CFRA

Industry Surveys

Aerospace & Defense

DECEMBER 2022

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CONTENTS

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CHARTS & FIGURES

NEW THEMES

What's Changed: Faced with rising inflation in 2022, defense companies' profit margins have been under pressure. Check out page 16.

What's Changed: CFRA expects global plane demand in 2023 to grow above 2019 levels, but supply chain issues will likely prevent the commercial aerospace industry from making a full recovery until 2024 at the earliest. Read more starting page 19.

EXECUTIVE SUMMARY

Our outlook for Aerospace & Defense (A&D) is neutral, as we see growth for defense businesses being offset by below-normal earnings in commercial aerospace due to lingering effects of the pandemic.

Strong Growth in U.S. and Allied Defense Spending Stemming from Russian Invasion of Ukraine

Government contracting generates around 65% of A&D industry revenue, with four of the industry's six largest firms by sales generating 75%-plus of revenue from government contracts, by our estimate.

In March 2022, shortly after Russia's invasion of Ukraine, Congress and the President raised the FY 22 defense budget 5% vs. FY 21. The actual total of FY 22 spending was up an even higher 9% Y/Y after a series of supplemental Ukraine military support measures are factored in, by CFRA's estimate.

Given the trailing 10-year average annual growth of just 1% for U.S. defense spending, this year's 9% jump will deliver a material demand boost to U.S. defense firms. And we expect at least 6% Y/Y U.S. defense spending growth in FY 23. European allies are also raising defense spending to support Ukraine and to bolster their own deterrence strategies, which will serve to further boost U.S defense firms.

Inflation Surge Hits Fixed-Price Contracts Hard, Pressuring Defense Firm Margins

Most of the major U.S. defense firms generate at least 50% (sometimes over 80%) of revenue from fixed-price contracts, many of which are for multi-year projects. These contracts don't leave defense firms much, if any, room to raise prices if costs come in higher than expected. Accordingly, the 2022 inflation surge means defense profit margins will likely be under pressure during the next year.

Commercial Aerospace Demand is Rapidly Recovering from Pandemic Downturn

U.S. air passenger volume for November 2022 grew 12% Y/Y and recovered to 6% below November 2019. The U.S. recovery is being followed by similar rebounds in Western Europe, Southeast Asia, and other developed markets, with the notable exception of China due to its zero-Covid-19 policy severely limiting travel. CFRA expects U.S. air passenger volume will surpass 2019 levels during 2023 as international and business travel patterns normalize post-pandemic.

Supply Chain Crunch is Limiting Output for Commercial Aerospace Firms

During the early phase of the Covid-19 pandemic, the number of aerospace engineers and aerospace manufacturing workers in the U.S. fell 17% and 10%, respectively, from their pre-pandemic peaks (Bureau of Labor Statistics). These job cuts occurred as airlines grounded thousands of planes and cancelled orders in the early phase of the Covid-19 pandemic, causing a steep drop-off in work throughout the commercial aerospace supply chain. In response, producers implemented layoffs and early retirement programs to cut costs and save cash, planning for a prolonged downturn.

However, rather than the 2024-2025 time frame most industry executives targeted for a full global air travel recovery, demand made a near full recovery during 2022. The quick recovery soon after steep job cuts has left firms up and down the flight equipment supply chain struggling to meet maintenance orders and new plane delivery schedules that are now being aggressively pushed by airline customers. Labor and supply chain issues have caused key aircraft original equipment manufacturers (OEMs) Airbus and Boeing to significantly push out their schedules for ramping production back to pre-pandemic levels.

Positive Long-term Demand Trends for Commercial Aerospace Remain Intact

The federal government and most U.S. firms have lifted Covid-19 travel restrictions, and we expect this will be the case for all countries during 2023, except China. This should allow commercial aerospace to get back to its long-term growth trend, driven by global economic expansion and integration's heavy reliance on air travel. Further, October 2022 backlogs for Boeing and Airbus were roughly 5,300 and 7,400 planes, respectively, leaving the sub-industry with strong long-term earnings potential.

CFRA Industry Snapshot

www.cfraresearch.com

AEROSPACE & DEFENSE

Outlook: Neutral

MARKET CAP BREAKDOWN*

(as of November 30, 2022)

RANK NO.	COMPANY NAME	MARKET CAP ($ billion)
1	Raytheon Technologies	145.3
2	Lockheed Martin	127.2
3	The Boeing Co.	106.6
4	Northrop Grumman	82.1
5	General Dynamics	69.2
6	L3Harris Technologies	43.2
7	TransDigm	34.2
8	Howmet Aerospace	15.6
9	Textron	14.9
10	Axon Enterprise	13.1
	Others†	42.6

Source: CFRA, S&P Global Market Intelligence.
*Companies included in the S&P 1500 index.
†Refer to the Comparative Company Analysis section of this survey for other companies in the industry.

ETF FOCUS

XLI Industrial Select Sector SPDR	AUM ($M) 14,146.3	Expense Ratio 0.10
ITA iShares U.S. Aerospace & Defense	AUM ($M) 4,329.3	Expense Ratio 0.39
VIS Vanguard Industrials	AUM ($M) 3,712.0	Expense Ratio 0.10
PPA Invesco Aerospace & Defense	AUM ($M) 1,714.8	Expense Ratio 0. 61
XAR SPDR S&P Aerospace & Defense	AUM ($M) 1,306.1	Expense Ratio 0.35

BY THE NUMBERS

+11% Expected 2022 Y/Y EPS growth for major defense firms (LMT, NOC, GD, LHX)

+6% Forecast for U.S. 2023 defense spending growth

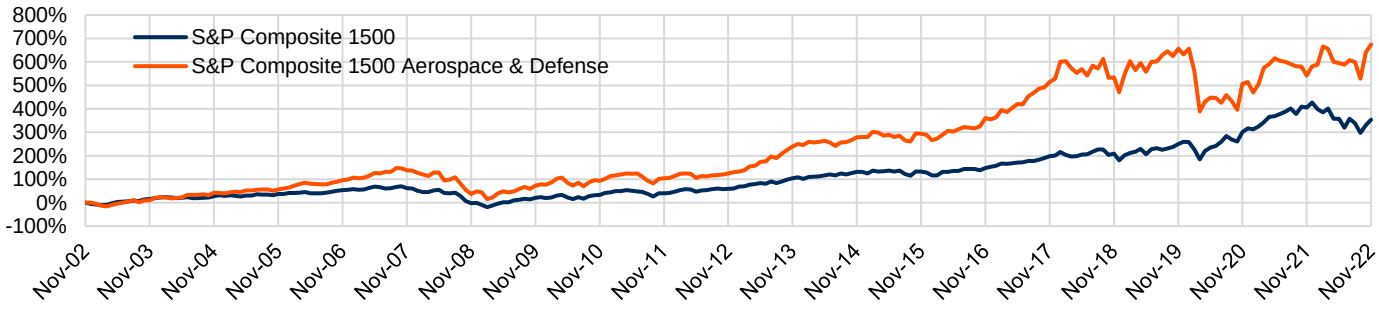
-65% Boeing's commercial airplane revenue in Q3 2022 vs. pre-grounding Q3 2018

530 Boeing 737 orders in year ended October 2022

+21% Increase in TSA checkpoint travel screenings from October 2021 to October 2022

-24% Shortfall in GE narrow-body LEAP engine deliveries in Q3 2022 vs. Q3 2019

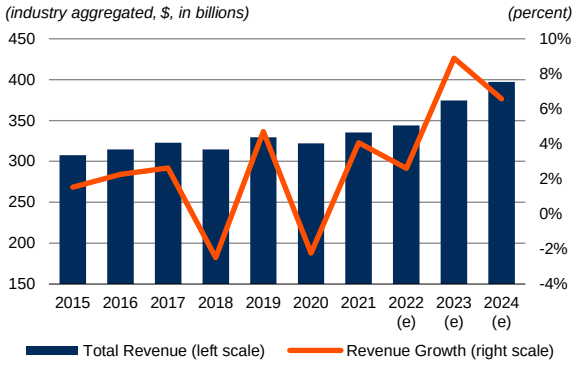
20-YEAR INDEX PERFORMANCE



Data through November 30, 2022.
Source: CFRA, S&P Global Market Intelligence.

FINANCIAL METRICS

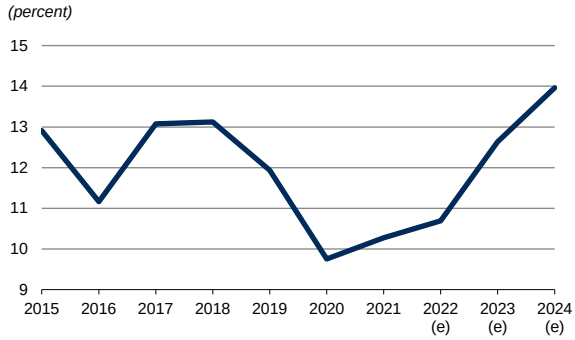
Revenue



Source: CFRA, S&P Global Market Intelligence.

- Consensus sees the total revenue for companies in the S&P Composite 1500 Aerospace & Defense Index to grow 8.9% in 2023 and 6.6% in 2024, with majority of the growth coming from Boeing, Raytheon, and General Dynamics.
- Pent-up air travel demand and the step-up in U.S. and allied defense spending post-Russian invasion are expected to be the main drivers of revenue growth for 2023-2024, in CFRA's view.

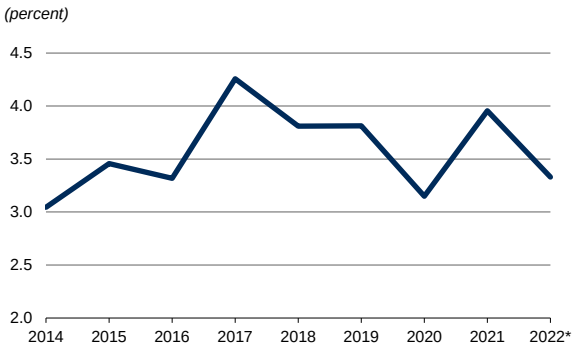
EBIT Margin



Source: CFRA, S&P Global Market Intelligence.

- The average EBIT margin of the S&P Composite 1500 Aerospace & Defense Index is projected to expand 194 bps in 2023 and 133 bps in 2024 following a 42 bps increase in 2022.
- We see tight supply (due to supply crunch) and resilient demand to lift margin of Aerospace & Defense (A&D) in 2023-2024.

Net Debt-to-EBIT Ratio



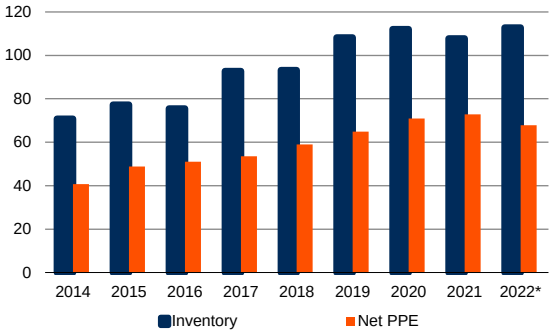
*Last twelve months ended third quarter of 2022.

Source: CFRA, S&P Global Market Intelligence.

- The median net debt-to-EBIT ratio for the S&P Composite 1500 Aerospace & Defense Index declined to 3.3x in the last twelve months as of the third quarter of 2022 from 4.0x in 2021.
- Many A&D firms took out more debt during the pandemic to get through the worst of the crisis. We expect the median debt-to-EBIT ratio to continue to decrease in the rest of 2022 and 2023 as commercial operating profits recover and pandemic debt is gradually paid down. Current Fed funds rate at 4% (with high possibility of more hikes to come) will provide strong incentive for A&D firms to pay down debt rather than refinance at higher rates, in our view.

Aggregate Inventory and Net Property, Plant, and Equipment (PPE)

(industry aggregated, $, in billions)



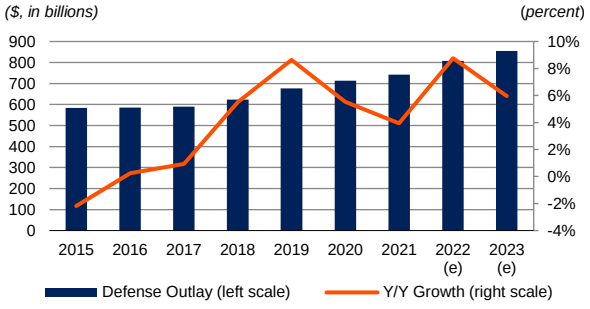
*As of third quarter of 2022.

Source: CFRA, S&P Global Market Intelligence.

- Inventory grew 4.5% in the third quarter of 2022, while net PPE in 2021 dropped 6.9% versus 2021 levels.
- In a growing economy, inventory and net PPE growth typically represents rising capacity to meet higher demand from airlines.
- However, we expect industry inventory to tick down during 2023 as the commercial aircraft supply chain gradually works down excess inventory accumulated due to widespread order cancellations from the airline industry during the pandemic. Further, Boeing is making progress reducing excess 737 and 787 inventories, which rose to unhealthy levels while regulators halted deliveries of those models during large stretches of 2020-2022.

KEY INDUSTRY DRIVERS

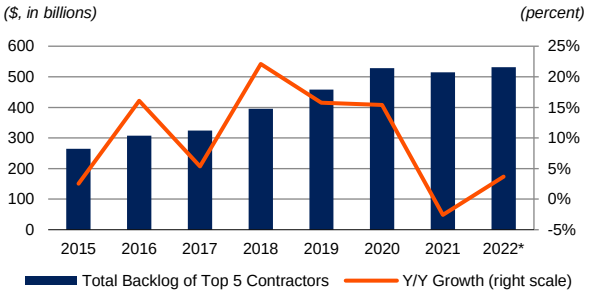
U.S. Defense Spending (Outlays)



e-Estimates by CFRA.
Source: Congressional Budget Office.

- Defense outlays represent actual money spent by the government, which can differ from budgeted amounts due to timing and discretion.
- U.S. defense spending grew 4.0% to $742.0 billion in 2021 versus $713.8 billion in 2020.
- CFRA estimates U.S. defense spending will grow 8.8% in 2022 and will increase by another 5.9% in 2023, driven by defense build-up at home and continued military aid to Ukraine.

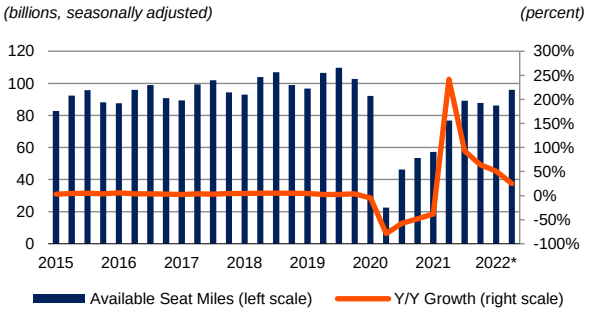
Defense Backlog



*Data through third quarter.
Source: Company reports.

- Defense backlog of the top five defense contractors grew 3.7% in the third quarter of 2022 to $531.1 billion compared to $512.3 billion in 2021.
- We expect stronger backlog growth in 2023 as U.S. politicians are increasingly supporting funding to maintain sea, air, space, and intelligence superiority over non-democratic rival nations, in our view, and with increased funding to support Ukraine's defense against Russia.

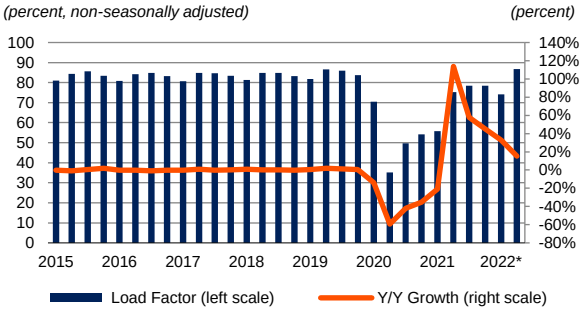
Available Seat Miles



*Data through the second quarter.
Source: Bureau of Transportation Statistics.

- Available seat miles is a measure of passenger carrying capacity of the airline industry.
- Available seat miles grew 25.1% Y/Y in the second quarter of 2022 to about 90% of 2019's level. Fast recovery in the available seat miles is consistent with the air travel demand resiliency we have been witnessing in the recent quarters.
- CFRA expects available seat miles to grow to 3% above pre-pandemic 2019 levels by year-end 2023.

