markets, with more than half of its revenue coming from services and the rest from products.

GE Aviation also has several joint ventures with engine and engine part manufacturers. Most notably, CFM International, which is a 50/50 venture with Snecma of France, produces the best-selling CFM56 engine family, and the new LEAP engine and Engine Alliance (EA), which is a 50/50 venture with Pratt and Whitney, produces the GP7200

engine for the Airbus A380. Additionally, company-produced engines power about two-thirds of the US Department of Defense's rotorcraft, half of its bombers and three-fourths of its fighters. In 2013, GE acquired Avio SpA, an Italian manufacturer of aviation propulsion components and systems, for \$4.5 billion. Company revenue growth has been bolstered by increasing commercial orders, while military sales declined due to reduced defense spending.

### Financial performance

Over the five years to 2017, GE Aviation's industry-specific revenue is expected to climb at an annualized rate of 7.1% to \$19.2 billion. The company has greatly benefited from increased global aircraft sales, which boosted demand for its engines. Demand was particularly strong because a large portion of demand for new aircraft is based on more fuel-efficient engines that the company provides. On the other hand, military sales of engines suffered from a declining US defense budget.

### GE Aviation (industry-specific) financial performance\*

Year	Revenue (\$ million)	(% change)	Operating Income (\$ million)	(% change)
2012	13,829.9	N/C	2,716.6	N/C
2013	14,662.3	6.0	3,150.1	16.0
2014	16,068.1	9.6	3,605.4	14.5
2015	17,592.7	9.5	3,992.6	10.7
2016	18,084.0	2.8	4,433.4	11.0
2017	19,241.0	6.4	5,011.8	13.0

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance

**Lockheed Martin Corporation**  
Market share: 7.7%

Based out of Bethesda, MD, Lockheed Martin Corporation is a major global aerospace and defense company that is principally engaged in researching, designing, developing, manufacturing, integrating and sustaining advanced technology systems, products and services. As of the end of 2016, the company operates 400 locations worldwide and employs about 97,000 people, with most operations (especially manufacturing) positioned within the United States. The company conducts operations through four segments: aeronautics, missiles and fire control (MFC), rotary and mission systems (RMS) and space systems. However, the aeronautics segment, which manufactures military aircraft, is the most industry-relevant. In addition, in the fourth quarter of 2015, the company completed its acquisition of industry-specific Sikorsky Helicopters from United Technologies Corporation, putting it in the newly titled RMS unit. In 2016, 78.0% of the company's \$47.3 billion revenue was generated through contracts with the US government.

Aeronautics is Lockheed's biggest division, bringing in more than 33.0% of the company's revenue. Products produced by aeronautics include the F-35 and F-22 stealth fighters, C-130 and

C-5M transporters and the F-16 multirole fighter. An estimated 72.0% of this segment's revenue is sourced from US government deals. In particular, the F-35 program makes up more than half of the segment's revenue. The program includes the development, low-rate initial production and eventual mass production of aircraft. In recent years, Lockheed has received criticism for cost overruns and delays associated with the F-35, but demand from the US Department of Defense and foreign governments remains strong. In 2012, the company acquired CDL Systems, Chandler/May Inc. and Procerus Technologies. These companies were involved in manufacturing and supporting unmanned aerial vehicles. Their purchase showcases Lockheed's focus on growth in rapidly expanding markets, such as unmanned aerial drones.

Since November of 2015, industry-specific revenue also includes Sikorsky sales. Sikorsky is a major military and civilian helicopter manufacturer and aftermarket service provider. Sikorsky helicopter models include the Black Hawk, the CH-53k and the S-76C++. The company has also recently introduced its S-97 RAIDER helicopter prototype. The new unit is aligned under the RMS segment, greatly increasing the company's industry market share.

### Lockheed Martin Corporation (industry-specific) - financial performance\*

Year	Revenue (\$ million)	(% change)	Operating Income (\$ million)	(% change)
2012	14,953.0	N/C	1,699.0	N/C
2013	14,123.0	-5.6	1,612.0	-5.1
2014	14,920.0	5.6	1,649.0	2.3
2015	15,970.0	7.0	1,636.0	-0.8
2016	17,769.0	11.3	1,887.0	15.3
2017	18,569.0	4.5	1,947.2	3.2

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

### Financial performance

Revenue within the company's aeronautics segment is expected to grow at an annualized rate of 4.4% over the five years to 2017 to total \$18.6 billion. In 2013, revenue growth was reversed primarily due to lower F-16

and C-130 deliveries. Despite this volatility, revenue is expected to climb in the future due to the increased tempo of the F-35 program. Moreover, the acquisition of Sikorsky is expected to help the company's revenue grow 4.5% in 2017.

## Player Performance

**United Technologies Corporation**  
Market share: 6.7%

United Technologies Corporation (UTC) was founded in 1975 with headquarters in Hartford, CT. UTC manufactures technology products and services to building systems and aerospace industries worldwide through four primary segments: Otis; UTC climate, controls and security; UTC aerospace systems; and Pratt and Whitney. However, only the last two segments are industry-relevant. In 2016, the company generated more than \$56.1 billion in revenue and employed 197,200 people worldwide.

Pratt and Whitney manufactures commercial, military, business jet and general aviation aircraft engines and parts, and provides fleet management for engines. UTC aerospace systems produces aerospace products and offers aftermarket services, including power generation, management and distribution systems; flight, engine-control and environmental-

control systems; fire protection and detection systems; auxiliary power units; and propeller systems.

Over the five years to 2017, UTC has won several important contracts. For example, Pratt and Whitney is under contract to build engine and propulsion components for the F-35 Lightning II stealth fighter. Earlier in 2016, the Air Force announced that Pratt and Whitney will supply the engines for the new B-21 stealth bomber. UTC is also a major shareholder in International Aero Engines, a joint-venture company that manufactures engines for small- to medium-sized commercial airliners.

