



**2017 Global aerospace and defense sector
financial performance study**

Defense subsector expands, while commercial
aerospace growth slows down

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Foreword

As the newly appointed Deloitte Global Aerospace & Defense leader, it is my privilege to share with you the 2017 Global aerospace and defense sector financial performance study. Each year, Deloitte produces a comprehensive financial analysis of the global aerospace and defense industry.

The 2017 study looks at the top 100 companies (or business segments of conglomerates) that have generated at least US\$500 million in revenues in 2016. This assessment allows Deloitte to provide industry executives with a detailed understanding of how their sector is performing and how the aerospace and defense segments are performing relative to each other.

A new section we have added this year analyzes the top 20 companies' 'Letters to Shareholders' to provide insight on what C-suite executives are saying about their performance and strategic focus areas for the future.

I hope that you will find this report informative and something that you can readily reference for your business. And as always, we welcome your feedback and suggestions as we endeavor to make future reports even more valuable for you and your company.

Robin S. Lineberger

Deloitte Global Aerospace & Defense leader

Executive summary

Global aerospace and defense sector revenue growth is slowing, marginally outpacing global gross domestic product growth. Global aerospace and defense (A&D) sector revenues grew 2.4 percent in 2016, adding US\$15.7 billion in revenues, to reach US\$674.4 billion. Although the growth rate declined from 3.8 percent in 2015, it slightly outperformed the estimated global gross domestic product (GDP) growth of 2.3 percent.¹ This growth was driven primarily by the European commercial and US defense subsectors.

Global commercial aerospace revenue growth slowed from 6.3 percent in 2015 to 2.7 percent in 2016. Revenue for the subsector increased from US\$314.7 billion in 2015 to US\$323.1 billion. The European subsector recorded strong growth at 6.7 percent, while in the US growth was marginal, at 1.3 percent. This is a direct result of a 1.8 percent decline in aircraft deliveries in the US, while in Europe, deliveries increased by 8.3 percent. Aircraft backlog remained at an all-time high, having grown by 1.6 percent to 13,687 in 2016.

The global defense subsector continued to recover as global defense spending increased. Following a recovery in 2015, global defense revenue grew 2.1 percent, or US\$7.2 billion, in 2016 to US\$351.3 billion. Global defense spending rose 0.6 percent, with US defense expenditure up 1.7 percent.² The primary factor in the improvement was likely the 3.1 percent growth in US defense revenues resulting from the 3.6 percent increase in funding from the US Department of Defense (DoD), the subsector's largest customer.³ In contrast, the European defense subsector revenues grew only 0.6 percent while defense spending in Europe increased 2.8 percent.⁴ Despite more spending, European defense revenue growth declined, likely due to a US\$1.3 billion negative impact to the top line of Airbus' Defense & Space division, resulting from its ongoing portfolio reshaping.

European A&D sector revenue growth continues to outperform the US sector. In 2016, European A&D companies posted 3.7 percent year-on-year (YoY) growth, slightly outpacing the US sector's 2.4 percent growth. This outperformance echoes the results of 2015, when Europe's A&D sector grew by 8.2 percent while US revenues increased by only 1.4 percent. The growth in Europe in 2016 was primarily driven by the commercial aerospace subsector, which grew 6.7 percent largely as a result of an increase in commercial aircraft deliveries. On the other hand, the European defense subsector grew by only 0.6 percent as compared to 3.1 percent for the US defense subsector.

Revenue growth was led by incremental revenues in the original equipment manufacturers and electronics segment. These companies added US\$3.4 billion and US\$3.7 billion, respectively. Growth in the OEM segment is likely attributed to robust revenue increase at Airbus Group, which added US\$2.4 billion, and Lockheed Martin, which contributed US\$1.9 billion in revenues in 2016. In the electronics segment, Harris Corp. was the leading contributor to revenue, adding US\$2.4 billion, mainly led by the acquisition of Exelis.⁵

Global A&D sector operating margin continues to hold, with the European sector improving as the US sector declines. Operating margins for the sector sustained a double digit margin of 10.4 percent, holding near the 10.5 percent in 2015. Margins for the US sector declined 2.5 percent to 11.5 percent, whereas the European sector reported an operating margin of 9.6 percent, up 5.3 percent. This growth trend was primarily led by improvements at Airbus, Rolls-Royce and Safran. As a result, the gap between the US and Europe has narrowed to 1.8 percent from 2.3 percent in 2015. European improvement indicates greater focus on rationalizing assets and reducing operating expenses. Efforts to achieve scale with cross-border European alliances and joint ventures have increased over the past decade and are likely to continue as pricing pressure and greater competition increases from Russia, China and other nations.