Load Factor

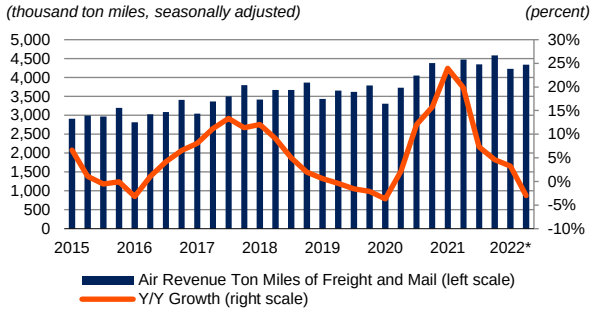


*Data through the second quarter.

Source: Bureau of Transportation Statistics.

- The passenger load factor measures the capacity utilization of available seat miles.
- The load factor grew 15.4% Y/Y to 86.7% in the second quarter of 2022, which exceeds 2019's average of 84.5% as demand has been strong while capacity addition is limited by supply chain disruption.
- In 2021, the average load factor improved 37.4% from a -38.0% in 2020, but still 14.8% below 2019's level.

Air Revenue Ton Miles of Freight and Mail

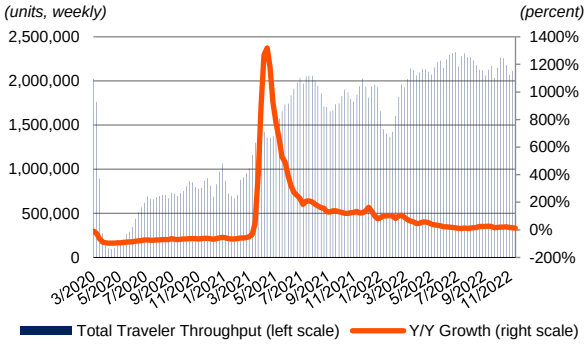


*Data through the second quarter.

Source: Bureau of Transportation Statistics.

- Air revenue ton miles of freight and mail measures the volume airlines and air freight carriers generate for non-passenger cargo that they are paid to transport. This includes commercial cargo transported in the bellies of passenger aircraft, as well as the cargo of non-passenger carriers like UPS and FedEx.
- Airfreight and mail ton miles declined 3.0% in the second quarter of 2022 compared to a year ago. We think this signals a weakness in consumer goods spendings.

TSA Checkpoint Traffic

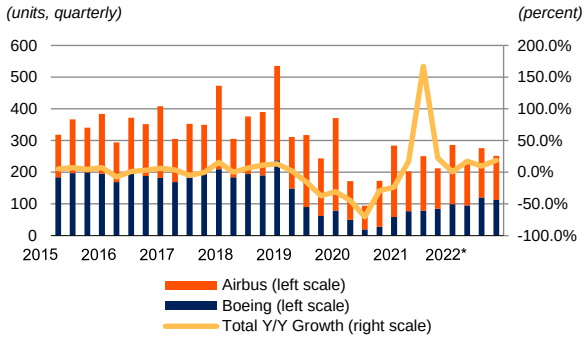


*Data through the week of November 19, 2022.

Source: Transportation Security Administration.

- The total number of U.S. air travelers plummeted 95% in the early months of the Covid-19 pandemic, but has since recovered substantially, driven by the ramp-up of Covid-19 vaccinations.
- As of November 19, 2022, U.S. air traveler counts have recovered to roughly 95% of the pre-pandemic level. CFRA expects 2023 U.S. air traveler counts will grow 3% vs. 2019.

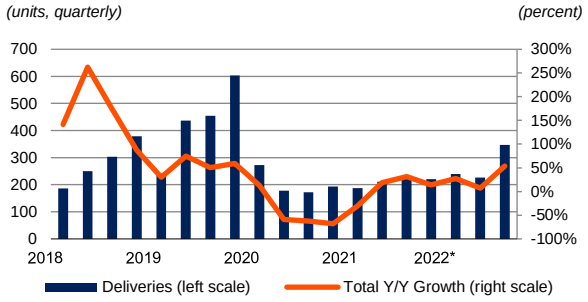
Boeing and Airbus Commercial Aircraft Deliveries



*Data through third quarter.
Source: Company reports.

- The second quarter of 2020 was the low point for deliveries during the pandemic, with a modest recovery starting in the third quarter of 2021.
- The combined total deliveries of Boeing and Airbus increased 18.9% to 252 units in the third quarter of 2022 compared to 212 units a year ago, supported by global travel demand recovery.
- We expect deliveries will continue to grow but will remain below pre-pandemic highs through 2023 due to supply chain shortages for Boeing and Airbus, and reduce demand from China due to its zero-Covid-19 policy.

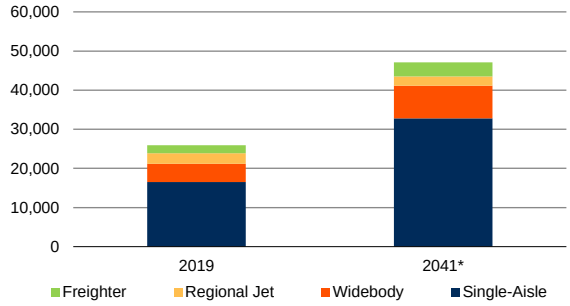
GE LEAP Engines Deliveries



*Data through third quarter.
Source: Company reports.

- The GE LEAP engines are used to power the Airbus A320 and Boeing 737 family of aircraft. The deliveries of the engines are a good leading indicator of Airbus's and Boeing's aircraft deliveries.
- In the third quarter of 2022, GE LEAP engines deliveries grew 53.5% to 347 versus 226 units from a year ago.
- However, engine volume was still well below pre-pandemic level, signaling the supply chain cannot yet accommodate Boeing and Airbus ramping production rates back to 2019 levels.

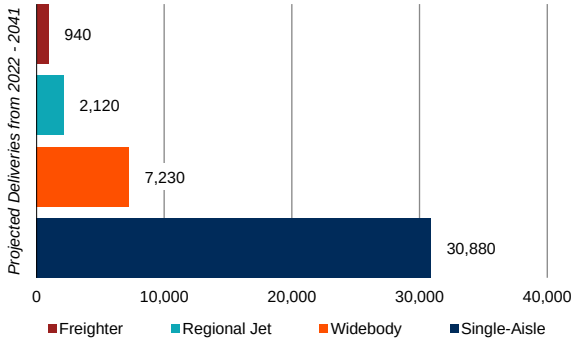
World Aircraft Fleet Forecast



*Forecast.
Source: Boeing's "Commercial Market Outlook 2022-2041".

- The global aircraft fleet is projected to grow at a CAGR of 2.9% over the 21-year period ending 2041, from 25,900 in 2019 to 47,080 by 2041, according to estimates from Boeing.
- The Asia-Pacific region is expected to expand the most at 4.0%, adding 19,060 aircraft by 2041.
- The share of single-aisle airplanes is expected to increase from 64% in 2019 to 70% by 2041, driven primarily by the fast-growing low-cost carriers (which favor the single-aisle airplanes) and stronger demand from airlines operating in emerging markets.

Total New Deliveries

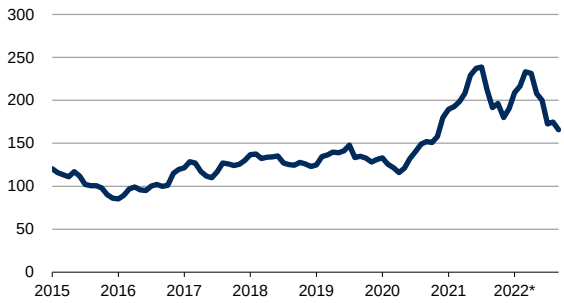


Source: Boeing's "Commercial Market Outlook 2022-2041".

- An estimated 41,170 aircraft are expected to be delivered from 2019 to 2041 globally; 49% of total deliveries will be to support anticipated traffic growth, and 51% to replace retiring aircraft.
- The Asia-Pacific, Europe, and North America regions, which control about 87% of global low-cost carrier (LCC) capacity, are expected to account for about 86% of all single-aisle airplane deliveries from 2019 through 2041, according to Boeing.

Global Metal Price Index

(Index, 2016=100)



*Data through September.

Source: Federal Reserve Economic Data.

- Metal prices peaked around the second quarter of 2021 and have since been on a downturn due to disrupted property markets. S&P Global Market Intelligence expects metal demand to be muted in 2023 as downward trends of the housing market in both the U.S. and China hamper metal demand.
- The global metal price index in September 2022 averaged 165.9, dropping 13.4% Y/Y compared to 191.4 in the prior-year period.

WTI Spot Prices

(MMb/d)

*Data through October.

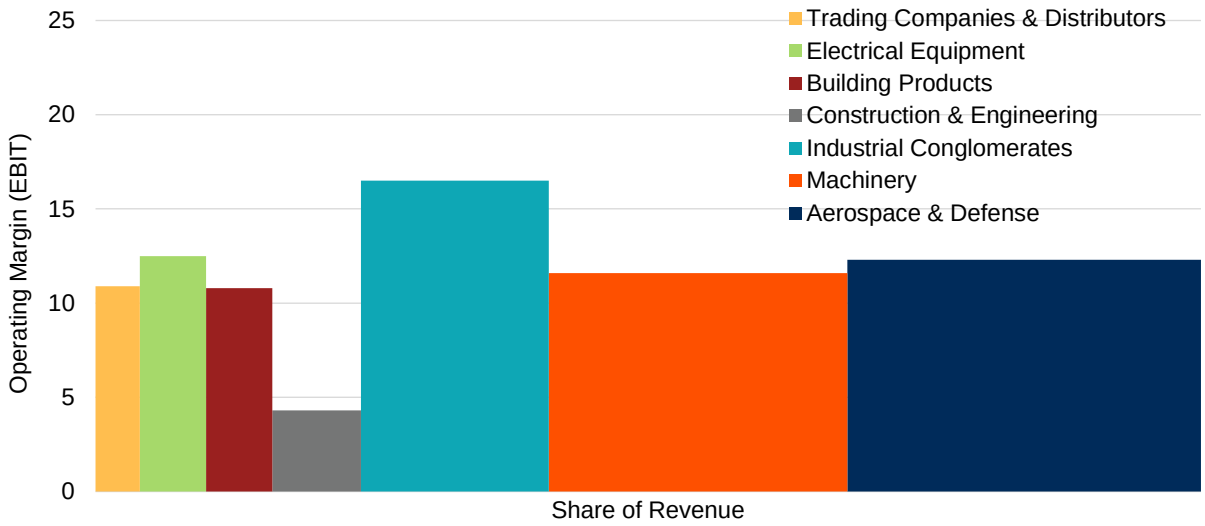
Source: Federal Reserve Economic Data.

- Lower oil prices reduce airlines' operating expenses and improve profitability via lower fuel costs, their second largest expense after employee compensation.
- The EIA expects WTI to average $95.88 in 2022 and $89.33 in 2023, versus $70.89 in 2021.
- In October 2022, WTI stood at $87.6 per barrel, a 7.4% increase from the prior-year period, as supply disruption from Russia keeps energy prices elevated.
- While this rise in oil price drives up fuel prices and hurts airline earnings, it can also drive orders for newer, more fuel-efficient airplanes.

INDUSTRY TRENDS

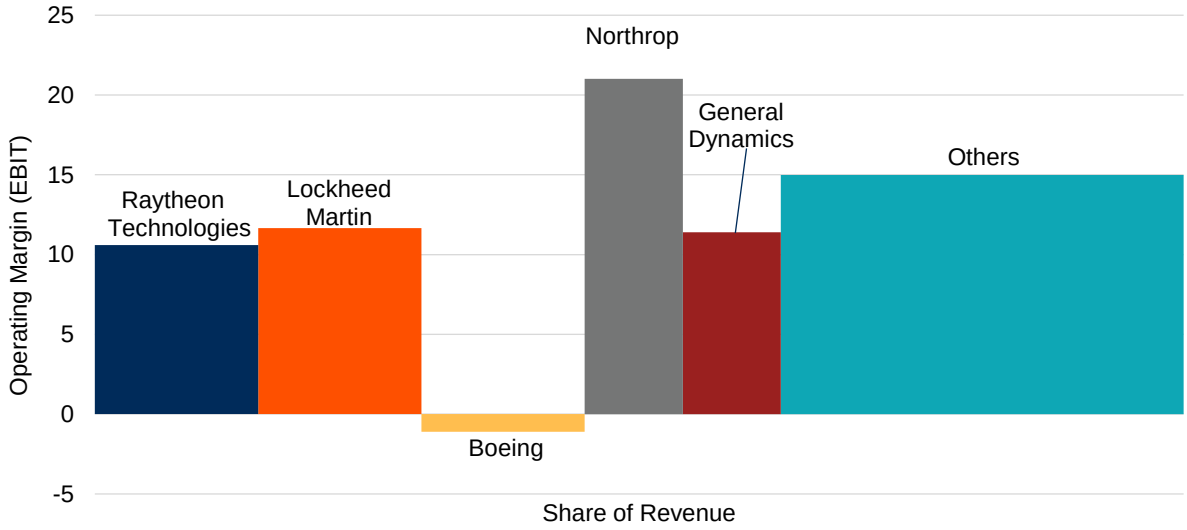
The Aerospace & Defense industry is within the Capital Goods industry group (part of the Industrials sector) and comprises 23 companies. Below are the profit maps showing the current state of the Capital Goods industry group and the Aerospace & Defense industry.

PROFIT-POOL MAP OF CAPITAL GOODS INDUSTRY GROUP
(for the year of 2021)



Source: CFRA, S&P Global Market Intelligence.

PROFIT-POOL MAP OF AEROSPACE & DEFENSE INDUSTRY
(for the year 2021)



Source: CFRA, S&P Global Market Intelligence.

As depicted above, Aerospace & Defense is the largest industry in the Capital Goods industry group in terms of revenue market share; however, the industry ranked third in terms of operating margins, trailing both the Industrial Conglomerates and Electrical Equipment industries. Within the Aerospace & Defense industry, three companies (Raytheon Technologies, Lockheed Martin, and Boeing) dominate 54.3% of the industry's market capitalization and 57.8% of the industry's total revenue in 2021.

Competitive Environment

Below, we used the Porter's Five Forces framework as a tool to analyze the competitive environment of the aerospace & defense industry.

Porter's Five Forces Analysis	
Degree of Rivalry/ Competition ***(Medium)***	We rank competition in the Aerospace & Defense industry as Medium due to the generally low number of competing firms (usually two to four) compared to more fragmented industries. This helps the industry enjoy relatively less intense price competition, in our view. The **commercial aerospace** original equipment manufacturer (OEM) segment has a multi-tiered duopoly structure, in our view, with Boeing and Airbus dominating the global market for commercial jets. The market for producing private jets is more fragmented, but also much less valuable than the global commercial fleet. For the **defense segment**, there is a greater number of large competitors, but generally, only two to three are capable of competing on specific types of major contracts, such as fighter jets, advanced helicopters, missile systems, satellite projects, or nuclear naval vessels.
Bargaining Power of Customers ***(Medium)***	**Commercial aerospace** customers are globally fragmented compared to the duopoly structure of suppliers, giving the few aircraft OEMs' reasonably strong pricing power. However, OEMs still compete strongly on price, typically offering airlines substantial volume discounts as purchase incentives and to lock in valuable long-term service contracts. OEMs also benefit from airlines' strong incentives to stay with their existing supplier. Changing plane models requires new training for flight and maintenance crews. OEMs also have multi-year backlogs of aircraft orders, meaning it typically takes several years to start seeing delivery of new planes if an airline wishes to switch suppliers. Finally, OEMs require progress payments from airlines as the planes are built, which are typically forfeited if an airline cancels orders. The U.S. Department of Defense is the primary customer for the U.S. **defense industry**, with its large size and sole customer status limiting the industry's bargaining power. The Pentagon usually has the final say in the awards of contracts and how much a defense contractor may earn on invested capital. Declining defense budgets can be a negative catalyst for the industry, but long-term contracts and multi-year backlogs of work for defense firms help mitigate this risk.
Bargaining Power of Suppliers ***(Low)***	Major aircraft manufacturers offer two engine options for some of their new planes, such as Boeing's 787 and Airbus' A320neo, reducing their dependence on one engine supplier. In addition, the avionics (aviation electronic controls equipment) supplier base is less concentrated than the aircraft manufacturing industry, thus giving the larger aircraft manufacturers (Boeing, Airbus, etc.) more bargaining power.
Threat of Substitutes ***(Low)***	We don't see any technology on the horizon that could displace passenger jets in transporting people and cargo over long distances in short time periods. For defense, any disruptive technology is likely to be developed within the industry, as new developments are typically made via government R&D funding flowing through established defense firms.
Threat of New Entrants or New Entry ***(Low)***	The Aerospace & Defense industry has high barriers to entry due to regulation, capital intensity, and long lead times. Designing a new commercial aircraft takes 8 to 10 years with highly regulated certification processes. This means a new entrant would have to absorb years of losses before its first chance to generate revenue. Further, new entrants would likely not be price competitive, with entrenched OEMs substantially undercutting them due to lower costs derived from their already massive production scale.