UTC has also participated in merger and acquisition activity. UTC completed its \$18.3 billion acquisition of Goodrich Corporation, a major aircraft component and systems manufacturer, in 2012. The company combined its

## United Technologies Corporation (US industry-specific) - financial performance\*

Year	Revenue		Operating Income	
	(\$ million)	(% change)	(\$ million)	(% change)
2012	18,747.0	N/C	2,076.9	N/C
2013	21,299.3	13.6	2,722.2	31.1
2014	22,838.5	7.2	2,644.2	-2.9
2015	20,298.9	-11.1	1,528.0	-42.2
2016	16,577.3	-18.3	2,151.6	40.8
2017	16,220.4	-2.2	2,295.8	6.7

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

Hamilton Sundstrand operation with Goodrich to form the current UTC aerospace. In September 2015, UTC completed its sale of Sikorsky Helicopters to Lockheed Martin for \$9.0 billion. Sikorsky is one of the largest helicopter manufacturers in the world and a key defense contractor. Nonetheless, due to lackluster US defense spending, faltering commercial sales and Sikorsky's status as the only platform manufacturing business in UTC's portfolio, the company sold off the division. Earlier in 2016, UTC dismissed a takeover attempt by Honeywell.

## Financial performance

Over the five years to 2017, UTC's industry-specific revenue is expected to decline at an annualized rate of 2.9% to \$16.2 billion. For most of the past five years, the company has benefited from strong demand from the commercial aircraft market, which has helped mitigate volatile revenue from the Sikorsky segment that was heavily exposed to US military spending. Starting in 2012, the company's revenue has skyrocketed due to the acquisition of Goodrich, which almost doubled UTC aerospace's revenue. However, starting in 2015, revenue started to drop due to the sale of Sikorsky.

## Other Companies

### Textron Inc.

**Estimated market share: 3.4 %**

Based out of Providence, RI, Textron Inc. is a conglomerate that has aircraft, defense, industrial and finance businesses. In 2016, the company employed about 36,000 people worldwide and generated \$13.8 billion, up 3.0% from the previous year.

Textron contributes to the Aircraft, Engine and Parts Manufacturing industry through its Textron aviation and Bell subsidiaries, as well as its Textron systems segment. The company's Bell subsidiary supplies helicopters, tiltrotor aircraft (such as the V-22) and helicopter parts to military and commercial markets. However, most of Bell's commercial helicopters are produced in Canada, so only military products count for this industry. Textron Systems manufactures network-centric warfare systems for the US Department of Defense, but its industry-specific activities are primarily its unmanned aerial vehicle production. Textron aviation was formed this year with the merger of its Cessna subsidiary and recently acquired Beechcraft Corporation. Beechcraft is a producer of

general aviation aircraft under the Beechcraft and Hawker brands and was one of Cessna's main rivals. The company also had defense product offerings such as trainer and surveillance aircraft. Cessna itself is a staple among smaller general aviation companies, but sales have greatly suffered since the recession. The acquisition of Beechcraft will strengthen the company's civilian sales and diversify it away from declining defense spending.

In 2014, the company's AirLand Scorpion fixed-wing aircraft made its first public appearance at the Farnborough International Airshow. The aircraft is being developed by Textron AirLand LLC, a joint venture between Textron and AirLand Enterprises LLC and is designed as an inexpensive option for light attack and intelligence, surveillance and reconnaissance missions. Uncommon in the defense industry, the Scorpion has been developed without a government contract and at the company's expense. It is hoped that there is a large enough market for inexpensive tactical aircraft amid declining Western defense budgets and increasing geopolitical tensions. IBISWorld expects Textron to bring in an



# Major Companies

## Other Companies continued

estimated \$8.1 billion in industry-specific revenue in 2017.

### **General Dynamics**

Estimated market share: 2.9%

Formed in 1952, Falls Church, VA-based General Dynamics is a leading aerospace and defense company. Its 99,900-strong global workforce generated \$31.4 billion in 2016. While the company produces everything from ships to ammunition and land combat vehicles, its industry-specific segment is the aerospace group, which

produces and services the Gulfstream business-jet line and performs completions for other original equipment manufacturers. The aerospace group is the only part of the company that does not make most of its money from military-related contracts. Most aircraft and parts are manufactured in the United States, but international customers represent the majority of the company's backlog. In 2017, the company is expected to bring in an estimated \$7.0 billion in industry-specific revenue.

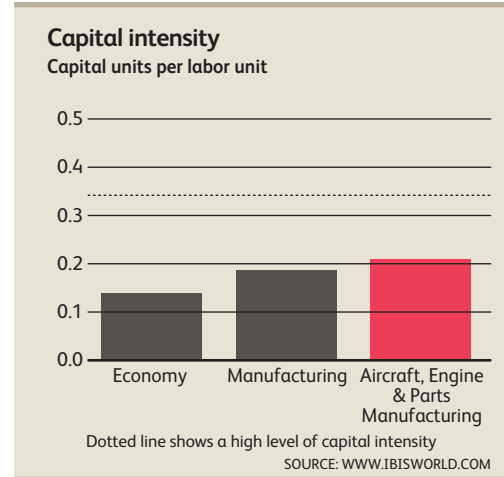
# Operating Conditions

Capital Intensity | Technology & Systems | Revenue Volatility  
 Regulation & Policy | Industry Assistance