Global defense operating margin growth strengthens as commercial aerospace margins tighten. The commercial aerospace subsector's operating margin declined 9.4 percent in 2016 compared with defense companies' operating margins, which grew 5.3 percent, despite only a 2.1 percent revenue increase in 2016. Commercial subsector operating margins fell to 9.1 percent, while defense companies' operating margins increased to 11.5 percent. Growth in defense subsector margins was led by strong operating performance at Rolls-Royce and Lockheed Martin.

Propulsion segment was the leader in operating margins. However, Tier 2 suppliers now rank second. They have earned close to 20 percent margins in the past and continued to outperform Tier 1 suppliers. In 2016, operating margins improved from 18.0 percent to 19.2 percent for the propulsion segment and from 16.7 percent to 17.9 percent for Tier 2 suppliers. Tier 1 suppliers' operating margins sustained a 10.0 percent margin in 2016, yet was much lower than the Tier 2 segment margins.

Sector productivity experienced a moderate improvement in 2016, led by strong growth in Europe. A&D productivity grew 1.9 percent in 2016 after a string of significant improvements in the recent past, recording strong growth of 7.6, 7.7, and 11.7 percent in the years between 2012, 2013, and 2014, respectively. Productivity among global A&D companies averages US\$36,504 per employee, slightly higher as the employee base declined 1.1 percent and operating profit grew marginally. The European A&D sector experienced solid productivity growth of 11.1 percent, while productivity in the US increased only by 1.1 percent. However, productivity levels per employee continue to differ significantly and the US leads Europe at US\$42,817 and US\$31,970, respectively.

Debt levels continue to rise as companies increase leverage to finance acquisitions, share buybacks, and develop new and innovative products. Debt-to-equity ratio for the global A&D sector weakened 39.4 percent from 1.18 times in 2015 to 1.65. The US sector's debt-to-equity ratio deteriorated 34.2 percent rising from 1.79 to 2.40. As interest rates remained low, increased debt levels, especially in the US, were used to finance share buybacks, acquisitions and product development. Although European A&D companies saw their debt-to-equity ratio weaken to 1.58 in 2016, they remained much stronger than the US sector.

US and European A&D equities outperformed their respective market indices. US companies significantly outperformed the Standard & Poor's (S&P) 500 index, which was up 11.2 percent when compared to the Dow Jones A&D index, which was up 17.9 percent. Similarly, the European companies' performance was up 4.9 percent in 2016, outperforming the STOXX 600 Index, which grew at only 1.3 percent.

Figure 1. Summary of key drivers of 2016 global aerospace and defense sector revenue and earnings performance