Operating Environment

The U.S. defense market is dominated by a handful of large players that compete for prime contractor roles (responsible for final delivery of products and controlling total project cost) on major defense programs, such as fighter jets, naval vessels, and missile and satellite systems. The “Big Five” defense contractors in order of estimated defense revenues are Lockheed Martin, Raytheon Technologies, Northrop Grumman, General Dynamics, and Boeing. After the Big Five contractors, there are myriad small- and medium-sized defense firms that compete for smaller contracts, as well as serve as sub-contractors, or suppliers, to the primes. CFRA thinks the defense market is highly competitive, but also highly profitable due to significant barriers to entry.

The commercial aerospace market is heavily dependent on the success of the two dominant global plane makers, Boeing and Airbus. Despite this duopoly, competition is intense to win new orders from airlines. While these two firms dominate the large commercial aircraft market, hundreds of small, medium, and large aerospace firms supply Boeing and Airbus with the over 600,000 individual parts needed to assemble a modern commercial jet. These firms supply Boeing and Airbus planes with everything from highly engineered, multi-million-dollar parts—like jet engines, fuselages, and electronic control systems—to non-complex products—such as tray tables, windows, and carpeting.

The market for business/private jets is more fragmented and competitive than that of commercial jets. Major business jet original equipment manufacturers (OEMs) include Bombardier (Learjet brand), Gulfstream (a division of General Dynamics), Embraer, and Cessna Aircraft Co. (a subsidiary of Textron Inc.).

THE DEFENSE SEGMENT

The top 10 U.S. defense contractors in the S&P Composite 1500 Aerospace & Defense generated defense-related revenues of $314.6 billion in 2021, based on CFRA’s estimates.

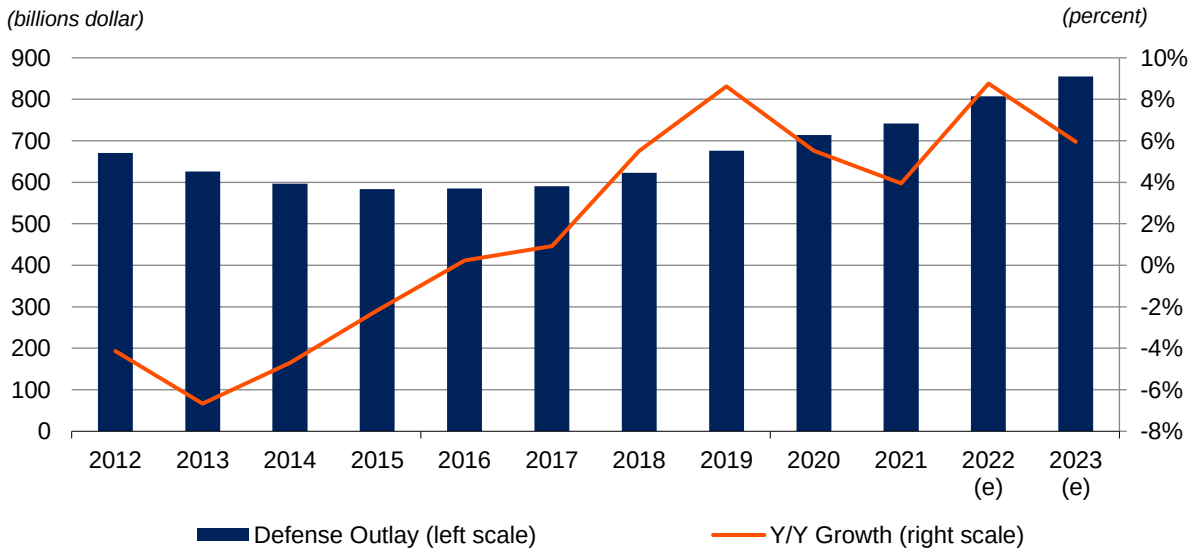
LEADING GLOBAL DEFENSE CONTRACTORS
(ranked by FY2021 defense revenues, in $, millions)

RANK NO.	COMPANY NAME	2021 REVENUES		DEFENSE SHARE*
		Total	Defense	
1	Lockheed Martin Corporation	67,044	48,150	72%
2	Raytheon Technologies Corporation	64,388	36,723	57%
3	General Dynamics Corporation	38,469	30,768	80%
4	The Boeing Company	62,286	30,520	49%
5	Northrop Grumman Corporation	35,667	30,334	85%
6	L3Harris Technologies, Inc.	17,814	13,361	75%
7	Huntington Ingalls Industries, Inc.	9,524	9,475	99%
8	Textron Inc.	12,382	3,219	26%
9	TransDigm Group Incorporated	4,798	2,389	50%
10	Aerojet Rocketdyne Holdings, Inc.	2,188	2,100	96%

*Estimates by CFRA
Source: CFRA Research, company reports

U.S. defense spending has historically grown regardless of economic downturns, government deficits, or the political party in control of Washington. However, defense budget cuts do periodically occur for other reasons, primarily during periods when major military engagements are drawn down, in our view. This occurred during the Vietnam drawdown of the early 1970s, the post-Gulf War and Cold War drawdown during the mid-1990s, and the 2012-2015 period of reduced defense spending as major U.S. Middle East operations were wound down. (Note: U.S. troop levels in Afghanistan by early 2021 were already less than 3% of the peak 2011 level by CFRA's estimate.)

U.S. ANNUAL DEFENSE OUTLAYS



e-Estimates by CFRA.
Source: Congressional Budget Office.

In March 2022, President Biden signed into law a 5% increase in the FY 22 defense budget vs. FY 21. Then, in a series of subsequent economic aid packages for Ukraine passed throughout 2022, an approximate $25 billion in additional spending on defense was approved, bringing the FY 22 budget increase to 9%, by our estimate. The base defense budget for FY 22 includes items such as $5.1 billion for the construction and continued R&D of Columbia-class ballistic missile submarines, $3 billion for the B-21 Raider strategic bomber program, and $1.3 billion for the Conventional Prompt Strike (CPS) program.

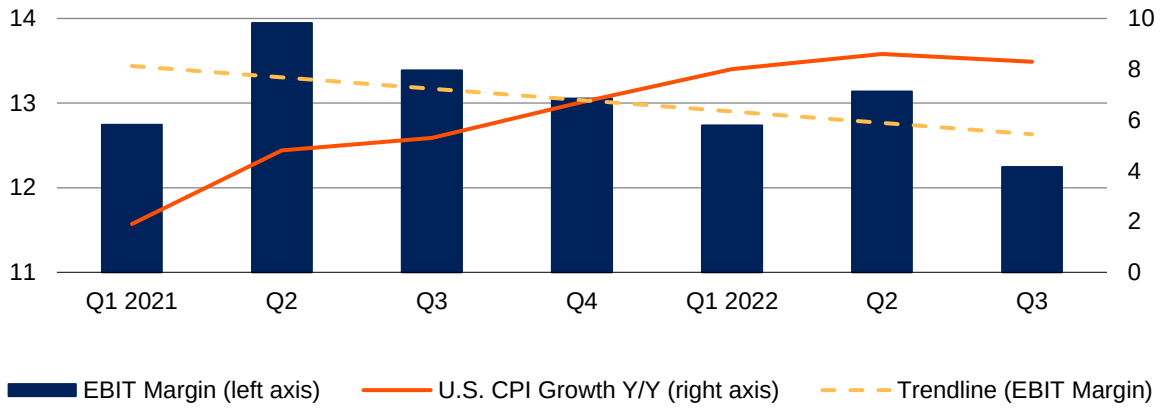
CFRA expects U.S. defense spending in FY 23 (including Ukraine military aid) to grow 6% vs. FY 22. We think Republicans taking over the House in the 2022 mid-term elections gives them leverage to increase the FY 23 budget above Biden's initial request of a 4% increase vs. FY 22.

Inflation Surge Hits Fixed-Price Contracts Hard, Pressuring Defense Firm Margins

High inflation has been dragging margins of defense companies down. The chart below shows that the average EBIT margin of the top 10 defense companies has been falling since the second quarter of 2021 as CPI rises.

EBIT MARGIN FOR THE TOP 10 DEFENSE FIRMS VS. CPI

(percent) *(percent)*

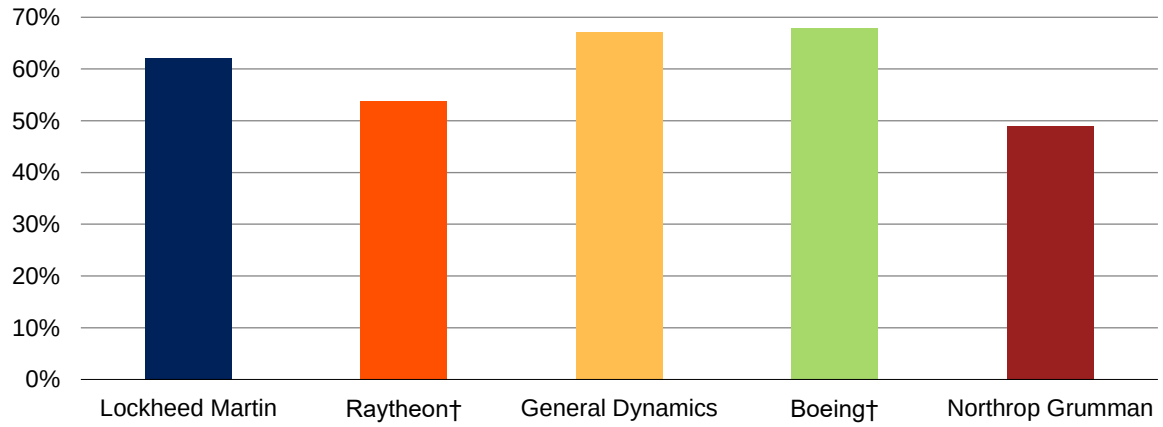


Source: CFRA, S&P Global Market Intelligence, Federal Reserve Economic Data.

Most of the major U.S. defense firms generate at least 50% (sometimes over 80%) of revenue from fixed-price contracts, many of which are for multi-year projects. These contracts don't leave defense firms much, if any, room to raise prices if costs come in higher than expected. Given the 2022 inflation surge, defense profit margins have been under pressure.

REVENUE PERCENTAGE FROM FIXED-PRICE CONTRACTS FOR THE TOP 5 DEFENSE FIRMS IN FY 21

(percent)



†Revenue from defense segments.

Source: Company reports.

Advanced Technology Focus of Large U.S. Defense Firms

While defense spending is currently seeing healthy growth, reductions do periodically occur. However, this does not necessarily pose a major risk to defense firm earnings, in our view. Roughly 61% of the U.S. defense budget is spent on personnel and operations, by our estimate, while the areas where defense contractors focus, R&D and procurement, represent only about 33% of spending. This relatively small share for R&D and procurement means total defense spending can come down even as R&D and procurement spending continue increasing, in our view.

We think the major defense firms' focus on R&D and procurement helps limit the impact they feel when total budgets are reduced. This is because politicians and military leaders will typically look to cut spending in areas other than the high-priority programs the contractors are working on, in our view. In fact, U.S. defense spending decreased 4% annually during 2012-2015, but major defense contractor earnings per share grew around 8% annually over the same period. This was most likely due to the contractors' focus on high-priority R&D and procurement programs that saw healthy funding growth even as the overall defense budget shrank, in our opinion. Below, we outline a few examples of high-priority defense programs that are likely to see steady growth in funding even if total defense budgets are unexpectedly reduced in the years ahead.

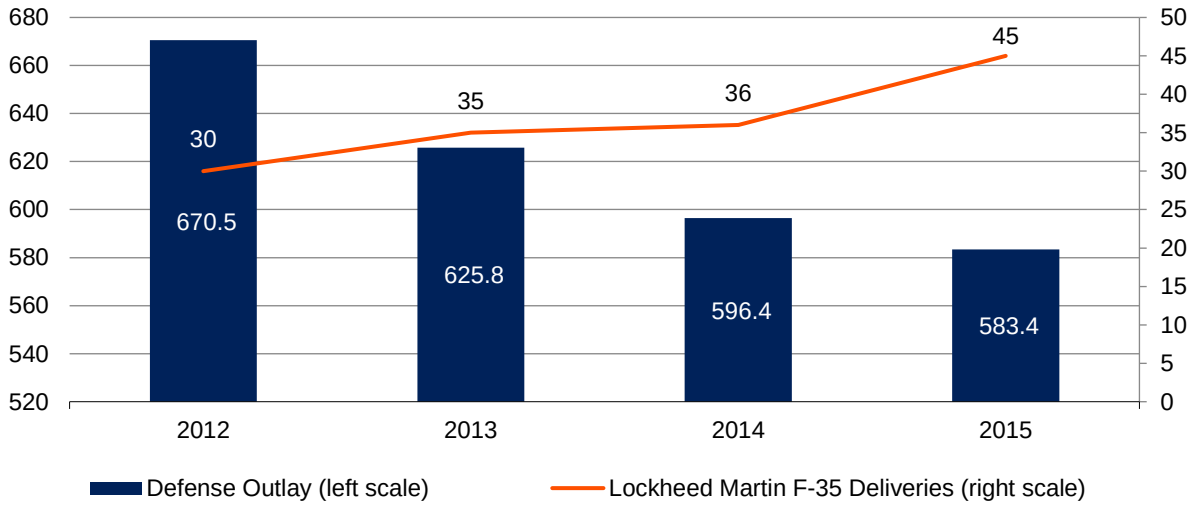
F-35 Joint Strike Fighter

The F-35 initiative is the Department of Defense's (DOD) most expensive weapons program ever, and is the largest revenue source for the nation's largest defense contractor, Lockheed Martin. Current DOD plans (updated as of May 2, 2022) call for acquiring a total of 2,456 F-35 fighter jets through 2044. Allies are expected to purchase hundreds of additional F-35s, and eight nations are cost-sharing partners in the program with the United States. The Biden administration's proposed FY 23 defense budget requested about $11 billion for the program. Prime contractor Lockheed Martin performs overall systems integration and final assembly and checkout; Northrop Grumman and BAE Systems supply components for mission systems and airframe; and Raytheon Technologies' Pratt & Whitney division supplies F-35 jet engines.

Below is an illustration of how the DOD's strong demand for state-of-the-art fighter jets allowed Lockheed Martin to rapidly grow its F-35 deliveries (and earnings) even as total U.S. defense spending was in decline from 2012 to 2015.

F-35 DELIVERIES AND U.S. DEFENSE OUTLAYS

($ billions) *(unit)*



Source: Congressional Budget Office, company reports.