## Capital Intensity

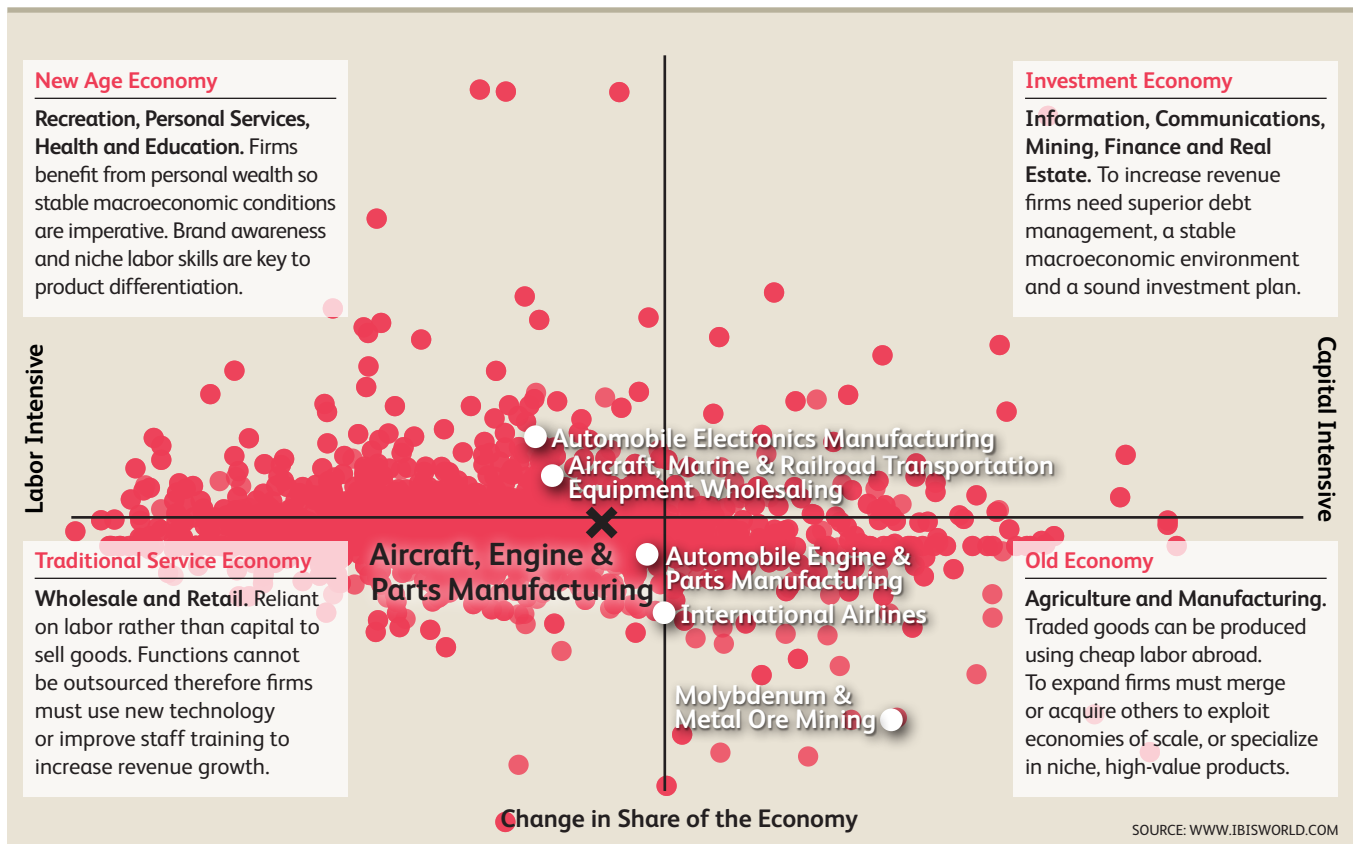
Level  
 The level of capital intensity is **Medium**

The Aircraft, Engine and Parts Manufacturing industry exhibits a medium level of capital intensity. For every dollar spent on labor, industry operators will spend \$0.21 on capital. Manufacturing facilities require massive amounts investment. Many aeronautics products are extremely sophisticated and the production lines needed to make them are very advanced. Capital intensity is also increased because many industry products are one of a kind and thus require new investment in production equipment and methods. This is particularly true for new military aircraft. Programs like the F-35 stealth fighter, required companies to develop completely new technology, which not only necessitated investment in new tools



during the development stage, but also the retooling of existing facilities to accommodate new production.

## Tools of the Trade: Growth Strategies for Success



# Operating Conditions

## Capital Intensity continued

Additionally, defense related production, especially if deals with top-secret technology, can't be outsourced to lower cost countries as it would endanger national security. Therefore, defense-related capital costs cannot typically be reduced through the offshoring of manufacturing. However, offshoring is more prevalent in the commercial segment, as the technology is not as sophisticated and secret. Nevertheless, offshoring is not as big as in other industries because production typically requires highly skilled labor, which is harder to find in global centers of lower cost production.

Industry capital intensity is also weighed down by very high wage costs. Because of the sophistication of

aerospace products, workers must be highly skilled. As a result, average wages are high, especially for engineers and management. The shortage of engineering and science related workers in the United States has also increased wage costs, as competition for labor rises.

Over the five years to 2017, capital intensity has significantly increased. Recent defense cuts and industry consolidation has also put pressure on companies to reduce their workforce. At the same time companies invested in automation to lower payroll, improve productivity and production time. Lastly, the development of new military and civil aircraft has forced operators to retool and expand facilities.

## Technology & Systems

### Level

The level of  
Technology  
Change is **High**

The Aircraft, Engine and Parts Manufacturing industry has a high level of technological innovation. The aerospace sector is one of the most advanced in the economy, building highly sophisticated products such as fighter jets, jet engines and advanced electronics. To manufacture these products, industry players invest significant resources into research and development (R&D), new manufacturing processes and specialized equipment.

### The manufacturing aspect

Aerospace manufacturing processes and materials are distinguished from many other manufacturing industries by the stringency of the industry's requirements for safety, reliability and efficiency in operations. Components need to be manufactured with greater accuracy and closer tolerances, and a high degree of attention has to be given to assembly. Materials with extremely high strength and low weight are necessary, such as titanium-rich composite materials.

In recent years, a significant portion of aerospace manufacturing innovation has

revolved around new manufacturing techniques such as additive manufacturing (AM) and advances in machine tools such as computer numerical control (CNC) machines (machine tools that are controlled by computers and carry out preprogrammed commands) and robotics.

AM, more commonly known as 3D printing, is a series of process by which 3D objects are created from electronic data by laying down successive layers of material. Through this technology almost any shape can be created, allowing for the production of highly complex shapes beyond the ability of traditional machine tools. Originally, 3D printing was used to create models, but in more recent years parts and components have been printed. For instance, General Electric and Pratt & Whitney both use 3D printing to produce components for their new generation of jet engines, while Boeing and Northrop Grumman use the technology to build parts for their aircraft such as the 787 Dreamliner and X-47B unmanned aerial vehicle (UAV). AM-

# Operating Conditions

## Technology & Systems continued

related innovation has increasingly centered on moving beyond the manufacturing of plastic objects, which have limited use in aircraft, to the production of metal objects made out of alloys such as titanium.

More conventional machine tools have also undergone some innovation in recent years. Operators have invested in more automated CNC machines that use more axes, as this enhances the complexity of shapes machines can produce. These machines require less human intervention, because a greater number of axes means that operators are less likely to have to reorient work pieces manually. Increased automation also involves machines that self-clean through chip evacuation systems. The cleaning requirements of most CNC machines are quite intensive, since they necessarily collect pieces of material that have been cut away.