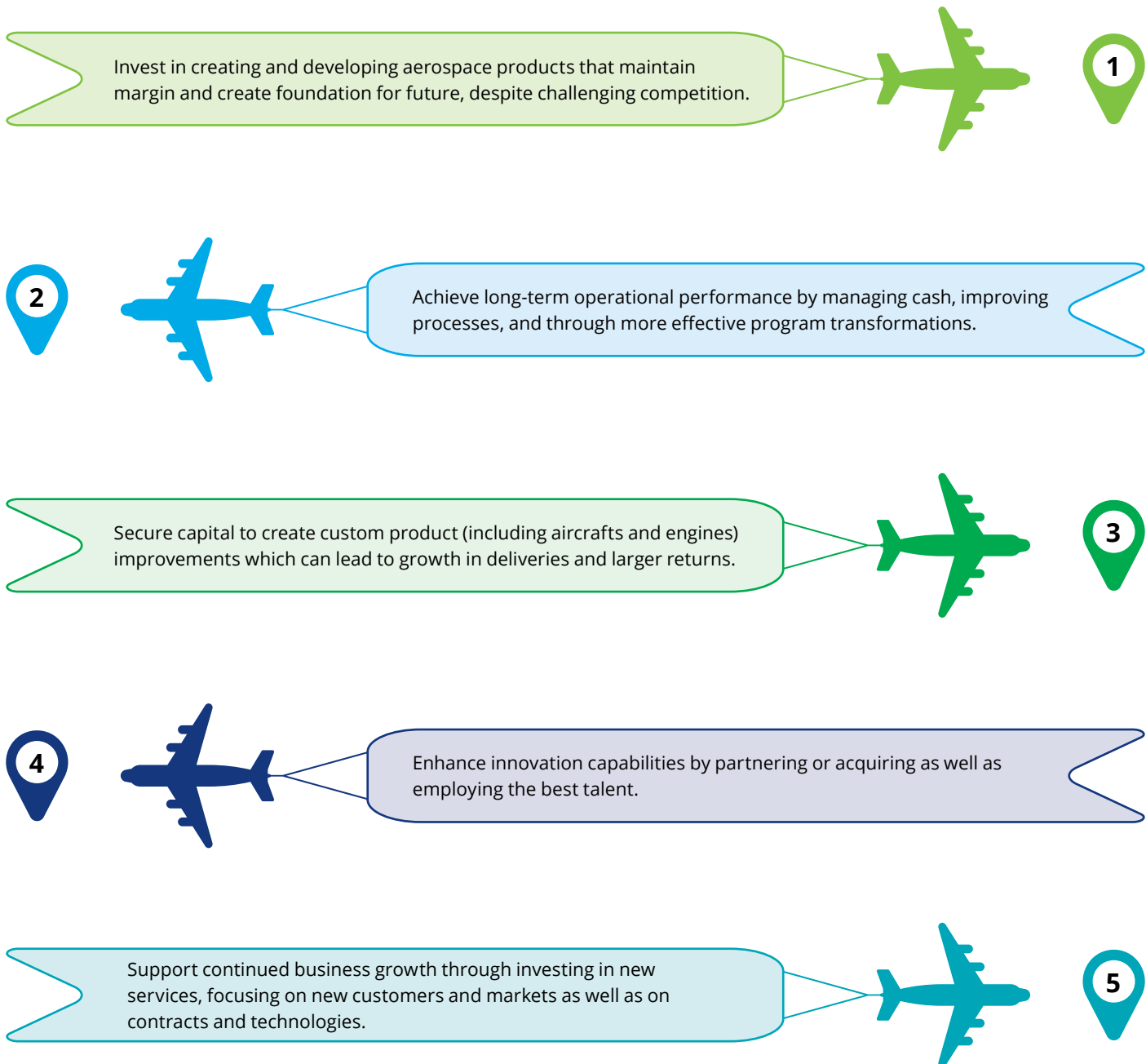
Revenue growth	US\$ billion
• Growth from electronics segment	\$3.7
• Growth from OEM segment	\$3.4
• Growth from Tier 1 segment	\$2.0
• Growth from Tier 2 segment	\$2.0
• Growth from propulsion segment	\$1.9
• Growth from services segment	\$1.8
• Other*	\$0.7
Total revenue growth	\$15.7
Core operating earnings:	US\$ billion
• Increased performance of European defense subsector	\$2.0
• Decreased performance of European commercial aerospace subsector	(\$0.2)
• Increased performance of the US defense subsector	\$1.7
• Decreased performance of the US commercial aerospace subsector	(\$1.8)
• Other*	(\$1.2)
Total increase in operating earnings	\$0.5

*For revenue, 'other' includes revenue growth from aerostructures and the Tier 3 segment. For core operating earnings, 'other' includes some companies from outside the US and Europe, such as Brazil, Canada, Israel, Japan, Singapore, China, South Korea, Australia and Taiwan. Companies from these regions are not included in the "US" and the "European" region totals, but have been included in "other".

Source: Deloitte Global analysis of the 100 major global aerospace and defense companies using public company filings and press releases. See methodology section for further information and definitions of financial metric, as well as company name, reports, and dates. Note that all figures are in US\$.