Missile Defense: Terminal High Altitude Area Defense (THAAD) and/or Patriot Advanced Capability

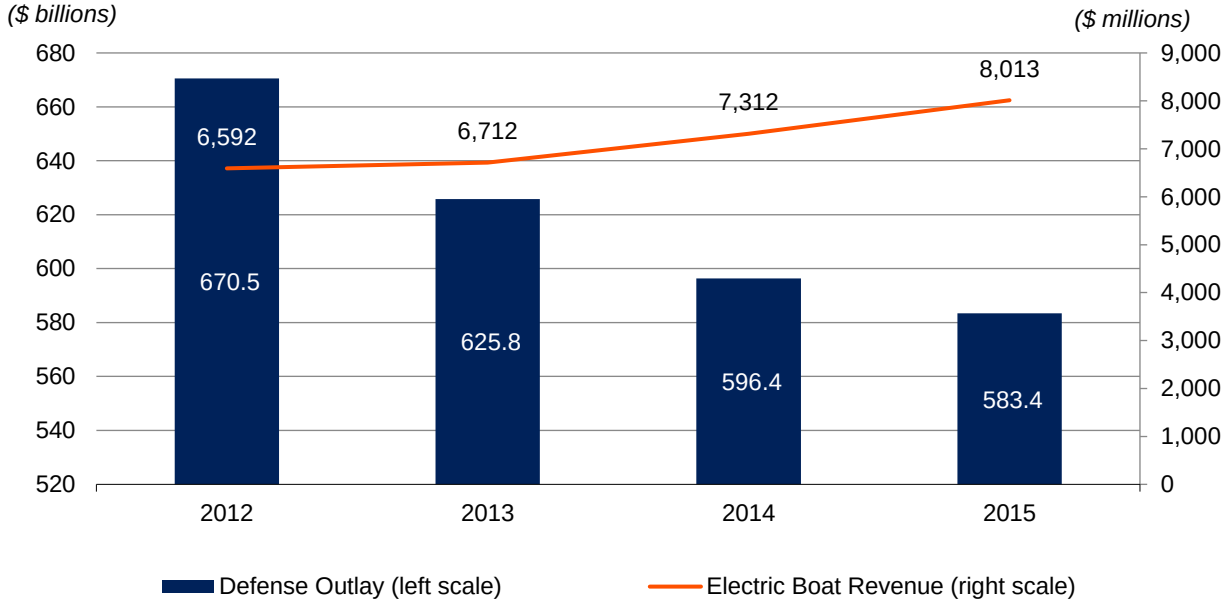
The Missile Defense Agency's budget for FY 23 is $9.6 billion, and $335 million for THAAD. Lockheed Martin is the primary contractor, with Raytheon as the systems integrator.

Virginia-Class Nuclear Submarines

The Navy has been procuring Virginia-class nuclear-powered attack submarines since FY 98. The Navy's FY 23 budget submission estimates the procurement cost of the Virginia-class submarine program at $7.3 billion. The main defense firms for the program are Electric Boat, a subsidiary of General Dynamics (prime contractor), and Huntington Ingalls (subcontractor).

Below is an illustration of how the DOD's high priority on nuclear navy superiority allowed Electric Boat to rapidly grow revenue even as total U.S. defense spending was in decline during 2012-2015.

ELECTRIC BOAT AND U.S. DEFENSE OUTLAYS



Source: Congressional Budget Office, company reports.

Ford Class Aircraft Carriers (CVN-78)

USS Gerald R. Ford (CVN-78) is the first completely new design for an aircraft carrier since USS Nimitz (CVN-68). The shipbuilders found value in every square inch of the ship, saving the Navy a projected $4 billion in ownership costs over the ship's 50-year lifespan. The Navy's proposed FY 23 budget requests $3.2 billion in procurement funding for Ford Class Aircraft Carriers. The carriers are assembled at Newport News Shipbuilding, a division of Huntington Ingalls, which is the only shipyard in the U.S. that can build nuclear aircraft carriers.

COMMERCIAL AEROSPACE SEGMENT

The customer base for commercial aerospace consists of hundreds of airlines and aircraft leasing companies around the world, but they are supplied by a small number of aircraft developers and manufacturers. Boeing and European firm Airbus have historically held a duopoly for global supply of narrow-body (generally 100-200 seats) and wide-body (200+ seats) commercial jets. From 2012 to 2018, Boeing was the leader in annual global aircraft deliveries. But in 2019, Airbus passed Boeing as the top airplane producer globally, with Boeing faltering as its design and safety failures led regulators to ground its flagship 737 MAX narrow-body following two fatal crashes. Boeing's commercial aircraft deliveries peaked at 806 in 2018, and were just 340 in 2021, with large swathes of 737 orders cancelled during 2019-2021.

However, after a nearly two-year grounding and a comprehensive design and safety system overhaul, the 737 MAX was cleared by federal regulators to resume flying in the U.S. in late 2020. European and Canadian regulators followed suit in early 2021. This renewed faith in the airplane from regulators led to the resumption of growth in Boeing's 737 order book. Year-to-date through October 2022, Boeing received 530 new 737 orders, signaling the plane's operating efficiencies, particularly on fuel, are still highly desirable to airline customers.

COMMERCIAL AIRCRAFT NET ORDERS, DELIVERIES AND BACKLOG BY MANUFACTURER

(in units of commercial aircraft)

	NET ORDERS		DELIVERIES		BACKLOG	
YEAR	BOEING	AIRBUS	BOEING	AIRBUS	BOEING	AIRBUS
2022*	554	810	363	495	5,323	7,397
2021	479	507	340	611	5,136	7,082
2020	-471	268	157	566	4,997	7,184
2019	243	1,131	380	863	5,625	7,482
2018	918	796	806	800	5,873	7,577
2017	932	1,207	763	718	5,786	7,265
2016	767	853	748	688	5,715	6,874
2015	837	1,160	762	635	5,795	6,831
2014	1,384	1,712	723	629	5,789	6,386

*Data through October 2022

Source: Company reports/website

The Commercial Aerospace Industry is Still Battling the After-effects of Covid-19 Downturn

The primary end market of the commercial aerospace industry is airlines, which have historically been highly cyclical and financially unstable during recessions. When the economy is healthy, air traffic tends to grow to support global economic growth and integration, driving high existing fleet utilization. This results in strong demand for maintenance, replacement parts, and overhaul (MRO) for the A&D industry. Growing air travel demand also leads to influxes of new aircraft orders to expand airline fleets, which increases the backlogs of major original equipment manufacturers (OEMs), like Boeing, Airbus, and their major suppliers, allowing them to raise prices and ramp up their production lines.

On the flip side, air traffic tends to decline during recessions, leading to lower fleet utilization and aftermarket MRO revenue, as well as airline distress that leads to new aircraft orders being delayed or canceled. In a typical recession, most of the global airline fleet continues to fly, although with cheaper tickets and fewer full flights. This differs significantly from the current Covid-19 downturn.

Unlike a typical aviation downturn where passenger volumes remain above 90% of peak levels, TSA checkpoint traffic (number of U.S. air travelers) fell to just 5% of 2019 levels during the initial Spring 2020 months of the pandemic in the U.S. And even by November 2022, U.S. passenger traffic had recovered to only 94% of pre-pandemic levels. This multi-year severe downturn has marked by far the worst period in the history of commercial aviation. And even with the significant recovery over the past year, airline passenger volumes are still in a downturn, with significant ground still to recover to pre-pandemic highs.

Not surprisingly, demand for new commercial aircraft fell alongside air travel volumes during the pandemic. Accordingly, Airbus and Boeing sharply reduced production rates of new aircraft, with Boeing's cuts also driven by regulatory and quality control problems on the 737 and 787 models. At Airbus, the cuts have been driven purely by the pandemic. For the third quarter of 2022, we estimate Airbus' narrow-body production was down roughly 25% vs. fourth quarter 2019 (pre-pandemic), and that wide-body production was down an even greater 50%. The larger cuts for wide-bodies are due to their more common use on long-haul international flights, which have seen more pandemic travel restrictions than domestic flights that more often rely on narrow-bodies.

Lower Airbus and Boeing production hurts not only the earnings of these major OEMs, but their hundreds of suppliers too. Supplier firms range from large (engine and fuselage suppliers) to small (seats and small mechanical parts), but regardless of size, most are still being hurt as MRO revenue and new orders from the OEMs remain well below pre-pandemic levels. Operating costs have been hard to cut, too, as costs for key inputs like labor, metals, and semiconductors have risen sharply during the pandemic. Much of the supply chain's cost base is also tied up in fixed assets like plants and machinery that are difficult reduce.

Some aerospace suppliers did enough business in the more stable defense segment to maintain positive earnings and healthy balance sheets through the pandemic. But many that are highly focused on commercial aerospace had to significantly increase debt to pay their bills while their operations burned cash. For many suppliers, the balance sheet deterioration that occurred in 2020-2021 will keep earnings below the 2019 peak long after the pandemic ends and demand has recovered, in our view, as much of their future operating profit will now be used for debt service that was not there before the pandemic.

CFRA expects U.S. air passenger volumes and global plane demand to grow above 2019 levels during 2023, but supply chain issues will likely prevent the commercial aerospace industry from making a full recovery until 2024 or later. Large swaths of the commercial aerospace employee base were laid off or encouraged to retire early during 2020-2021, as most firms were burning through cash and the downturn seemed likely to last several more years. These firms and their airline customers have been pleasantly surprised by the faster-than-expected recovery in global air travel (outside of China), but the speed of the recovery and broad labor shortages since the pandemic have now left aerospace suppliers unable to staff back up to meet recovering demand.

Flight equipment OEMs such as Boeing, Airbus, GE, and P&W have all expressed issues with strained output due to labor shortages, supply chain issues, or both. As a result of these shortages, Boeing reduced its aircraft delivery guidance twice in 2022 to 375 from the planned delivery of about 500 at the start of the year. Similarly, Airbus also reduced its aircraft delivery guidance to 700 from 720, and had to delay its ramp-up plans for the A320neo family by over half a year from the summer of 2023 to early 2024 due to supply chain issues. CFRA expects these aerospace labor and supply chain problems will gradually improve during 2023-2024, but they are likely to keep Boeing and Airbus deliveries well below all-time highs even as air travel demand reaches new records, in our view.

The 737 MAX is Flying Again, and 787 Deliveries Have Resumed

Boeing, many of its top customers, and its suppliers were all severely impacted by two tragic crashes of the 737 MAX in late 2018 and early 2019. Both crashes were ultimately found to be caused by the same sensor failure, which was compounded by poor safety software in the plane's design. This led to a global

regulatory grounding of the 737 MAX aircraft starting in March 2019, which ultimately lasted until January 2021 when the MAX began flying again globally.

With the MAX now flying again, Boeing has begun working down its large inventory of MAX planes. After peaking at around 450 planes, the large MAX inventory was reduced to 270 as of September 2022. In CFRA's view, it will take at least two more years for Boeing to get its excess MAX inventory down to normal levels, as it is also making efforts to ramp back production of new MAX planes, to near 40 per month over the next year. This would still be about 23% below the pre-grounding peak of 52 MAX planes being made per month, but the ramp of supply orders for the MAX is nonetheless helping many commercial aerospace suppliers stop the cash burn they have been struggling with as orders plummeted during the pandemic.

Boeing also has an unhealthy inventory of 787 wide-bodies, which stood at 115 planes in September 2022. This was caused by quality control issues on Boeing's 787 production lines, which led regulators to halt new 787 deliveries for much of 2021-2022. However, Boeing received permission to resume 787 deliveries during Summer 2022, and we expect 787 inventory to normalize by year-end 2024.

Resumption of 737 MAX and 787 deliveries is a much-needed development for Boeing, especially after a combination of crises caused the firm to burn through $23.2 billion of cash during 2020-2021. The development is less welcome for Airbus, as the competitor gained considerable market share in the narrow-body market during the MAX grounding in 2019 and 2020. In CFRA's view, Boeing is likely offering planes at a discount to historical prices to sell its excess inventory, and also in an effort to get the plane back into fleets to start rebuilding faith in the brand.

Complex Nature of Aerospace Technology, Manufacturing, and Supply Chains

Commercial aircraft deliveries are occasionally disrupted by supplier issues arising from the complex nature of the product. In 2018, both Boeing and Airbus were negatively impacted by delays and volume shortfalls caused by suppliers. Boeing failed to meet its 737's delivery target of 52 aircraft per month for much of 2018 due to delivery delays from two major suppliers—engine manufacturer CFM International and fuselage supplier Spirit AeroSystems Holdings.

Airbus was also impacted by engine shortages for both of its A320neo engine options—Pratt & Whitney's (P&W) PW1100G and CFM's LEAP-1A. In January 2018, a new knife-edge seal issue on the P&W engines was discovered after four Airbus A320neos experienced engine shutdowns on take-off or during flight. P&W resumed shipments of the fixed PW1100G engines to Airbus in April 2018, while Airbus restarted deliveries of the P&W's engine-powered A320neo in late April 2018.

KEY INFOMATION FOR MAJOR COMMERCIAL AIRCRAFT PROGRAMS AS OF OCTOBER 2022

Manufacturer	Model	Backlog	Key Stats
Boeing	737	4,277	▪ The 737 MAX variant has secured more than 5,000 orders since launch. ▪ Total number of suppliers: 387
	747	2	▪ Boeing is likely to terminate production of the 747 by the end of 2023, in our view. ▪ Total number of suppliers: 260
	777	445	▪ The 777X variant has 353 orders as of October 2022, with first delivery targeted for 2025. ▪ Total number of suppliers: 389
	787	488	▪ The first 787-10 variant, claimed to be one of the most profitable Boeing models, was delivered to Singapore Airlines in March 2018.

			▪ Total number of suppliers: 446
Airbus	A220	556	▪ Previously known as the Bombardier C Series – rebranded under the Airbus A220 series since July 2018, following the completion of strategic partnership between Airbus, Bombardier, and Investissement Quebec. ▪ Claimed to have 13% cost advantage per seat over its nearest competitor. ▪ Total number of suppliers: 133
	A320 family (including A318, A319, A320, and A321)	6,216	▪ Two engine options available: Pratt & Whitney (P&W) PW1100G and CFM LEAP-1A. ▪ The A320neo (new engine option) version is equipped with sharklet wing tip devices, able to deliver 20% fuel burn reduction per seat. ▪ Total number of suppliers: 455
	A330	210	▪ The most popular wide-body family – more than 1,400 A330s in operations with over 130 organizations. ▪ The A330neo family offers a 25% improvement in fuel burn per seat. ▪ Total number of suppliers: 364
	A350	415	▪ The A350 XWB offers 25% lower fuel burn, carbon dioxide emissions, and operating costs than its previous generation competitor aircraft. ▪ The A350-900 Ultra-Long-Range variant can fly up to 9,700 nautical miles (nm), further than any other commercial aircraft in service today. ▪ Total number of suppliers: 373

Source: Company reports/website, Airframer.

The Jet Engine Oligarchy

Commercial aircraft OEMs source their engines from third-party suppliers. The jet engine supply market has a limited number of established competitors, including GE's jet engine-making division, GE Aviation (with revenues of $21.3 billion in 2021), Rolls-Royce's jet engine division (£7.9 billion in 2021, including civil and defense aerospace revenues), Raytheon Technologies' Pratt & Whitney division ($18.2 billion in 2021), and Safran's Aircraft Propulsion and Aircraft Interiors divisions ($8.9 billion in 2021).

Engine manufacturers commonly operate through joint ventures to defray the high costs and risks of engine development and manufacturing. GE has a 50/50 joint venture, called CFM International, with France's Safran Aircraft Engines. CFM International makes the engines used for the Boeing 737 MAX (LEAP-1B), Airbus A320neo family (LEAP-1A), and COMAC C919 (LEAP-1C). Another joint venture, International Aero Engines (IAE), includes Pratt & Whitney, Japanese Aero Engine Corp., and Germany's MTU Aero Engines. IAE makes the V2500 engine, which powers the original Airbus A320 family (prior to the A320neo family).

Maintenance, Repair, and Overhaul

The global maintenance, repair, and overhaul (MRO) business consists largely of repair service and replacement parts sold to aircraft operators around the world. MRO differs from aircraft OEM primarily through its recurring revenue streams. Contracts for OEM suppliers or maintenance businesses allow them to benefit from years of service and replacement part orders over an aircraft's approximately 20-

year flying life. Further, in economic downturns, MROs typically see revenues hold up relatively well as the primary driver of their business is aircraft utilization and not new aircraft orders.

M&A Environment

CFRA does not expect any major M&A announcements in the Aerospace & Defense industry during 2023. Recent attempts to consolidate on the defense side have been blocked by the Biden Administration's regulators and their view that further consolidation of the current Big Five prime contractors will reduce competition.

Similarly, the commercial side is already highly consolidated, with just two major plane OEMs and three dominant engine OEMs. One potential area where some smaller scale M&A may occur is lower-tier suppliers to big primes and dominant commercial OEMs. A fair number of smaller suppliers are likely still in distress due to debt taken on to survive the pandemic, and inability to adequately staff up during the recovery due to labor shortages. This will likely lead to some smaller suppliers consolidating during 2023-2024, in our view.

HOW THE INDUSTRY OPERATES

Although the Aerospace & Defense industry generally operates in mature, volatile markets, as well as in highly competitive and regulated environments, the major segments of the industry—commercial aircraft, military weapons, and space—also possess their own distinct demand drivers and operating characteristics. Therefore, we discuss each segment separately.