Industry operators are also increasing their use of robotics. Traditionally, robots in the aerospace industry have been limited to tasks such as drilling holes because the relatively large size of aircraft would require too many robots to cover a particular space. However, advances are being made to introduce mobile robots that can maneuver around aircraft and accurately carry out tasks such as painting and structural inspection.

Besides using more advanced equipment, manufacturers are introducing new software and communications tools to streamline the industry's notoriously complex supply chains. Software companies such as SAP have introduced supply chain management solutions that include integration of supplier networks (i.e. supplier synchronization such sharing orders, inventory, or production forecasts) and data analysis of supply chains to identify bottlenecks and create benchmarks. Similar solutions have also included order automation

and shared manufacturer-supplier resource planning.

## Product innovation

Within the commercial segment of the industry, product innovation has been geared towards building more fuel-efficient aircraft. High fuel prices and increasing scrutiny of aircraft pollution have increased demand for aircraft that can burn less fuel. Virtually all commercial aircraft recently introduced or in development are built around fuel efficiency technology such as new engines and increased use of lighter composite materials. This includes Boeing's 787 Dreamliner, 737 MAX and 777X.

Both General Electric and Pratt & Whitney have introduced or are developing many more fuel-efficient engines. For instance, General Electric has introduced the GENx engine that is currently used on Boeing's Dreamliner and 747-8. Using composite materials, carbon fiber and new component designs, General Electric claims that the GENx offers up to 15.0% better fuel consumption than other engines.

Commercial aircraft are also being built with new avionics systems. This includes the replacement of analog cockpit systems with all electronic ones and the introduction of fly-by-wire control systems that optimize wing configuration for the lowest possible fuel consumption. On-board electronic aircraft management systems are also helping centralize and control multiple complex systems such engine monitoring.

However, despite multiple technological breakthroughs over the years, the basic design of commercial aircraft has stayed the same. Aside from the Dreamliner, almost all the other large commercial airliners being developed in the United States or Europe are based around older models. For instance, the 737 MAX is just an updated version of the original 737, but with increased use of

# Operating Conditions

## Technology & Systems continued

composite material, new more fuel-efficient engines and advanced avionics.

Far more technological innovation has occurred in the military segment of the industry. Unlike commercial aircraft manufacturers, defense contractors receive substantial R&D funding and subsidies from the government, which is constantly looking to development new platforms to enhance capabilities and obtain military superiority.

The largest US military development program is the 5th generation, F-35 jet fighter. The fighter incorporates multiple advanced features such as stealth technology and advanced avionics, software and networking capabilities, which represent the direction in which military aircraft technology is headed. Stealth technology is used to reduce the radar cross section of aircraft, making them undetectable to traditional radar systems. This technology includes the use of particular shapes in aircraft design, radar absorbent materials and internal weapon bays. The F-35 is also equipped with advanced avionics such as active electronically scanned array (AESA) radar, which can perform various roles simultaneously, while reducing detectability. The aircraft is also extremely software-intensive, using software to oversee complex systems; controlling, analyzing and managing sensor data. Software-intensive systems are supposed to be easier and less expensive to upgrade than hardware-intensive systems, which require replacement or even aircraft modification. However, the planes software system has had multiple glitches and related development costs are rising. The fighter is also expected to be capable of networking with other F-35s as well as other platforms. This includes target acquisition and guidance for other aircrafts' missiles and sharing of situational awareness data. Technologies such as AESA radar, advanced

networking capabilities and to a smaller degree, stealth technology features, are also being installed on older generation and non-fighter aircraft.

However, one of the most rapidly developing and potentially revolutionary technologies worked on by the industry in recent years are unmanned aerial vehicles (UAVs). UAVs are remotely piloted aircraft, different from a missile because it is capable of controlled, sustained and level flight. Today's operational UAVs encompass a wide range of sizes, weights, speeds and operating altitudes ranging from the four-pound Raven that flies for about one hour at 50 knots and normally below 1000 feet, to the largest operational UAV, the Global Hawk, which weighs about 15,000 pounds, and flies at 400 knots for more than 30 hours at 65,000 feet. However, there has also been substantial progress in the development of micro UAVs. One of the smallest such UAVs is Harvard University's Robobee, which weight 80mg and has a mere 3cm wingspan.

The mission capabilities of UAVs are also rapidly changing. Currently, most operational UAVs are used by the military for intelligence, surveillance, reconnaissance and precision strike missions. However, they are relatively easy to detect and defeat, making them vulnerable in "contested" airspace. Therefore, UAVs are being developed that can operate in such airspace. For instance, General Atomics' Avenger and Northrup Grumman's RQ-180 include stealth features such as internal weapon bays and radar absorbent materials. Along with increased stealth, new military UAVs are also taking on increased combat roles. BAE's Taranis is being developed as the first unmanned jet fighter, being able to attack both ground and air targets.

On the commercial front UAVs are being developed that can monitor

# Operating Conditions

## Technology & Systems continued

weather, act as communication relays (also used for the military), deliver cargo and carry our search and rescue missions, among other tasks.

Over the past five years, there has also been a rapid change in the propulsion systems used by UAVs. Currently, turboprop

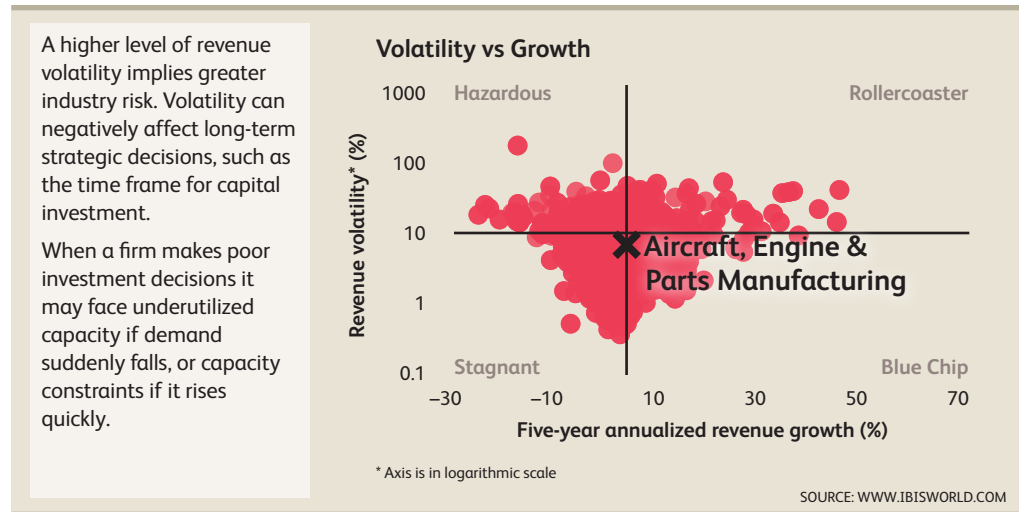
engines power most UAVs. However, the development of UAVs for higher altitude or “contested” airspace missions has increased the use of jet engines. Manufacturers are also increasingly turning to alternative sources of propulsion such as solar and even hydrogen power.