Commercial Aircraft Manufacturing

Volatile factors, such as airline profitability and growth in air traffic, drive demand for new commercial jets. Influencing these factors, in turn, is the overall health of the global economy, fuel prices, interest rates, and consumer confidence, which are also highly variable.

Demand Drivers for Commercial Jets

The airlines' willingness to buy new jets is influenced by the need to replace aging aircraft, match passenger demand with fleet capacity, meet environmental regulations regarding emissions and noise reduction, and reduce operating costs by improving fleet commonality and reducing fuel costs.

Airlines' profitability and long-term fleet planning are the primary demand drivers for large commercial aircraft. Fleet planning, in turn, is based on overall air traffic forecasts, combined with each airline's route structure and the age of existing aircraft.

◆ **Air traffic growth.** Using research provided by industry trade organizations such as the International Air Transport Association (IATA), UN agency International Civil Aviation Organization (ICAO), independent research firms, and aircraft makers Boeing and Airbus, airlines attempt to predict air traffic growth. The long-term growth rate of passenger air traffic provides a rough proxy for commercial aircraft demand or at least its directional trend.

◆ **Airline profitability and cash flow.** Another demand driver for new commercial aircraft is airline profitability and the ability to generate strong cash flow. Because aircraft tend to be very expensive assets that are typically heavily debt financed, an airline that is unprofitable and not generating solid, stable cash flow over a reasonable period will ultimately have difficulty financing new aircraft purchases at reasonable terms, no matter how optimistic management is about future traffic growth.

◆ **Fleet age and retirement cycle.** Commercial aircraft demand is also subject to fleet retirement cycles, which vary by airline or fleet operator. The average economic life of a commercial airplane is about 20 years.

Purchase Contracts Favor Buyers

Airlines usually buy new jets under long-term contracts. Typically, the aircraft buyer pays one-third or less of the contract price upfront, makes several progress payments, and then makes a relatively large balloon payment upon aircraft delivery. Although these contracts specify a fixed purchase price, they generally also include price escalation clauses tied to labor and materials costs (using the employment cost index and the producer price index for industrial commodities). Contracts also specify delivery dates. If the aircraft manufacturer does not meet the prescribed delivery date, it usually pays a stiff penalty.

Original equipment manufacturers (OEMs) have a strong incentive not to accept orders from customers they think will not take timely delivery. Given that manufacturers produce each aircraft model at a set rate, they tend to think of an aircraft in terms of one of a fixed number of delivery slots in a given year. When demand is strong and all the delivery slots over a period time are full, manufacturers will consider increasing the production rate to satisfy incremental demand. Given enough upfront warning of a

cancellation or deferral request, manufacturers are often able to find another customer to fill that delivery slot for that particular model of aircraft.

If demand is not strong enough to fill all the delivery slots for a particular model over a given timeframe, the manufacture must decide whether or not to build the aircraft for its inventory (called a “white-tail” in industry vernacular, referring to the lack of airline customer logo on the aircraft’s tail), or to cut the production rate. Manufacturers are usually loath to build white-tails, as they tie up significant working capital (aircraft are expensive assets) and pose a significant financial risk.

Development and Production Profile

The production of commercial aircraft is capital intensive. Aircraft makers spend heavily on research and development (R&D) and must reconfigure or retool production lines when management decides to build a new or derivative aircraft model. For example, observers estimate that development costs of $25 billion for the Airbus A380 were about 50% more than originally projected. Development costs for new engines are estimated to be in the $1 billion to $2 billion range.

Aircraft manufacturing involves long lead times. Building a commercial jet aircraft takes about a year on average, according to Boeing. Designing new aircraft or engines can take about eight to 10 years for a completely new model, and about five years for a derivative of an existing model. Tooling costs typically comprise one-third to one-half of total development costs. Once the production line is up and running, the company must continue to spend heavily to maintain it. Production equipment, especially tooling equipment, wears out relatively quickly and must be replaced.

The Defense Segment

The military weapons-making business operates in a highly regulated environment. Everything from weapons demand to cost allocation issues is dictated by the U.S. government. Except in times of war, demand for weaponry is driven mainly by the U.S. military’s anticipated long-term needs: The Pentagon accounts for more than 40% of global military weapons sales. Other factors include the geopolitical climate and U.S. government budget allocations.

Strategic Planning: The QDR

The U.S. Department of Defense (DOD) attempts to anticipate defense needs several decades into the future. Under a congressionally mandated process called the *Quadrennial Defense Review* (QDR), the DOD conducts an extensive study every four years to examine all military risks scenarios and, based on this, it makes recommendations regarding military strategy, troop size and deployment, and weapons procurement. Congress then reviews the recommendations.

Geopolitical Climate

The global geopolitical environment influences the type and quantity of weapons systems the U.S. military demands. It also influences foreign governments’ demand for American-made weapons, and U.S. approval of such export sales. During the Cold War, the Pentagon bought large amounts of traditional, big-ticket weapons systems in a bid to outgun the former Soviet Union’s once-formidable army and navy, and its nuclear missile arsenal. The wars in Afghanistan and Iraq, however, emphasized counterinsurgency equipment designed to find the enemy and protect U.S. troops from covert attacks (*e.g.,* anti-improvised explosive device technologies).

Defense Budget Process: Arduous and Unpredictable

Formulating the U.S. defense budget is a complicated, circuitous, and continuous process. Every year, the DOD, the president, and Congress review a five-year defense budget. Budgetary considerations dramatically affect the type and volume of weapons procurements.

In making long-range purchase decisions for specific weapons, the government considers force requirements and budget constraints. Nevertheless, even after all involved, from the DOD to Congress, have approved final budgets, spending on specific defense programs can deviate from previous plans. Even a decision to expand or terminate a program can be reversed the following year.

Political Considerations

A fact of life for defense businesses is that contracts are not awarded based on price and performance alone, but also on political considerations. Military contractors often purposefully spread out jobs on high-profile programs over as many states and congressional districts as possible to help ensure local congressional representatives and senators will actively support their programs. They have also been known to spend heavily on political donations.

International Markets: Offsets Needed to Win Contracts

While the U.S. represents by far the largest defense market, international defense contracts represent an important and growing opportunity for U.S. defense contractors. In the intensely competitive overseas military weapons markets, defense contractors typically must offer "offsets" to international customers, typically governments, to boost their chances of winning big contracts. To win a contract from a foreign country, the defense contractor typically must build a portion of the weapons system in the buyer's country. Offsets also may involve transferring jobs or skills to build the weapons systems or facilitating agreements to help the country export its goods.

Procurement Processes and Contract Administration Are Highly Regulated

Strict laws and regulations govern military weapons procurement processes and contracts. The primary one is the Defense Federal Acquisition Regulations Supplement (DFARS), which regulates everything from profit controls to cost allocation and reimbursement issues. Government inspectors, auditors, and technical specialists typically oversee contract administration and cost accounting practices. Consequently, the U.S. government has enormous sway over how much a defense contractor may earn on invested capital.

Military Contracts Vary

Historically, the military contractor system has used two basic kinds of contracts: cost-reimbursement contracts and fixed-price contracts.

◆ **Cost-reimbursement (cost-plus) contracts.** These contracts typically constitute reimbursement of allowable costs plus an additional fee. The defense contractor is reimbursed periodically for allowable costs based on its progress in fulfilling the contract. Cost-plus contracts fall into three categories:

- *Cost-plus fixed fee contracts* include a fixed fee regardless of the program's final costs;
- *Cost-plus incentive fee contracts* include increases or decreases in the fixed fee within a certain range, based on whether the defense contractor completes the program under or over budget;
- *Cost-plus-award-fee contracts* provide the defense contractor with an award fee based on its performance against predetermined benchmarks, at the discretion of the customer.

◆ **Fixed-price contracts.** These typically fall into one of two categories: firm and incentive contracts.

- *Firm fixed-price contracts* allow the defense contractor to benefit from cost savings it may achieve by completing the contract under budget. At the same time, the contractor accepts sole responsibility for losing money if it experiences cost overruns.
- *Fixed-price incentive contracts* allow the defense contractor to share any savings based on target costs or to share the cost of overruns that exceed targeted costs, up to a negotiated ceiling price. The defense contractor is responsible for all costs above that ceiling.

◆ **Time-and-materials contracts.** A third type of contract, the time-and-materials contract, is used when it is not possible to estimate accurately the extent or duration of the work or to anticipate costs with any degree of confidence. Time-and-materials contracts pay contractors for labor at negotiated hourly billing rates and for certain material expenses. Such contracts include a ceiling price that the contractors exceed at their own risk.

Regulatory Environment

The Federal Aviation Administration (FAA) is the regulatory body for aircraft development, production, and operation in the United States. The FAA's primary responsibilities include overseeing airport operations, air traffic control, certification of private and commercial aircraft, and oversight on launch and re-entry of commercial space vehicles.

Gaining FAA certification for a new aircraft model is a rigorous, iterative process that can take up to a decade, and still up to five years on derivative models of existing aircraft. This major hurdle is one of the key components of high barriers to entry in the commercial aerospace industry, in our view, and long-term successful relationships with regulators are of large value to entrenched competitors in the industry.

The FAA has counterparts in most other developed economies, including the European Aviation Safety Agency, Transport Canada's Civil Aviation, and the Civil Aviation Administration of China.

Commercial aircraft operations are also subject to myriad international, federal, state, and local laws as well as regulations governing protection of the environment, including regulation of greenhouse gas and other air emissions, as well as noise reduction. Increasingly strict emission standards have been a long-term driving force in aircraft modernization, with successful new models needing to demonstrate significant improvements in fuel efficiency and noise reduction.

Government agencies control all aspects of defense contracts both internationally and abroad. In the U.S., the Department of Defense, or Pentagon, is the primary overseer of defense industry operations. Defense contractors also have manufacturing operations that are subject to typical regulations as the private, including workplace safety, labor, and environmental standards.

HOW TO ANALYZE A COMPANY IN THIS INDUSTRY

At CFRA, we recommend a top-down approach to valuation. An examination of the industry drivers outlined on pages 8 to 11 is a good starting point.

Industry Drivers

◆ **Commercial aircraft orders and backlog.** Trends in aircraft orders and backlog foreshadow production and revenue patterns. The Aerospace Industries Association (AIA), a trade group, compiles data on net orders and backlog of major commercial aircraft companies by product group. Similar data for other kinds of aircraft and military equipment are also available from the AIA.

◆ **Airline industry profits.** The financial success of the airline industry drives new orders (or cancellations) for commercial aircraft. Airlines for America (or A4A, formerly the Air Transport Association), a trade group, compiles reports on aggregate airline industry profits and reports earnings results from major air freight carriers.

◆ **Production capacity utilization.** This measure is an important indicator in assessing aerospace manufacturers' cost structure and pricing power. These, in turn, are important determinants of profit margin and return on equity (ROE), two key profitability measures. In general, rising capacity utilization rates lead to higher profit margin and ROE; conversely, declining capacity utilization rates lead to lower profit margin and ROE. The Federal Reserve provides various production capacity statistics.

◆ **Air traffic forecasts.** Because the world's airlines are the civil aircraft segment's primary customer base, their air traffic forecasts constitute another important indicator for civil aircraft manufacturers. The airlines use short- and long-term air traffic forecasts to help determine whether to expand or contract fleet size. Several airlines industry trade organizations, such as the IATA and Airlines for America (A4A), provide air traffic statistics.

◆ **General aviation shipments.** The General Aviation Manufacturers Association (GAMA) compiles and publishes quarterly data on units shipped and the dollar value of shipments by general aviation manufacturers of small jets and turboprop planes. This information can be used to calculate historical growth statistics and projections.

◆ **U.S. defense budget.** Every fall, the U.S. Congress and the president finalize the annual budget for the U.S. Department of Defense (DOD). The budget specifies planned purchase levels for each military program.

Financial Analysis

To analyze the financial health and investment prospects of an aerospace & defense company, it is important to assess the company's business fundamentals, the competitive landscape, and health and major trends of the industry in which the company competes. It is also critical to determine the company's profitability and solvency ratios, as indicated by its financial statements, in order to evaluate its financial performance relative to its own history and that of its peers.

An aerospace company's financial statements—the income statement, balance sheet, and the statement of cash flows—provide an important basis for assessing its overall performance.

Quality of Revenues and Earnings

Assessing the quality of revenues and earnings is important when analyzing aerospace & defense companies. High-quality revenue growth likely comes from internally generated volume expansion and price increases. Lower quality (and less predictable) revenue expansion mostly comes from acquisition-related sales volume growth, which is not internally generated. High-quality earnings consist primarily of income generated by the company's ongoing business operations. Lower-quality earnings typically include nonrecurring gains from asset sales, pension plans, litigation, insurance, or tax-related settlements. High-quality earnings should also track free cash flow generation, as there is a high degree of program accounting used by companies in the industry, so earnings can be heavily influenced by subtle changes in management estimates.

Watch Out! *Program accounting is not officially addressed in the formal accounting literature, but it is used mainly in the commercial aircraft industry and more commonly with commercial sales. Program accounting requires estimates of future costs such as labor and raw materials costs, warranty, and guarantee costs. These estimates enable management to manipulate earnings by underestimating expected costs and overestimating profits under a program during initial estimates, subsequently revising cost estimates upward in later periods to reflect more accurate information. In addition, revenue projections required are based on expected units to be produced. As revenues are recognized on delivery, gross margins may be manipulated if the company overestimates units to be produced. Fixed costs are then spread over more units, resulting in lower unit costs and therefore higher margins.*

◆ **Assessing revenue growth.** It is important to identify the factors driving revenue expansion. Are revenues rising on sales volume growth from operations, or from one-time boosts related to acquisitions? If revenue growth is being driven by acquisitions, will the acquisitions enable cost reductions, and if so, will they justify the purchase price of the acquired company? Is growth in sales volume benefiting from favorable market fundamentals and management acumen, or from large price discounts?

◆ **Analysis of free cash flow.** Free cash flow represents actual cash generated by operations less capital expenditures, or costs needed to maintain the company's business operations, are excluded from this measure. While reported earnings are accounted for through an accrual method that seeks to match expenses with the revenues they generate, cash flow is reported as it occurs and thus tends to be more variable than reported earnings.

Free cash flow can be used to grow the business, make acquisitions, pay down debt, repurchase shares and/or pay dividends—activities that shareholders generally like to see.

Rapidly growing businesses sometimes have low or even negative cash flow, as heavy investments are made in inventory, plant and equipment, and other cash outlays necessary to grow the business. At some point, however, these businesses must begin generating significant positive cash flow, if they are to provide decent returns for investors.

CFRA also uses free cash flow generation as a check on the quality of earnings. Given the high degree of program accounting used in the industry, earnings are highly susceptible to changes in management estimates. Industry investors tend to pay close attention to the old street adage that "Earnings are an opinion. Cash is fact." As such, we monitor the degree to which net income is converted into free cash flow over several quarters.

Watch Out! *Supplier financing arrangements (also known as reverse factoring) can delay a company's payments to its suppliers. These arrangements can result in overstated cashflows and understated leverage ratios. There are several variations of these programs, but basically, a company arranges for a financial institution to pay its suppliers and the company repays the financial institution later. This effectively lengthens the supplier payment terms and thus improves working capital. However, operating cash flows can be overstated if the cash payment to the financial institution is presented as financing outflows rather than operating cash flows, which would be the case if the company pays the supplier directly. Furthermore, companies may not reclassify accounts payable under reverse factoring programs into financial liabilities, which may understate leverage ratios.*

◆ **Restructuring charges and asset write-downs.** Because the timing and size of restructurings and write-downs are often discretionary, CFRA thinks that restructuring charges and asset write-downs materially reduce earnings quality. Questions arise as to whether assets were obsolete or overvalued in earlier periods, which signals that the company may have been under-depreciating the asset—and, thus, overstating reported net earnings. Questions also arise as to whether large asset write-downs overstate future earnings, especially when companies continue to operate assets that previously had been written down. Amounts charged typically can be found either in the "Management Discussion and Analysis" or in the footnotes section of a company's annual report.

Watch Out! *Significant and/or recurring use of special charges is a red flag that a company may be using special charges to flatter non-GAAP results. Specifically, we caution that companies may boost non-GAAP earnings in the current period by bundling normal, recurring costs into the special charges. Alternatively, the company may position itself to boost reported earnings in future periods by either (a) recording excess reserves on the liability side of the balance sheet or (b) by reducing the carrying value of assets that will be used in a subsequent period.*

Measures of Financial Condition

Among the useful measures of financial condition are the current ratio and the debt-to-equity ratio.

◆ **Current ratio.** This commonly used ratio helps in assessing a company's ability to service its short-term financial obligations; it is one indicator of solvency, or the ability to pay debts and meet other financial responsibilities as they come due. The current ratio is derived by dividing current assets by current liabilities. Current assets are those that can be readily converted into cash or used up in the course of a firm's operating cycle (typically one year). Current liabilities generally encompass short-term debt, accounts payable, and other short-term obligations.

A ratio above 1.0 is viewed as a positive; the higher the current ratio, the better the company is able to service its short-term obligations. A good practice is to compare a company's present current ratio with its historic ratio, to make sure that the present ratio is not abnormally low.

◆ **Debt-to-equity ratio.** This ratio, used to assess a company's financial strength and flexibility, is based on the level of debt relative to total equity. The ratio is calculated by dividing total debt (including lease obligations) by total equity. A high debt-to-equity ratio would indicate that a company is highly leveraged and thus generally more vulnerable to economic downturns when interest and debt payments might take up a significant portion of income.

Watch Out! *The revaluation of an acquired company's balance sheet to fair market value required under US GAAP provides an opportunity to value that balance sheet in a way that will benefit future earnings. This is generally done by understating the value of assets and overstating the value of liabilities acquired. This provides a benefit to earnings following the acquisition because the difference between the fair market value of the target's net assets and the purchase price is allocated to goodwill, which is not expensed unless it is deemed impaired in a future period, and therefore does not impact earnings on a recurring basis.*

Measures of Profitability

Among the useful profitability measures are operating and net profit margins.

◆ **Operating margins.** These ratios measure a company's profits as a percentage of revenues; the higher the ratio, the greater the company's profitability. Operating profit margins are derived by dividing operating income (which excludes interest, taxes, special gains and charges, and non-operating income) by total revenues. Net profit margins are calculated by dividing net income by total revenues.

Watch Out! *Aerospace and Defense companies generally incur substantial costs related to R&D. Under U.S. GAAP, R&D costs must be expensed as incurred. A sharp decline in R&D costs relative to sales raises concern that a company may be delaying or cutting back on R&D costs in the current period to boost earnings. This practice may benefit current period earnings at the expense of future earnings as the company suffers due to inadequate investment in new products resulting from lower R&D. While research costs must be expensed in the period of occurrence, IFRS standards allow the capitalization of certain costs incurred in the development of new products. The concerns, indicators and discussion above are therefore equally applicable when analyzing companies reporting under IFRS.*

◆ **ROE and ROA.** These measures reveal how profitably a company manages its capital investments. Return on equity (ROE), which measures the rate of return on common shareholders' equity, is calculated by dividing net income (less preferred stock dividends) by average common shareholders' equity. Return on assets (ROA), a measure that compares net income to assets, independent of the company's debt leverage, is calculated by dividing net income by total assets.

Equity Valuation

Aerospace & defense stocks generally have quite different profitability and growth profiles and, therefore, trade at significantly different earnings multiples. Investors typically use price-to-earnings (P/E) multiples in valuing stocks, and CFRA also uses this metric as our primary valuation tool. The industrials sector P/E multiples tend to be tied to investors' outlook for aerospace & defense industry spending.

GLOSSARY

Fighter jet—A military jet designed primarily to engage in air-to-air combat.

Fuselage—The central structure of an aircraft, which houses crew, passengers, and/or cargo.

Jet engine—An engine in which air is taken from the outside, compressed, heated (via fuel combustion), expanded in a jet or a turbine, and expelled from the jet at a much higher velocity than the intake velocity, which creates propulsive thrust.

Narrow-body—A passenger jet with single-aisle in its cabin.

Maintenance, repair, and overhaul (MRO)—The MRO business consists largely of repair service and replacement parts sales to the global commercial airlines segment.

Range—The distance an aircraft can travel before needing to refuel.

Transport—A commercial or military aircraft designed principally for the movement of people and/or cargo.

Turboprop—A gas turbine engine that employs a portion of its drive to rotate a propeller; also, an aircraft with such an engine.

White-tails—Commercial jets with tails that have not yet been painted with the airline's logo. They are new planes that have not been delivered to the customer, usually due to the latter's financial problems.

Wide-body—A passenger jet with two aisles in its cabin.

INDUSTRY REFERENCES

ONLINE RESOURCES

Airbus: Global Market Forecast
aircraft.airbus.com
Provides Airbus' long-range air traffic and commercial aircraft market forecasts.

Airframer
airframer.com
Provides a unique and valuable overview of this rapidly evolving marketplace, with a substantial database and up-to-the-minute analysis.

BOEING: Current Market Outlook
boeing.com/commercial/market
Provides Boeing's long-range air traffic and commercial aircraft market forecasts.

Defense News
defensenews.com
Covers developments in the defense industry.

The New York Times
nytimes.com
An American daily newspaper based in New York City with a worldwide readership.

TRADE ASSOCIATIONS

Aerospace Industries Association (AIA)
aia-aerospace.org
Represents the nation's major manufacturers of aircraft, aircraft engines, missiles, spacecraft, and related components and equipment. Releases numerous statistical series, including industry financial results, employment, imports/exports, and backlogs. The "Statistics/Additional Resources" page has a comprehensive list of links to other aerospace research and websites.

Airlines for America (A4A)
airlines.org
Trade organization for the principal U.S. airlines (formerly called the Air Transport Association); publishes statistics on airline traffic, revenues, costs, and capacity.

General Aviation Manufacturers Association (GAMA)
gama.aero
Represents more than 50 manufacturers of fixed-wing aircraft, engines, avionics, and components; compiles and publishes quarterly statistics on U.S. general aviation manufacturers' shipments.

International Air Transport Association (IATA)
iata.org
Trade association of the world's largest airlines; publishes statistics on the global airline industry.

International Civil Aviation Organization (ICAO)
icao.int/Pages/default.aspx
A United Nations specialized agency that works with industry groups to reach consensus on international civil aviation Standards and Recommended Practices and policies.

REGULATORY AND GOVERNMENT AGENCIES

Bureau of Transportation Statistics (BTS)
bts.gov
A principal agency of the U.S. Federal Statistical System.

Congressional Budget Office (CBO)
cbo.gov
A federal agency within the legislative branch of the U.S. government that provides budget and economic information to Congress.

Federal Aviation Administration (FAA)
faa.gov
A federal agency that is part of the Department of Transportation; monitors the commercial and general aviation industries and designs regulations governing aviation safety.

Federal Reserve Economic Data (FRED)
fred.stlouisfed.org
A database maintained by the Research division of the Federal Reserve Bank of St. Louis that has more than 500,000 economic time series from 87 sources.

National Aeronautics and Space Administration (NASA)
nasa.gov
A government agency that administers U.S. government space programs.

Transportation Security Administration (TSA)
tsa.gov
An agency of the U.S. Department of Homeland Security that has authority over the security of the traveling public in the U.S.

U.S. Department of Defense (DOD)
defense.gov
A division of the U.S. executive branch in charge of planning defense forces and overseeing military operations; compiles annual DOD budget information and discussion of military programs and structure of U.S. military forces.

U.S. Department of Transportation (DOT)
transportation.gov
Regulates transportation in the U.S.; publishes monthly air carrier traffic statistics and quarterly information on air carrier financial results and space launches.

COMPARATIVE COMPANY ANALYSIS

Operating Revenues

Ticker		Company		Yr. End	Million $ 2021	2020	2019	2018	2017	2016	2015	CAGR (%) 10-Yr.	5-Yr.	1-Yr.	Index Basis (2012=100) 2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																				
AIR	§	AAR CORP.	#	MAY	NA	1,652.3	2,072.0	2,051.8	1,748.3	1,590.8	1,525.4	-0.9	1.6	-20.3	NA	108	136	135	115	104
AJRD	§	AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	2,188.0	2,072.7	1,981.5	1,895.9	1,877.2	1,761.3	1,155.6	9.1	4.4	5.6	189	179	171	164	162	152
AVAV	§	AEROVIRONMENT, INC.	#	APR	NA	394.9	367.3	314.3	268.4	233.1	233.7	3.0	11.1	7.5	NA	169	157	134	115	100
AXON	†	AXON ENTERPRISE, INC.		DEC	863.4	681.0	530.9	420.1	343.8	268.2	197.9	25.4	26.3	26.8	436	344	268	212	174	136
CW	†	CURTISS-WRIGHT CORPORATION		DEC	2,505.9	2,391.3	2,488.0	2,411.8	2,271.0	2,108.9	2,205.7	2.2	3.5	4.8	114	108	113	109	103	96
GD	[]	GENERAL DYNAMICS CORPORATION		DEC	38,469.0	37,925.0	39,350.0	36,193.0	30,973.0	30,561.0	31,781.0	1.6	4.7	1.4	121	119	124	114	97	96
HXL	†	HEXCEL CORPORATION		DEC	1,324.7	1,502.4	2,355.7	2,189.1	1,973.3	2,004.3	1,861.2	-0.5	-7.9	-11.8	71	81	127	118	106	108
HWM	[]	HOWMET AEROSPACE INC.		DEC	4,972.0	5,259.0	7,098.0	6,778.0	12,960.0	12,394.0	12,413.0	NA	-16.7	-5.5	40	42	57	55	104	100
HII	[]	HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	9,524.0	9,361.0	8,899.0	8,176.0	7,441.0	7,068.0	7,020.0	3.8	6.1	1.7	136	133	127	116	106	101
KAMN	§	KAMAN CORPORATION		DEC	709.0	784.5	761.6	736.0	724.9	1,808.4	1,775.1	-7.1	-17.1	-9.6	40	44	43	41	41	102
LHX	[]	L3HARRIS TECHNOLOGIES, INC.		DEC	17,814.0	17,814.0	18,194.0	6,168.0	5,897.0	5,992.0	3,885.0	12.6	24.3	-2.1	459	459	468	159	152	154
LMT	[]	LOCKHEED MARTIN CORPORATION		DEC	67,044.0	65,398.0	59,812.0	53,762.0	49,960.0	47,290.0	40,536.0	3.7	7.2	2.5	165	161	148	133	123	117
MRCY	†	MERCURY SYSTEMS, INC.		JUL	924.0	796.6	654.7	493.2	408.6	270.2	234.8	15.0	27.9	16.0	393	339	279	210	174	115
MOG.A	§	MOOG INC.		OCT	2,852.0	2,884.6	2,904.7	2,709.5	2,497.5	2,411.9	2,525.5	2.0	3.4	-1.1	113	114	115	107	99	96
NPK	§	NATIONAL PRESTO INDUSTRIES, INC.		DEC	355.8	352.6	308.5	323.3	333.6	341.9	355.6	-1.9	0.8	0.9	100	99	87	91	94	96
NOC	[]	NORTHROP GRUMMAN CORPORATION		DEC	35,667.0	36,799.0	33,841.0	30,095.0	26,004.0	24,706.0	23,526.0	3.0	7.6	-3.1	152	156	144	128	111	105
PKE	§	PARK AEROSPACE CORP.	#	FEB	53.6	46.3	60.0	51.1	40.2	31.8	145.9	-14.1	-20.5	-22.9	37	32	41	35	28	22
RTX	[]	RAYTHEON TECHNOLOGIES CORPORATION		DEC	64,388.0	56,587.0	45,349.0	34,701.0	59,837.0	57,244.0	56,098.0	1.5	2.4	13.8	115	101	81	62	107	102
TXT	[]	TEXTRON INC.	#	JAN	NA	12,382.0	11,651.0	13,972.0	14,198.0	13,788.0	13,788.0	0.9	-2.1	6.3	NA	90	85	101	103	100
BA	[]	THE BOEING COMPANY		DEC	62,286.0	58,158.0	76,559.0	101,127.0	94,005.0	93,496.0	96,114.0	-1.0	-7.8	7.1	65	61	80	105	98	97
TDG	[]	TRANSDIGM GROUP INCORPORATED		SEP	4,798.0	5,103.0	5,223.0	3,811.0	3,504.3	3,171.4	2,707.1	14.8	8.6	-6.0	177	189	193	141	129	117
TGI	§	TRIUMPH GROUP, INC.	#	MAR	NA	1,869.7	2,900.1	3,364.9	3,199.0	3,532.8	3,886.1	-4.3	-13.6	-35.5	NA	48	75	87	82	91
WWD	†	WOODWARD, INC.		SEP	2,245.8	2,495.7	2,900.2	2,325.9	2,098.7	2,023.1	2,038.3	2.8	2.1	-10.0	110	122	142	114	103	99

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

Net Income

Ticker		Company		Yr. End	Million $ 2021	2020	2019	2018	2017	2016	2015	CAGR (%) 10-Yr.	5-Yr.	1-Yr.	Index Basis (2012=100) 2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																				
AIR	§	AAR CORP.	#	MAY	NA	35.8	4.4	7.5	15.6	56.5	47.7	-6.5	-5.6	713.6	NA	75	9	16	33	118
AJRD	§	AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	143.7	137.7	141.0	137.3	-9.2	18.0	84.0	47.7	51.5	4.4	171	164	168	163	-11	21
AVAV	§	AEROVIRONMENT, INC.	#	APR	NA	23.3	41.1	47.4	17.9	13.1	9.0	-1.0	21.1	-43.2	NA	260	458	529	199	146
AXON	†	AXON ENTERPRISE, INC.		DEC	-60.0	-1.7	0.9	29.2	5.2	17.3	19.9	23.9	NM	3,381.3	-301	-9	4	147	26	87
CW	†	CURTISS-WRIGHT CORPORATION		DEC	267.2	201.4	307.6	275.7	214.9	187.3	145.5	7.8	7.4	32.7	184	138	211	190	148	129
GD	[]	GENERAL DYNAMICS CORPORATION		DEC	3,257.0	3,167.0	3,484.0	3,345.0	2,912.0	2,572.0	3,036.0	2.6	4.8	2.8	107	104	115	110	96	85
HXL	†	HEXCEL CORPORATION		DEC	16.1	31.7	306.6	276.6	284.0	249.8	237.2	-19.2	-42.2	-49.2	7	13	129	117	120	105
HWM	[]	HOWMET AEROSPACE INC.		DEC	258.0	261.0	470.0	642.0	-74.0	-941.0	-322.0	NA	NM	-1.1	-80	-81	-146	-199	23	292
HII	[]	HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	544.0	696.0	549.0	836.0	479.0	573.0	404.0	NA	-1.0	-21.8	135	172	136	207	119	142
KAMN	§	KAMAN CORPORATION		DEC	43.7	-69.7	209.8	54.2	49.8	58.9	60.4	-1.6	-5.8	NM	72	-115	347	90	82	97
LHX	[]	L3HARRIS TECHNOLOGIES, INC.		DEC	1,846.0	1,846.0	1,119.0	699.0	543.0	324.0	334.0	12.1	41.6	65.0	553	553	335	209	163	97
LMT	[]	LOCKHEED MARTIN CORPORATION		DEC	6,315.0	6,833.0	6,230.0	5,046.0	1,963.0	5,173.0	3,605.0	9.1	4.1	-7.6	175	190	173	140	54	143
MRCY	†	MERCURY SYSTEMS, INC.		JUL	62.0	85.7	46.8	40.9	24.9	19.7	10.4	12.9	25.7	-27.6	598	827	451	394	240	190
MOG.A	§	MOOG INC.		OCT	157.2	9.2	174.5	95.2	141.3	126.7	131.9	1.5	4.4	1,608.0	119	7	132	72	107	96
NPK	§	NATIONAL PRESTO INDUSTRIES, INC.		DEC	25.7	47.0	42.2	39.9	53.0	44.6	40.5	-6.1	-10.5	-45.4	63	116	104	99	131	110
NOC	[]	NORTHROP GRUMMAN CORPORATION		DEC	7,005.0	3,189.0	2,248.0	3,229.0	2,869.0	2,043.0	1,990.0	12.7	27.9	119.7	352	160	113	162	144	103
PKE	§	PARK AEROSPACE CORP.	#	FEB	8.5	4.9	9.6	113.5	20.6	9.3	18.0	-17.3	-23.1	-49.1	47	27	53	630	114	51
RTX	[]	RAYTHEON TECHNOLOGIES CORPORATION		DEC	3,864.0	-3,519.0	5,537.0	5,269.0	4,552.0	5,055.0	7,608.0	-2.5	-5.2	NM	51	-46	73	69	60	66
TXT	[]	TEXTRON INC.	#	JAN	NA	746.0	309.0	1,222.0	307.0	962.0	962.0	11.9	-5.0	141.4	NA	78	32	127	32	100
BA	[]	THE BOEING COMPANY		DEC	-4,202.0	-11,873.0	-636.0	10,460.0	8,458.0	5,034.0	5,176.0	NA	NM	-64.6	-81	-229	-12	202	163	97
TDG	[]	TRANSDIGM GROUP INCORPORATED		SEP	680.0	699.0	890.0	957.0	596.9	586.4	447.2	14.7	3.0	-2.7	152	156	199	214	133	131
TGI	§	TRIUMPH GROUP, INC.	#	MAR	NA	-450.9	-29.4	-327.1	-425.4	-43.0	-1,048.0	NA	-15.5	1,432.0	NA	43	3	31	41	4
WWD	†	WOODWARD, INC.		SEP	208.6	240.4	259.6	180.4	200.5	180.8	181.5	4.7	2.9	-13.2	115	132	143	99	111	100