## Revenue Volatility

Level  
The level of Volatility is **Medium**

The level of volatility is moderate based on the absolute changes in revenue from year to year. Early on over the past five years, declining commercial aircraft sales were offset by stable defense related contracts. Recently, when military spending dropped, strong demand from a recovered air transportation market helped the commercial aircraft sector mitigate losses

from a weaker military market. In general, long term contracts, a healthy backlog and a strong replacement and servicing market helps reduce volatility. Over the coming years, volatility is forecast to decline low as a large backlog of commercial aircraft orders keeps revenue coming in, which will reduce damage from declining defense spending.



## Regulation & Policy

Level & Trend  
The level of Regulation is **Heavy** and the trend is **Increasing**

The Aircraft, Engine and Parts Manufacturing industry is highly regulated. Due to the fatal nature of aircraft accidents, everything from the manufacturing process to airworthiness and repair procedures come under strict government oversight.

### Civil regulation

In the United States, commercial aircraft products are required to comply with

Federal Aviation Administration regulations governing production and quality systems, airworthiness and installation approvals, repair procedures and continuing operational safety. Rules pertaining to the certification of aircraft and airworthiness standards are under Title 14 of the Federal Aviation Rules. Provisions within this title include: production certificates, airworthiness



# Operating Conditions

## Regulation & Policy continued

certificates, export airworthiness approvals and approval of engines, materials, parts, processes and appliances. The Parts Manufacturer Approval is a combined design and production approval for modification and replacement parts. It allows a manufacturer to manufacture and sell these parts for installation on type-certified products.

Internationally, similar requirements exist for airworthiness, installation and operational approvals. Furthermore, these requirements are generally administered by the national aviation authorities of individual nations and, in the case of Europe, coordinated by the European Joint Aviation Authorities. Compliance with these regulators and regulations is vital to US manufacturers because of the export-intensive nature of the industry.

The FAA also heavily regulates the domestic operation of UAVs. Currently, hobbyist or recreational use of UAVs is allowed as long as the UAV is flown at an altitude of less than 400 feet, is within sight of the operator and stays clear of people, stadiums, airports and other objects (recent requirements also force hobbyist to register their drones). However, civil, public and commercial use of UAVs in US airspace is far more restricted. Currently, government agencies and commercial operators of UAVs have to obtain special permission and certification from the FAA. In 2015, as part of a 2012 Congressional order, the FAA gave a notice of proposed rulemaking outlining how it intends to regulate small UAVs for commercial use. The rules include the restriction of UAV flights to daytime and within the visual-line-of-sight and require pilot certification. However, it will be some time until these proposed regulations are finalized.

### International standards

Industry operators also usually comply with domestic and international

nongovernmental standards and certifications. For instance, certification through the International Aerospace Quality Group is prominent for players in the international aerospace industry. The main standard is referred to as: AS 9100 in the Americas, EN 9100 in Europe and JISQ 9100 in Asia. The certification serves to identify recognized suppliers in the aerospace sector and harmonize world aerospace standards. The standards were developed from the International Organization for Standardization's ISO 9000 standards.

### Government procurement and defense regulation

Government contracts are heavily regulated and manufacturers deal with numerous US government agencies and entities, including all the branches of the US military, NASA and Homeland Security. Similar government authorities exist in international markets. All federal procurement must comply with federal acquisition regulation (FAR). These regulations govern the policies and procedures for acquisition, including planning, contract formation and contract administration. In order to obtain contracts, companies have to comply with FAR. Moreover, many agencies could alter or expand on FAR through supplements. For example, the Defense Federal Acquisition Regulation is a FAR supplement governing military-related acquisitions.

Due to the sensitive nature of the industry's military-related projects, there are multiple regulations that provide the government with oversight of defense contractors. The National Industrial Security Program (NISP) is the government-wide authority for managing the needs of the private sector to access classified government information. NISP is implemented by the Department of Defense's Defense Security Service (DSS). The DSS is responsible for personnel

# Operating Conditions

## Regulation & Policy continued

security investigations, supervising industrial security, and performing security education and awareness training. This includes clearing and evaluating contractors' facilities to handle sensitive information and acting as a liaison between the government and private contractors regarding classified information. The DSS is also responsible for security oversight and clearance of companies operating under foreign ownership, control or influence (FOCI). In FOCI companies, a foreign interest has either the direct or indirect power to decide matters affecting the management or operations of the company in a manner which may result in unauthorized access to classified information or may adversely affect the performance of classified contracts.

The foreign sale of the industry's military-related equipment is also heavily regulated. The Arms Export Control Act (AECA) gives the president authority to control the import and export of defense articles and defense services. The Act also places certain restrictions on American arms traders and manufacturers, prohibiting them from the sale of sensitive technologies to certain parties and requiring documentation of such trades to allies. The implementation of the AECA is done through International Traffic in Arms Regulations (ITAR) which control the sale of items on the US Munitions List, which is a list of articles, services, and related technology designated as defense- and space-related by the government. Under the act, the US Department of State's Directorate of Defense Trade Controls is responsible for enforcing and interpreting the sale of items on the munitions list. This includes reviewing all munitions list items that are being exported and ensuring these items are not transferred to unauthorized third

parties. All arms traders and industry manufacturers have to register with the Department of State.

The Bureau of Industry and Security under the US Department of Commerce controls goods and technology that have both civilian and military strategic use through the Export Administration Act. Industry goods under the Department of Commerce oversight are far less restricted. In early 2014, the Obama Administration moved thousands of items off the US Munitions List and put them under the Department of Commerce oversight in order to boost US defense-related exports, including many industry products.