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

				Return on Revenues (%)						Return on Assets (%)						Return on Equity (%)					
Ticker	**Company**		**Yr. End**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**	**2021**	**2020**	**2019**	**2018**	**2017**	**2016**
AEROSPACE AND DEFENSE																					
AIR	§ AAR CORP.	#	MAY	NA	2.2	0.2	0.4	0.9	3.6	NA	2.3	0.2	0.5	1.0	3.8	NA	4.9	2.7	9.1	8.0	5.8
AJRD	§ AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	6.6	6.6	7.1	7.2	NM	1.0	5.9	4.7	5.2	5.5	NM	0.8	5.9	34.0	28.3	52.4	NM	NM
AVAV	§ AEROVIRONMENT, INC.	#	APR	NA	5.9	11.2	15.1	6.7	5.6	NA	2.5	7.0	9.3	3.8	3.0	NA	4.2	8.5	9.6	5.4	4.8
AXON	† AXON ENTERPRISE, INC.		DEC	NM	NM	0.2	7.0	1.5	6.4	NM	NM	0.1	4.1	1.5	6.2	NM	NM	0.2	9.2	3.3	11.2
CW	† CURTISS-WRIGHT CORPORATION		DEC	10.7	8.4	12.4	11.4	9.5	8.9	6.5	5.0	8.2	8.5	6.6	6.2	6.5	11.3	18.6	18.0	15.2	14.9
GD	[] GENERAL DYNAMICS CORPORATION		DEC	8.5	8.4	8.9	9.2	9.4	8.4	6.5	6.2	7.1	7.4	8.3	7.8	6.5	21.4	27.1	29.0	26.8	25.5
HXL	† HEXCEL CORPORATION		DEC	1.2	2.1	13.0	12.6	14.4	12.5	0.6	1.1	9.8	9.8	10.2	10.4	0.6	2.1	22.2	19.6	20.7	20.6
HWM	[] HOWMET AEROSPACE INC.		DEC	5.2	5.0	6.6	9.5	NM	NM	2.5	2.3	2.7	3.4	NM	NM	2.5	5.2	2.5	5.9	NM	NM
HII	[] HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	5.7	7.4	6.2	10.2	6.4	8.1	5.1	8.5	7.8	13.1	7.5	9.0	5.1	39.9	35.4	51.1	28.1	36.5
KAMN	§ KAMAN CORPORATION		DEC	6.2	NM	27.6	7.4	6.9	3.3	3.6	NM	14.8	3.7	3.4	4.1	3.6	NM	7.8	2.5	3.3	10.6
LHX	[] L3HARRIS TECHNOLOGIES, INC.		DEC	10.4	6.2	8.9	11.3	9.2	5.4	5.3	3.0	4.3	7.1	5.4	2.7	5.3	5.0	0.0	22.6	21.0	18.9
LMT	[] LOCKHEED MARTIN CORPORATION		DEC	9.4	10.4	10.4	9.4	3.9	10.9	12.4	13.5	13.1	11.2	4.2	10.8	12.4	149.6	269.7	1,499.6	455.4	155.7
MRCY	† MERCURY SYSTEMS, INC.		JUL	6.7	10.8	7.1	8.3	6.1	7.3	3.2	5.3	3.3	3.8	3.0	2.7	3.2	6.4	4.5	5.5	4.2	4.8
MOG.A	§ MOOG INC.		OCT	5.5	0.3	6.0	3.5	5.7	5.3	4.6	0.3	5.6	3.2	4.6	4.2	4.6	0.7	13.7	7.8	12.7	12.4
NPK	§ NATIONAL PRESTO INDUSTRIES, INC.		DEC	7.2	13.3	13.7	12.4	15.9	13.0	6.1	10.8	10.3	9.7	12.9	10.7	6.1	12.7	11.0	10.9	12.1	12.2
NOC	[] NORTHROP GRUMMAN CORPORATION		DEC	19.6	8.7	6.6	10.7	11.0	8.3	16.5	7.2	5.5	8.6	8.2	8.0	16.5	32.9	26.4	42.2	46.3	37.9
PKE	§ PARK AEROSPACE CORP.	#	FEB	15.8	10.5	15.9	222.1	51.2	29.2	5.3	3.0	5.6	60.1	12.1	3.0	5.3	3.7	6.8	4.3	11.6	NM
RTX	[] RAYTHEON TECHNOLOGIES CORPORATION		DEC	6.0	NM	12.2	15.2	7.6	8.8	2.4	NM	4.0	3.9	4.7	5.6	2.4	NM	8.8	3.9	16.1	18.6
TXT	[] TEXTRON INC.	#	JAN	NA	6.0	2.7	6.0	8.7	2.2	NA	4.7	2.0	5.4	8.6	2.0	NA	11.8	5.4	15.2	22.5	5.5
BA	[] THE BOEING COMPANY		DEC	NM	NM	NM	10.3	9.0	5.4	NM	NM	NM	8.9	7.5	5.6	NM	NM	NM	985.4	653.1	138.4
TDG	[] TRANSDIGM GROUP INCORPORATED		SEP	14.2	13.7	17.0	25.1	17.0	18.5	3.5	3.8	5.5	7.8	6.0	5.5	3.5	NM	NM	NM	NM	NM
TGI	§ TRIUMPH GROUP, INC.	#	MAR	NA	NM	NM	NM	NM	NM	NA	NM	NM	NM	NM	NM	NA	NM	NM	NM	NM	NM
WWD	† WOODWARD, INC.		SEP	9.3	9.6	9.0	7.8	9.6	8.9	5.1	6.2	6.6	4.8	7.3	6.8	5.1	12.9	15.9	12.4	15.5	15.3

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

Ticker	Company		Yr. End	Current Ratio						Debt/Capital Ratio (%)						Debt as a % of Net Working Capital					
				2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																					
AIR	§ AAR CORP.	#	MAY	0.0	2.8	3.8	2.7	2.8	2.7	NA	12.1	39.9	13.5	15.9	14.4	NA	22.3	56.8	23.8	29.1	27.8
AJRD	§ AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	1.4	1.1	1.6	1.4	1.7	1.5	32.2	54.6	34.7	43.6	85.2	94.6	70.1	137.4	56.0	91.3	140.2	224.4
AVAV	§ AEROVIRONMENT, INC.	#	APR	0.0	4.2	7.5	10.5	6.4	7.4	NA	23.5	0.0	0.0	0.0	0.0	NA	61.4	0.0	0.0	0.0	0.0
AXON	† AXON ENTERPRISE, INC.		DEC	2.7	3.8	3.1	3.4	1.9	2.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
CW	† CURTISS-WRIGHT CORPORATION		DEC	1.8	1.6	2.1	2.0	2.4	2.1	36.5	34.9	30.0	33.2	34.8	38.7	183.4	195.4	96.9	116.1	100.4	110.3
GD	[] GENERAL DYNAMICS CORPORATION		DEC	1.4	1.3	1.2	1.2	1.4	1.2	37.3	39.0	39.2	53.0	25.8	22.5	174.6	179.2	258.4	356.3	76.1	96.9
HXL	† HEXCEL CORPORATION		DEC	2.5	2.9	2.2	2.1	2.5	2.2	35.6	38.2	42.1	41.7	35.0	35.5	222.9	265.1	274.5	271.2	204.2	204.3
HWM	[] HOWMET AEROSPACE INC.		DEC	2.2	2.2	1.4	1.9	2.3	2.1	54.6	56.8	51.6	51.6	58.3	61.3	284.8	233.5	285.6	193.6	192.5	257.1
HII	[] HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	1.1	1.1	0.9	1.0	1.6	1.6	54.0	47.0	44.7	45.8	42.1	43.6	908.5	773.4	NM	NM	159.1	159.9
KAMN	§ KAMAN CORPORATION		DEC	4.5	2.6	4.6	2.6	3.0	2.0	19.4	20.1	18.2	31.1	38.4	34.9	44.8	50.6	25.0	60.0	78.7	87.3
LHX	[] L3HARRIS TECHNOLOGIES, INC.		DEC	1.4	1.6	1.6	1.2	1.1	1.3	26.3	24.9	22.7	52.1	55.0	57.6	381.3	284.7	290.8	932.1	2,364.6	643.1
LMT	[] LOCKHEED MARTIN CORPORATION		DEC	1.4	1.4	1.2	1.1	1.4	1.2	51.6	65.9	78.2	94.0	106.1	89.9	200.6	214.3	365.2	774.4	294.3	556.6
MRCY	† MERCURY SYSTEMS, INC.		JUL	4.3	5.0	5.9	4.6	3.4	3.6	11.9	0.0	0.0	20.2	0.0	27.8	40.6	0.0	0.0	75.0	0.0	102.5
MOG.A	§ MOOG INC.		OCT	2.0	2.3	2.2	2.2	2.6	2.6	37.0	42.8	38.6	41.4	44.1	50.3	96.9	103.0	92.3	108.0	96.0	107.2
NPK	§ NATIONAL PRESTO INDUSTRIES, INC.		DEC	6.5	6.5	8.6	7.4	7.4	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOC	[] NORTHROP GRUMMAN CORPORATION		DEC	1.3	1.6	1.1	1.2	2.3	1.2	49.7	57.4	59.2	63.8	66.9	57.3	441.2	247.4	1,020.8	1,001.5	151.6	575.7
PKE	§ PARK AEROSPACE CORP.	#	FEB	20.1	16.6	16.7	15.1	11.6	19.1	0.0	0.0	0.0	0.0	0.0	27.3	0.0	0.0	0.0	0.0	0.0	26.9
RTX	[] RAYTHEON TECHNOLOGIES CORPORATION		DEC	1.2	1.2	1.3	1.1	1.3	1.3	29.6	29.8	48.7	52.0	44.9	43.6	475.1	414.6	266.4	1,030.0	299.5	335.6
TXT	[] TEXTRON INC.	#	JAN	0.0	2.4	2.5	2.1	2.1	2.2	NA	31.8	35.4	31.4	35.1	35.4	NA	68.4	64.2	61.9	70.4	70.7
BA	[] THE BOEING COMPANY		DEC	1.3	1.4	1.1	1.1	1.1	1.2	136.5	142.1	183.6	95.4	82.4	88.6	208.0	177.5	370.8	136.2	76.1	55.1
TDG	[] TRANSDIGM GROUP INCORPORATED		SEP	4.2	4.3	3.2	4.1	2.4	3.9	119.7	127.5	123.5	119.7	138.5	109.1	369.0	374.4	510.1	464.3	926.9	468.2
TGI	§ TRIUMPH GROUP, INC.	#	MAR	0.0	2.2	1.6	1.3	1.9	1.3	NA	173.2	177.9	165.4	75.1	55.0	NA	231.7	310.8	545.3	146.4	236.1
WWD	† WOODWARD, INC.		SEP	4.0	3.1	1.8	1.9	2.4	2.0	26.1	28.3	41.9	47.8	31.4	32.2	71.4	96.2	192.4	242.4	103.2	124.4

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

Ticker		Company		Yr. End	Current Ratio						Debt/Capital Ratio (%)						Debt as a % of Net Working Capital					
					2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																						
AIR	§	AAR CORP.	#	MAY	NA	2.8	3.8	2.7	2.8	2.7	NA	12.1	39.9	13.5	15.9	14.4	NA	22.3	56.8	23.8	29.1	27.8
AJRD	§	AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	1.4	1.1	1.6	1.4	1.7	1.5	32.2	54.6	34.7	43.6	85.2	94.6	70.1	137.4	56.0	91.3	140.2	224.4
AVAV	§	AEROVIRONMENT, INC.	#	APR	NA	4.2	7.5	10.5	6.4	7.4	NA	23.5	0.0	0.0	0.0	0.0	NA	61.4	0.0	0.0	0.0	0.0
AXON	†	AXON ENTERPRISE, INC.		DEC	2.7	3.8	3.1	3.4	1.9	2.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
CW	†	CURTISS-WRIGHT CORPORATION		DEC	1.8	1.6	2.1	2.0	2.4	2.1	36.5	34.9	30.0	33.2	34.8	38.7	183.4	195.4	96.9	116.1	100.4	110.3
GD	[]	GENERAL DYNAMICS CORPORATION		DEC	1.4	1.3	1.2	1.2	1.4	1.2	37.3	39.0	39.2	53.0	25.8	22.5	174.6	179.2	258.4	356.3	76.1	96.9
HXL	†	HEXCEL CORPORATION		DEC	2.5	2.9	2.2	2.1	2.5	2.2	35.6	38.2	42.1	41.7	35.0	35.5	222.9	265.1	274.5	271.2	204.2	204.3
HWM	[]	HOWMET AEROSPACE INC.		DEC	2.2	2.2	1.4	1.9	2.3	2.1	54.6	56.8	51.6	51.6	58.3	61.3	284.8	233.5	285.6	193.6	192.5	257.1
HII	[]	HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	1.1	1.1	0.9	1.0	1.6	1.6	54.0	47.0	44.7	45.8	42.1	43.6	908.5	773.4	NM	NM	159.1	159.9
KAMN	§	KAMAN CORPORATION		DEC	4.5	2.6	4.6	2.6	3.0	2.0	19.4	20.1	18.2	31.1	38.4	34.9	44.8	50.6	25.0	60.0	78.7	87.3
LHX	[]	L3HARRIS TECHNOLOGIES, INC.		DEC	1.4	1.6	1.6	1.2	1.1	1.3	26.3	24.9	22.7	52.1	55.0	57.6	381.3	284.7	290.8	932.1	2,364.6	643.1
LMT	[]	LOCKHEED MARTIN CORPORATION		DEC	1.4	1.4	1.2	1.1	1.4	1.2	51.6	65.9	78.2	94.0	106.1	89.9	200.6	214.3	365.2	774.4	294.3	556.6
MRCY	†	MERCURY SYSTEMS, INC.		JUL	4.3	5.0	5.9	4.6	3.4	3.6	11.9	0.0	0.0	20.2	0.0	27.8	40.6	0.0	0.0	75.0	0.0	102.5
MOG.A	§	MOOG INC.		OCT	2.0	2.3	2.2	2.2	2.6	2.6	37.0	42.8	38.6	41.4	44.1	50.3	96.9	103.0	92.3	108.0	96.0	107.2
NPK	§	NATIONAL PRESTO INDUSTRIES, INC.		DEC	6.5	6.5	8.6	7.4	7.4	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NOC	[]	NORTHROP GRUMMAN CORPORATION		DEC	1.3	1.6	1.1	1.2	2.3	1.2	49.7	57.4	59.2	63.8	66.9	57.3	441.2	247.4	1,020.8	1,001.5	151.6	575.7
PKE	§	PARK AEROSPACE CORP.	#	FEB	20.1	16.6	16.7	15.1	11.6	19.1	0.0	0.0	0.0	0.0	0.0	27.3	0.0	0.0	0.0	0.0	0.0	26.9
RTX	[]	RAYTHEON TECHNOLOGIES CORPORATION		DEC	1.2	1.2	1.3	1.1	1.3	1.3	29.6	29.8	48.7	52.0	44.9	43.6	475.1	414.6	266.4	1,030.0	299.5	335.6
TXT	[]	TEXTRON INC.	#	JAN	NA	2.4	2.5	2.1	2.1	2.2	NA	31.8	35.4	31.4	35.1	35.4	NA	68.4	64.2	61.9	70.4	70.7
BA	[]	THE BOEING COMPANY		DEC	1.3	1.4	1.1	1.1	1.1	1.2	136.5	142.1	183.6	95.4	82.4	88.6	208.0	177.5	370.8	136.2	76.1	55.1
TDG	[]	TRANSDIGM GROUP INCORPORATED		SEP	4.2	4.3	3.2	4.1	2.4	3.9	119.7	127.5	123.5	119.7	138.5	109.1	369.0	374.4	510.1	464.3	926.9	468.2
TGI	§	TRIUMPH GROUP, INC.	#	MAR	NA	2.2	1.6	1.3	1.9	1.3	NA	173.2	177.9	165.4	75.1	55.0	NA	231.7	310.8	545.3	146.4	236.1
WWD	†	WOODWARD, INC.		SEP	4.0	3.1	1.8	1.9	2.4	2.0	26.1	28.3	41.9	47.8	31.4	32.2	71.4	96.2	192.4	242.4	103.2	124.4