Many UAVs are also covered by the Missile Technology Control Regime (MTCR), an informal grouping of 34 countries designed to prevent the proliferation of systems capable of delivering weapons of mass destruction. The regime requires State and Commerce Department authorization to export UAVs that can fly farther than 300 kilometers and carry more than 500 kilograms. Under MTCR guidelines, export of UAVs carries a "strong presumption of denial" of an export license. However, in early 2015, the Obama administration lightened restrictions on UAV exports. The new policy, the details of which are still classified, allows export sales of UAVs, even armed ones, to allies through government programs and with the recipient nation's agreement to "end use assurances."

In addition to these regulations, operators wishing to export industry products for both civilian and defense-related purposes have to comply with the Foreign Corrupt Practices Act, which prohibits bribery of foreign persons in order to win or retain business.

# Operating Conditions

## Industry Assistance

Level & Trend  
The level of Industry Assistance is **Medium** and the trend is **Steady**

The United States has been heavily involved in supporting the development, production, marketing and sale of aircraft and their components. Support is provided for a variety of reasons, such as to create employment, avoid dependence, stimulate technical and economic growth, and foster national prestige.

The government provides numerous tax benefits for companies within this industry. Some of these incentives include: the FSC Repeal and Extraterritorial Income Exclusion Act of 2000 and government funding; and tax-related incentives including grants and funding to start-up companies in this industry. The FSC act provides favorable tax treatment to goods manufactured in the United States and goods manufactured by US-owned companies operating overseas. In addition, in response to the declining availability of financing in traditional capital markets, the Export-

Import Bank of the United States has dramatically increased its financial support of US aircraft exports worldwide.

In the defense sector, the government typically helps cover the costs associated with technology and product development. In addition, strict regulations for defense contractors makes it more difficult for competition to arise. Lastly, the United States may help the industry sell to foreign countries by negotiating contracts and providing financing to purchasing governments.

There are no tariffs imposed on aircraft or aircraft parts in the United States; however, tariffs are applicable from countries that the United States has no official trade relations with, such as Cuba and North Korea. In addition, high tariffs may be imposed on industry products for multiple reasons, such as anti-dumping actions.

# Key Statistics

## Industry Data

	Revenue (\$m)	Industry Value Added (\$m)	Establishments	Enterprises	Employment	Exports (\$m)	Imports (\$m)	Wages (\$m)	Domestic Demand	Federal funding for defense (\$b)
2008	184,776.6	38,670.1	1,606	1,319	344,260	N/A	59,609.3	24,090.6	N/A	620.7
2009	170,186.1	36,760.6	1,607	1,326	346,735	84,879.4	30,968.0	24,749.6	116,274.7	661.0
2010	165,316.3	40,205.3	1,620	1,297	325,576	80,722.4	30,975.3	24,458.3	115,569.2	685.2
2011	170,931.8	43,733.4	1,590	1,278	323,728	88,352.1	33,898.0	25,801.1	116,477.7	683.0
2012	199,106.8	47,778.9	1,628	1,326	332,397	101,825.4	38,110.1	26,852.5	135,391.5	644.3
2013	209,670.1	49,534.4	1,616	1,321	341,208	111,543.6	42,301.5	28,144.7	140,428.0	592.5
2014	220,568.2	51,588.5	1,647	1,343	346,536	118,212.5	46,935.1	29,933.2	149,290.8	554.5
2015	217,263.7	50,926.9	1,699	1,381	349,245	123,382.2	46,901.5	29,399.2	140,783.0	536.1
2016	226,401.9	53,567.0	1,743	1,415	360,173	123,347.9	43,271.7	30,506.1	146,325.7	532.5
2017	240,360.1	56,933.9	1,795	1,454	376,856	128,301.0	45,091.3	32,200.6	157,150.4	540.9
2018	243,798.5	57,693.8	1,825	1,478	382,289	129,635.5	45,968.8	32,710.2	160,131.8	585.6
2019	249,371.7	58,935.4	1,857	1,504	390,200	132,627.9	47,006.0	33,476.0	163,749.8	605.8
2020	250,351.5	59,188.8	1,876	1,519	392,546	133,421.2	47,063.4	33,676.5	163,993.7	610.0
2021	249,230.4	59,048.2	1,883	1,525	393,117	133,132.4	46,708.9	33,670.5	162,806.9	608.2
2022	249,551.8	59,167.1	1,904	1,542	394,715	133,644.9	46,611.3	33,793.0	162,518.2	603.8
Sector Rank	2/437	2/436	72/437	73/437	4/437	1/401	9/401	1/437	6/401	N/A
Economy Rank	42/1796	54/1575	950/1796	918/1796	126/1796	3/526	12/526	54/1796	9/526	N/A

## Annual Change

	Revenue (%)	Industry Value Added (%)	Establishments (%)	Enterprises (%)	Employment (%)	Exports (%)	Imports (%)	Wages (%)	Domestic Demand (%)	Federal funding for defense (%)
2009	-7.9	-4.9	0.1	0.5	0.7	N/A	-48.0	2.7	N/A	6.5
2010	-2.9	9.4	0.8	-2.2	-6.1	-4.9	0.0	-1.2	-0.6	3.7
2011	3.4	8.8	-1.9	-1.5	-0.6	9.5	9.4	5.5	0.8	-0.3
2012	16.5	9.3	2.4	3.8	2.7	15.2	12.4	4.1	16.2	-5.7
2013	5.3	3.7	-0.7	-0.4	2.7	9.5	11.0	4.8	3.7	-8.0
2014	5.2	4.1	1.9	1.7	1.6	6.0	11.0	6.4	6.3	-6.4
2015	-1.5	-1.3	3.2	2.8	0.8	4.4	-0.1	-1.8	-5.7	-3.3
2016	4.2	5.2	2.6	2.5	3.1	0.0	-7.7	3.8	3.9	-0.7
2017	6.2	6.3	3.0	2.8	4.6	4.0	4.2	5.6	7.4	1.6
2018	1.4	1.3	1.7	1.7	1.4	1.0	1.9	1.6	1.9	8.3
2019	2.3	2.2	1.8	1.8	2.1	2.3	2.3	2.3	2.3	3.4
2020	0.4	0.4	1.0	1.0	0.6	0.6	0.1	0.6	0.1	0.7
2021	-0.4	-0.2	0.4	0.4	0.1	-0.2	-0.8	0.0	-0.7	-0.3
2022	0.1	0.2	1.1	1.1	0.4	0.4	-0.2	0.4	-0.2	-0.7
Sector Rank	43/437	48/436	77/437	85/437	41/437	104/401	195/401	41/437	41/401	N/A
Economy Rank	188/1796	199/1575	449/1796	464/1796	220/1796	153/526	255/526	205/1796	56/526	N/A

## Key Ratios

	IVA/Revenue (%)	Imports/Demand (%)	Exports/Revenue (%)	Revenue per Employee (\$'000)	Wages/Revenue (%)	Employees per Est.	Average Wage (\$)	Share of the economy (%)
2008	20.93	N/A	N/A	536.74	13.04	214.36	69,977.92	0.26
2009	21.60	26.63	49.87	490.82	14.54	215.77	71,379.01	0.25
2010	24.32	26.80	48.83	507.77	14.79	200.97	75,123.17	0.27
2011	25.59	29.10	51.69	528.01	15.09	203.60	79,699.93	0.29
2012	24.00	28.15	51.14	599.00	13.49	204.18	80,784.42	0.31
2013	23.62	30.12	53.20	614.49	13.42	211.14	82,485.46	0.32
2014	23.39	31.44	53.59	636.49	13.57	210.40	86,378.33	0.32
2015	23.44	33.31	56.79	622.10	13.53	205.56	84,179.30	0.31
2016	23.66	29.57	54.48	628.59	13.47	206.64	84,698.46	0.32
2017	23.69	28.69	53.38	637.80	13.40	209.95	85,445.37	0.33
2018	23.66	28.71	53.17	637.73	13.42	209.47	85,564.06	0.33
2019	23.63	28.71	53.18	639.09	13.42	210.12	85,791.90	0.33
2020	23.64	28.70	53.29	637.76	13.45	209.25	85,789.95	0.33
2021	23.69	28.69	53.42	633.99	13.51	208.77	85,650.07	0.32
2022	23.71	28.68	53.55	632.23	13.54	207.31	85,613.67	0.31
Sector Rank	223/436	164/401	23/401	115/437	233/437	18/437	38/437	2/436
Economy Rank	1073/1575	204/526	34/526	364/1796	1180/1796	41/1796	239/1796	54/1575

Figures are in inflation-adjusted 2017 dollars. Rank refers to 2017 data.

SOURCE: WWW.IBISWORLD.COM

## Industry Financial Ratios

	Apr 2012 - Mar 2013	Apr 2013 - Mar 2014	Apr 2014 - Mar 2015	Apr 2015 - Mar 2016	Apr 2015 - Mar 2016 by company revenue		
					Small (<\$10m)	Medium (\$10-50m)	Large (>\$50m)
<b>Liquidity Ratios</b>							
Current Ratio	2.2	2.1	2.2	2.3	2.2	2.3	2.2
Quick Ratio	0.9	0.8	0.9	0.9	0.8	1.0	0.9
Sales / Receivables (Trade Receivables Turnover)	8.2	8.0	8.2	8.0	9.5	8.0	7.0
Days' Receivables	44.5	45.6	44.5	45.6	38.4	45.6	52.1
Cost of Sales / Inventory (Inventory Turnover)	3.2	3.2	3.3	3.1	3.3	2.7	3.7
Days' Inventory	114.1	114.1	110.6	117.7	110.6	135.2	98.6
Cost of Sales / Payables (Payables Turnover)	13.1	11.3	12.4	12.0	13.3	12.2	10.7
Days' Payables	27.9	32.3	29.4	30.4	27.4	29.9	34.1
Sales / Working Capital	4.7	5.2	4.6	4.4	5.4	4.1	4.4
<b>Coverage Ratios</b>							
Earnings Before Interest & Taxes (EBIT) / Interest	6.8	6.0	6.1	5.2	4.2	9.6	3.2
Net Profit + Dep., Depletion, Amort. / Current Maturities LT Debt	3.1	2.6	3.4	2.8	n/a	3.3	2.1
<b>Leverage Ratios</b>							
Fixed Assets / Net Worth	0.6	0.5	0.5	0.5	0.5	0.5	0.6
Debt / Net Worth	1.2	1.6	1.0	1.1	1.0	1.1	1.9
Tangible Net Worth	36.4	30.4	37.4	34.1	32.1	39.3	25.0
<b>Operating Ratios</b>							
Profit before Taxes / Net Worth, %	19.7	20.2	16.5	17.6	15.6	19.3	19.4
Profit before Taxes / Total Assets, %	8.1	7.8	7.1	6.9	5.7	7.9	6.8
Sales / Net Fixed Assets	8.5	8.0	8.7	9.0	10.3	7.6	8.6
Sales / Total Assets (Asset Turnover)	1.4	1.4	1.4	1.4	1.5	1.4	1.2
<b>Cash Flow &amp; Debt Service Ratios (% of sales)</b>							
Cash from Trading	28.3	30.2	29.4	28.7	35.4	28.2	19.5
Cash after Operations	8.1	7.5	8.0	7.5	7.1	7.9	7.4
Net Cash after Operations	8.0	7.3	7.7	6.6	6.0	7.5	6.5
Cash after Debt Amortization	1.8	2.3	1.0	-0.1	-0.2	0.1	-0.2
Debt Service P&I Coverage	2.3	2.0	2.1	1.8	3.1	1.8	1.4
Interest Coverage (Operating Cash)	6.3	6.2	7.8	5.6	6.6	5.9	2.0
<b>Assets, %</b>							
Cash & Equivalents	9.3	8.5	9.5	9.8	13.2	9.7	4.9
Trade Receivables (net)	19.4	19.1	18.9	18.7	18.2	18.4	19.9
Inventory	33.3	33.5	33.0	32.3	32.6	33.4	29.3
All Other Current Assets	3.5	3.7	4.1	3.6	3.3	2.9	5.6
Total Current Assets	65.5	64.8	65.6	64.3	67.2	64.5	59.7
Fixed Assets (net)	21.5	21.5	20.5	20.7	21.5	21.2	18.2
Intangibles (net)	8.3	8.9	9.4	9.3	5.9	8.6	16.0
All Other Non-Current Assets	4.7	4.8	4.6	5.7	5.3	5.7	6.1
Total Assets	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Assets (\$m)	11,436.0	10,505.0	10,046.5	12,058.2	350.9	3,612.6	8,094.7
<b>Liabilities, %</b>							
Notes Payable-Short Term	9.2	9.3	9.2	8.9	11.2	7.9	7.7
Current Maturities L/T/D	3.6	3.7	3.0	3.8	5.4	3.6	1.9
Trade Payables	9.7	10.9	9.8	8.9	9.0	8.6	9.4
Income Taxes Payable	0.3	0.2	0.3	0.2	0.1	0.2	0.5
All Other Current Liabilities	8.1	9.5	9.1	9.8	9.1	10.3	9.6
Total Current Liabilities	30.8	33.7	31.5	31.6	34.8	30.6	29.1
Long Term Debt	15.7	17.8	14.3	17.4	20.2	14.4	20.3
Deferred Taxes	0.8	0.9	0.8	0.6	n/a	0.7	1.1
All Other Non-Current Liabilities	8.0	8.3	6.5	7.1	7.0	6.4	8.6
Net Worth	44.7	39.3	46.8	43.4	38.0	47.9	41.0
Total Liabilities & Net Worth (\$m)	11,436.0	10,505.0	10,046.5	12,058.2	350.9	3,612.6	8,094.7
Maximum Number of Statements Used	350	344	293	325	99	158	68