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

Ticker	Company		Yr. End	Price/Earnings Ratio (High-Low) 2021	2020	2019	2018	2017	2016	Dividend Payout Ratio (%) 2021	2020	2019	2018	2017	2016	Dividend Yield (High-Low, %) 2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																					
AIR	§ AAR CORP.	#	MAY	44 - 17	420 - 76	242 - 146	109 - 78	23 - 13	24 - 14	0.0	0.3	243.2	140.0	66.0	18.1	0.0 - 0.0	2.0 - 0.0	3.2 - 0.6	0.9 - 0.6	0.9 - 0.7	1.4 - 0.8
AJRD	§ AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	29 - 23	32 - 18	29 - 18	22 - 14	NM - NM	80 - 52	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
AVAV	§ AEROVIRONMENT, INC.	#	APR	142 - 59	42 - 27	60 - 26	77 - 37	57 - 39	76 - 49	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
AXON	† AXON ENTERPRISE, INC.		DEC	NM - NM	NM - NM	5163 - 2886	145 - 48	277 - 214	90 - 44	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
CW	† CURTISS-WRIGHT CORPORATION		DEC	21 - 16	31 - 16	20 - 14	23 - 15	26 - 17	25 - 15	10.7	14.0	9.2	9.5	11.5	12.3	0.6 - 0.5	0.7 - 0.5	0.9 - 0.5	0.6 - 0.5	0.6 - 0.4	0.6 - 0.5
GD	[] GENERAL DYNAMICS CORPORATION		DEC	18 - 13	17 - 10	16 - 13	20 - 13	22 - 18	21 - 15	40.4	39.2	33.1	32.1	33.9	35.4	2.5 - 2.0	3.0 - 2.3	4.1 - 2.2	2.5 - 2.0	2.2 - 1.5	1.8 - 1.6
HXL	† HEXCEL CORPORATION		DEC	336 - 228	211 - 71	24 - 16	23 - 17	20 - 16	20 - 14	0.0	44.8	17.7	17.5	15.0	15.9	0.8 - 0.0	0.0 - 0.0	2.5 - 0.0	1.1 - 0.7	1.1 - 0.7	0.9 - 0.7
HWM	[] HOWMET AEROSPACE INC.		DEC	60 - 40	57 - 18	30 - 16	23 - 12	NM - NM	NM - NM	7.4	4.2	12.1	18.5	NM	NM	0.3 - 0.2	0.3 - 0.0	0.3 - 0.0	1.5 - 0.3	1.4 - 0.8	1.2 - 0.8
HII	[] HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	16 - 12	16 - 8	19 - 14	14 - 9	24 - 18	15 - 10	34.2	24.7	27.1	15.8	24.0	17.1	2.7 - 2.1	2.9 - 2.0	3.0 - 1.5	1.9 - 1.5	1.7 - 1.1	1.4 - 1.0
KAMN	§ KAMAN CORPORATION		DEC	38 - 22	NM - NM	9 - 7	39 - 27	33 - 26	23 - 17	50.9	NM	10.6	41.3	43.1	33.1	2.4 - 1.8	2.3 - 1.4	2.7 - 1.2	1.5 - 1.2	1.4 - 1.1	1.7 - 1.3
LHX	[] L3HARRIS TECHNOLOGIES, INC.		DEC	27 - 19	44 - 29	29 - 17	30 - 22	33 - 23	41 - 28	44.3	64.8	41.0	38.9	48.3	77.8	2.0 - 1.7	2.4 - 1.7	2.3 - 1.3	2.2 - 1.3	1.9 - 1.3	2.1 - 1.6
LMT	[] LOCKHEED MARTIN CORPORATION		DEC	17 - 14	18 - 11	18 - 12	20 - 14	47 - 37	15 - 12	46.6	40.5	41.0	46.5	110.2	39.6	3.4 - 2.4	3.4 - 2.6	3.5 - 2.2	3.6 - 2.2	3.1 - 2.2	2.9 - 2.3
MRCY	† MERCURY SYSTEMS, INC.		JUL	78 - 51	59 - 36	77 - 41	62 - 36	75 - 37	45 - 24	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
MOG.A	§ MOOG INC.		OCT	19 - 13	345 - 126	19 - 14	34 - 27	23 - 14	19 - 11	20.4	273.9	20.0	18.8	0.0	0.0	1.5 - 1.2	1.6 - 1.1	2.9 - 1.0	1.4 - 1.0	1.4 - 1.1	0.0 - 0.0
NPK	§ NATIONAL PRESTO INDUSTRIES, INC.		DEC	32 - 22	14 - 10	22 - 13	24 - 16	16 - 12	17 - 12	27.5	15.0	16.6	17.5	13.2	15.6	7.8 - 5.4	7.7 - 5.3	8.9 - 6.2	7.4 - 4.6	6.6 - 4.3	6.0 - 4.6
NOC	[] NORTHROP GRUMMAN CORPORATION		DEC	9 - 7	20 - 14	29 - 18	19 - 12	19 - 14	22 - 16	14.0	29.9	39.1	25.4	24.0	31.3	1.8 - 1.3	2.0 - 1.5	2.0 - 1.4	2.1 - 1.4	1.9 - 1.2	1.6 - 1.3
PKE	§ PARK AEROSPACE CORP.	#	FEB	62 - 42	41 - 31	4 - 3	22 - 16	43 - 31	26 - 16	96.5	167.6	300.7	7.3	39.4	87.2	3.1 - 2.5	4.0 - 2.4	2.7 - 1.7	2.4 - 1.7	2.5 - 1.8	13.8 - 2.1
RTX	[] RAYTHEON TECHNOLOGIES CORPORATION		DEC	36 - 25	NM - NM	23 - 16	22 - 16	22 - 19	18 - 14	76.5	NM	44.1	41.2	45.6	40.9	2.6 - 1.9	2.9 - 2.2	5.9 - 1.9	2.7 - 2.0	2.4 - 2.0	2.6 - 2.2
TXT	[] TEXTRON INC.	#	JAN	15 - 7	41 - 32	21 - 13	12 - 9	44 - 27	13 - 9	0.0	2.4	5.8	2.2	1.6	6.8	0.2 - 0.1	0.4 - 0.2	0.2 - 0.1	0.2 - 0.1	0.2 - 0.1	0.3 - 0.2
BA	[] THE BOEING COMPANY		DEC	NM - NM	NM - NM	NM - NM	22 - 16	21 - 11	20 - 14	0.0	NM	NM	37.7	40.4	54.7	0.0 - 0.0	0.0 - 0.0	2.4 - 0.0	2.8 - 1.9	2.4 - 1.7	3.7 - 2.1
TDG	[] TRANSDIGM GROUP INCORPORATED		SEP	66 - 44	73 - 27	40 - 23	23 - 16	37 - 27	28 - 18	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	7.1 - 0.0	13.2 - 5.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
TGI	§ TRIUMPH GROUP, INC.	#	MAR	NM - NM	NM - NM	NM - NM	NM - NM	NM - NM	NM - NM	0.0	0.0	NM	NM	NM	NM	0.0 - 0.0	4.7 - 0.0	0.9 - 0.5	1.4 - 0.6	0.8 - 0.5	0.7 - 0.4
WWD	† WOODWARD, INC.		SEP	39 - 23	33 - 13	28 - 16	29 - 24	24 - 18	22 - 14	17.3	15.7	15.0	18.9	14.8	14.7	0.8 - 0.5	0.6 - 0.3	2.2 - 0.4	0.8 - 0.5	0.8 - 0.6	0.8 - 0.6

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

Ticker	Company		Yr. End	Earnings per Share ($)						Tangible Book Value per Share ($)						Share Price (High-Low, $)					
				2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
AEROSPACE AND DEFENSE																					
AIR	§ AAR CORP.	#	MAY	NA	1.0	0.1	0.2	0.4	1.6	0.0	23.6	22.4	22.2	22.9	22.6	45.5 - 30.9	48.0 - 8.6	52.8 - 29.8	51.5 - 33.9	44.0 - 31.2	38.8 - 18.4
AJRD	§ AEROJET ROCKETDYNE HOLDINGS, INC.		DEC	1.8	1.7	1.7	1.8	-0.1	0.3	4.2	0.4	4.6	2.5	-2.0	-3.1	53.5 - 39.9	57.3 - 32.1	52.8 - 30.1	38.9 - 24.4	36.3 - 17.7	21.4 - 14.0
AVAV	§ AEROVIRONMENT, INC.	#	APR	NA	1.0	1.7	2.0	0.7	0.6	0.0	7.8	20.5	19.5	17.3	16.3	143.7 - 53.5	99.8 - 45.0	95.4 - 48.6	121.3 - 41.6	59.0 - 24.7	32.4 - 22.2
AXON	† AXON ENTERPRISE, INC.		DEC	-0.9	0.0	0.0	0.5	0.1	0.3	13.9	14.8	8.5	7.3	2.5	2.4	212.4 - 115.6	134.7 - 50.1	77.7 - 42.4	76.5 - 24.5	28.2 - 20.6	30.2 - 13.6
CW	† CURTISS-WRIGHT CORPORATION		DEC	6.6	4.8	7.2	6.2	4.8	4.2	-4.5	-6.8	3.0	0.3	2.3	1.6	140.0 - 103.6	149.9 - 70.6	144.8 - 99.0	143.4 - 95.2	125.0 - 82.8	107.6 - 62.6
GD	[] GENERAL DYNAMICS CORPORATION		DEC	11.6	11.0	12.0	11.2	9.6	8.3	-16.0	-22.8	-27.7	-36.3	-4.0	-6.0	210.2 - 144.5	190.1 - 100.6	193.8 - 152.4	230.0 - 143.9	214.8 - 172.4	180.1 - 121.6
HXL	† HEXCEL CORPORATION		DEC	0.2	0.4	3.6	3.1	3.1	2.7	14.5	14.7	13.9	13.9	15.0	12.8	65.0 - 42.9	80.5 - 24.5	87.0 - 56.1	73.4 - 53.5	63.9 - 49.2	55.1 - 37.5
HWM	[] HOWMET AEROSPACE INC.		DEC	0.6	0.6	1.0	1.3	-0.3	-2.3	-2.8	-2.7	-0.3	0.2	-1.4	-2.5	36.0 - 22.9	34.3 - 9.9	32.0 - 16.1	31.2 - 15.6	30.7 - 18.6	22.6 - 16.8
HII	[] HUNTINGTON INGALLS INDUSTRIES, INC.		DEC	13.5	17.1	13.3	19.1	10.5	12.1	-24.5	-5.6	-6.8	-5.7	0.7	-2.8	224.1 - 156.4	279.7 - 136.4	260.8 - 186.7	276.7 - 173.8	253.4 - 183.4	189.2 - 118.2
KAMN	§ KAMAN CORPORATION		DEC	1.6	-2.5	7.5	1.9	1.7	2.1	15.0	12.6	20.6	13.6	6.0	3.7	59.8 - 33.9	67.5 - 29.4	68.2 - 54.4	75.1 - 51.3	60.4 - 45.5	50.9 - 37.1
LHX	[] L3HARRIS TECHNOLOGIES, INC.		DEC	9.1	5.2	7.4	5.8	4.4	2.6	-29.0	-29.1	-26.9	-26.1	-29.6	-28.3	246.1 - 168.7	231.0 - 142.0	217.3 - 129.5	175.5 - 123.2	144.9 - 99.1	107.5 - 71.0
LMT	[] LOCKHEED MARTIN CORPORATION		DEC	22.8	24.3	22.0	17.6	6.8	17.1	-12.3	-30.4	-40.0	-47.4	-55.7	-47.5	397.0 - 319.8	442.5 - 266.1	400.0 - 256.8	363.0 - 241.2	323.9 - 248.0	269.9 - 200.5
MRCY	† MERCURY SYSTEMS, INC.		JUL	1.1	1.6	1.0	0.9	0.6	0.6	6.7	10.3	9.5	2.1	4.7	0.3	88.8 - 44.4	96.3 - 52.2	89.4 - 43.0	57.3 - 30.1	55.0 - 29.3	32.8 - 15.7
MOG.A	§ MOOG INC.		OCT	4.9	0.3	5.0	2.6	3.9	3.5	13.8	10.5	13.2	9.5	9.3	3.8	92.0 - 67.8	95.9 - 32.5	98.5 - 74.0	93.9 - 68.4	90.0 - 60.3	73.1 - 38.1
NPK	§ NATIONAL PRESTO INDUSTRIES, INC.		DEC	3.6	6.7	6.0	5.7	7.6	6.4	48.2	50.7	49.9	50.7	50.5	48.0	117.9 - 78.3	97.9 - 66.6	133.1 - 80.4	140.3 - 88.8	121.4 - 91.8	108.8 - 72.3
NOC	[] NORTHROP GRUMMAN CORPORATION		DEC	43.5	19.0	13.2	18.5	16.3	11.3	-33.1	-46.3	-65.1	-69.5	-30.9	-41.4	408.0 - 282.9	385.0 - 263.3	383.9 - 237.1	360.9 - 223.6	311.2 - 223.9	253.8 - 175.0
PKE	§ PARK AEROSPACE CORP.	#	FEB	0.4	0.2	0.5	5.6	1.0	0.5	6.2	6.2	6.4	7.3	6.2	8.5	16.2 - 12.7	18.1 - 9.1	23.3 - 14.9	24.2 - 16.5	20.2 - 16.0	19.6 - 13.7
RTX	[] RAYTHEON TECHNOLOGIES CORPORATION		DEC	2.6	-2.6	6.4	6.5	5.7	6.1	-13.4	-15.0	-22.5	-42.4	-18.0	-19.0	92.3 - 65.0	158.4 - 48.1	151.1 - 103.2	144.2 - 100.5	128.5 - 106.9	111.7 - 83.4
TXT	[] TEXTRON INC.	#	JAN	NA	3.3	1.4	3.5	4.8	1.1	0.0	21.5	16.3	14.8	12.6	12.6	78.2 - 44.4	51.5 - 20.3	58.0 - 42.3	72.9 - 43.3	57.7 - 43.7	49.8 - 30.7
BA	[] THE BOEING COMPANY		DEC	-7.2	-20.9	-1.1	17.9	13.9	7.8	-43.5	-50.2	-35.6	-19.3	-11.0	-11.4	278.6 - 185.3	350.0 - 89.0	446.0 - 309.4	394.3 - 292.5	299.3 - 155.2	160.1 - 102.1
TDG	[] TRANSDIGM GROUP INCORPORATED		SEP	10.4	9.0	13.8	16.2	7.9	10.4	-258.6	-265.9	-251.7	-186.2	-200.5	-151.8	688.0 - 517.4	673.5 - 200.1	597.9 - 324.9	377.7 - 265.3	295.0 - 203.7	294.4 - 180.8
TGI	§ TRIUMPH GROUP, INC.	#	MAR	NA	-8.6	-0.6	-6.6	-8.6	-0.9	0.0	-22.5	-32.3	-31.8	-13.1	-18.2	24.5 - 10.5	26.2 - 3.0	29.4 - 11.2	30.1 - 11.4	34.8 - 19.7	40.4 - 22.4
WWD	† WOODWARD, INC.		SEP	3.2	3.7	4.0	2.8	3.2	2.9	13.5	9.2	5.1	0.4	10.5	7.5	130.8 - 101.3	129.1 - 46.5	124.8 - 70.6	89.3 - 68.4	82.9 - 65.2	71.5 - 41.2

Note: Data as originally reported. CAGR-Compound annual growth rate.
[]Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.
Souce: S&P Capital IQ.

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