Source: RMA Annual Statement Studies, rmahq.org. RMA data for all industries is derived directly from more than 260,000 statements of member financial institutions' borrowers and prospects.

Note: For a full description of the ratios refer to the Key Statistics chapter online.



# Jargon & Glossary

## Industry Jargon

**787** The Boeing Company's 787 class of commercial passenger aircraft that experienced production delays before beginning service and has since suffered equipment failures and a global grounding.

**LARGE COMMERCIAL AIRCRAFT** Large commercial aircraft are the largest category of commercial planes and can carry large amounts of passengers.

### ORIGINAL EQUIPMENT MANUFACTURER (OEM)

OEMs assemble complete aircraft, which they sell under their name. Examples include Boeing, Lockheed Martin Corporation and Northrup Grumman Corporation.

**UNMANNED AERIAL VEHICLES (UAV)** Aircraft that fly without a human crew on board.

## IBISWorld Glossary

**BARRIERS TO ENTRY** High barriers to entry mean that new companies struggle to enter an industry, while low barriers mean it is easy for new companies to enter an industry.

**CAPITAL INTENSITY** Compares the amount of money spent on capital (plant, machinery and equipment) with that spent on labor. IBISWorld uses the ratio of depreciation to wages as a proxy for capital intensity. High capital intensity is more than \$0.333 of capital to \$1 of labor; medium is \$0.125 to \$0.333 of capital to \$1 of labor; low is less than \$0.125 of capital for every \$1 of labor.

**CONSTANT PRICES** The dollar figures in the Key Statistics table, including forecasts, are adjusted for inflation using the current year (i.e. year published) as the base year. This removes the impact of changes in the purchasing power of the dollar, leaving only the "real" growth or decline in industry metrics. The inflation adjustments in IBISWorld's reports are made using the US Bureau of Economic Analysis' implicit GDP price deflator.

**DOMESTIC DEMAND** Spending on industry goods and services within the United States, regardless of their country of origin. It is derived by adding imports to industry revenue, and then subtracting exports.

**EMPLOYMENT** The number of permanent, part-time, temporary and seasonal employees, working proprietors, partners, managers and executives within the industry.

**ENTERPRISE** A division that is separately managed and keeps management accounts. Each enterprise consists of one or more establishments that are under common ownership or control.

**ESTABLISHMENT** The smallest type of accounting unit within an enterprise, an establishment is a single physical location where business is conducted or where services or industrial operations are performed. Multiple establishments under common control make up an enterprise.

**EXPORTS** Total value of industry goods and services sold by US companies to customers abroad.

**IMPORTS** Total value of industry goods and services brought in from foreign countries to be sold in the United States.

**INDUSTRY CONCENTRATION** An indicator of the dominance of the top four players in an industry.

Concentration is considered high if the top players account for more than 70% of industry revenue. Medium is 40% to 70% of industry revenue. Low is less than 40%.

**INDUSTRY REVENUE** The total sales of industry goods and services (exclusive of excise and sales tax); subsidies on production; all other operating income from outside the firm (such as commission income, repair and service income, and rent, leasing and hiring income); and capital work done by rental or lease. Receipts from interest royalties, dividends and the sale of fixed tangible assets are excluded.

**INDUSTRY VALUE ADDED (IVA)** The market value of goods and services produced by the industry minus the cost of goods and services used in production. IVA is also described as the industry's contribution to GDP, or profit plus wages and depreciation.

**INTERNATIONAL TRADE** The level of international trade is determined by ratios of exports to revenue and imports to domestic demand. For exports/revenue: low is less than 5%, medium is 5% to 20%, and high is more than 20%. Imports/domestic demand: low is less than 5%, medium is 5% to 35%, and high is more than 35%.

**LIFE CYCLE** All industries go through periods of growth, maturity and decline. IBISWorld determines an industry's life cycle by considering its growth rate (measured by IVA) compared with GDP; the growth rate of the number of establishments; the amount of change the industry's products are undergoing; the rate of technological change; and the level of customer acceptance of industry products and services.

**NONEMPLOYING ESTABLISHMENT** Businesses with no paid employment or payroll, also known as nonemployers. These are mostly set up by self-employed individuals.

**PROFIT** IBISWorld uses earnings before interest and tax (EBIT) as an indicator of a company's profitability. It is calculated as revenue minus expenses, excluding interest and tax.



# Jargon & Glossary

## IBISWorld Glossary continued

**VOLATILITY** The level of volatility is determined by averaging the absolute change in revenue in each of the past five years. Volatility levels: very high is more than  $\pm 20\%$ ; high volatility is  $\pm 10\%$  to  $\pm 20\%$ ; moderate volatility is  $\pm 3\%$  to  $\pm 10\%$ ; and low volatility is less than  $\pm 3\%$ .

**WAGES** The gross total wages and salaries of all employees in the industry. The cost of benefits is also included in this figure.

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