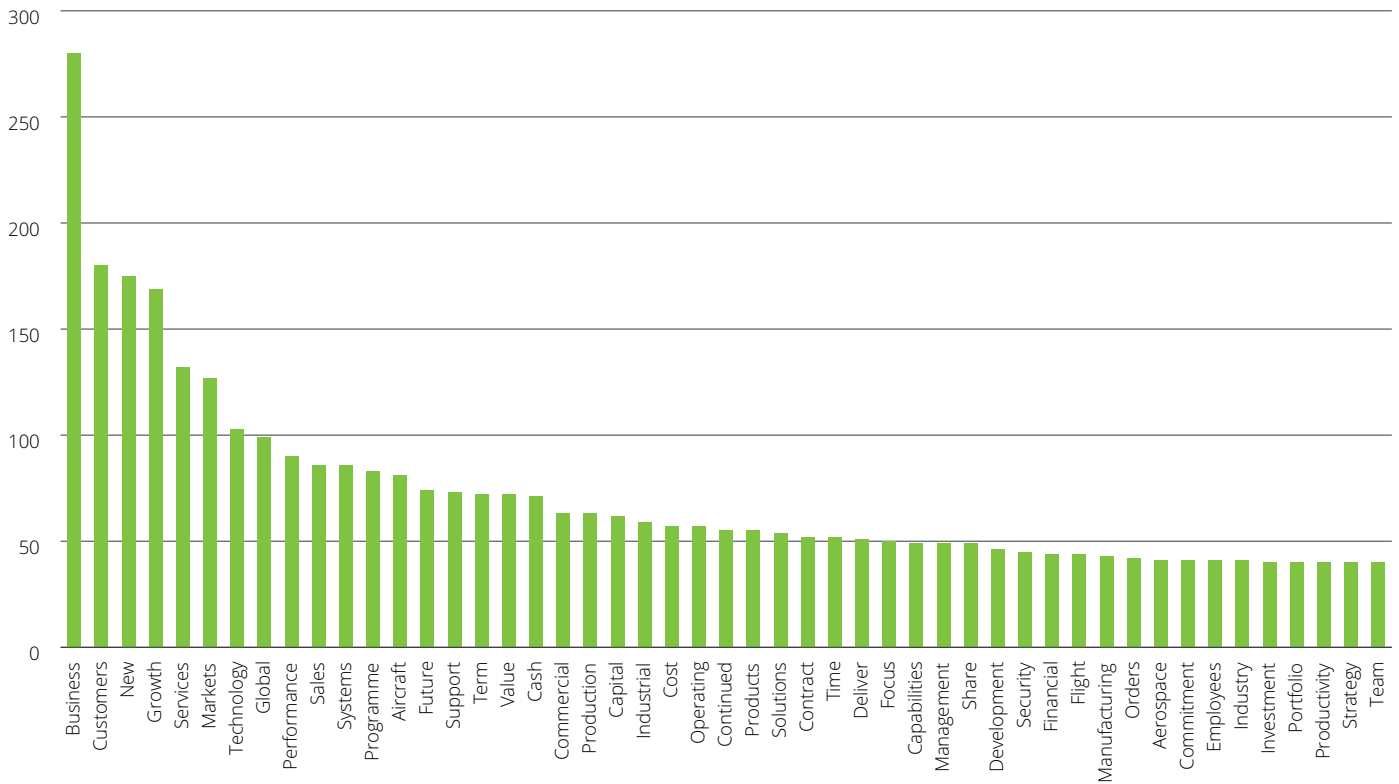
Using topic modeling to group the most frequent words used into different categories, we were able to uncover five key themes that underline the strategic focus for the top 20 A&D companies.

Figure 3. Broad themes that top A&D companies are focusing on and communicating to stakeholders



Source: Deloitte Global analysis based on the 2016 annual reports of the top 20 A&D companies.

Figure 4. Most frequent single words used in 2016 'Letter to Shareholders' of top 20 A&D companies



Source: Deloitte Global analysis based on the 2016 annual reports of the top 20 A&D companies.

Methodology: For the above analysis, we collated the 'Letters to Shareholders' of the top 20 A&D companies, which were pulled from each company's latest annual report. We conducted text analytics using text mining and topic modeling packages in "R", an open source software for statistical computation. This provided us with results of the most frequently appearing words as well as a list of the most frequent words grouped into different categories.

Scope of the study

The 2017 Global aerospace and defense sector financial performance study analyzes the top global A&D companies or those units of industrial conglomerates with A&D businesses that reported revenues of more than US\$500 million in 2016 with financial statements filed by 31 December 2016, unless otherwise specified. Figure 5 lists the 100 companies and divisions included in the analysis. The study does not include A&D organizations such as government-controlled entities, private companies that do not release public filings or public companies that do not report A&D business segment information. In addition, certain companies from last year's study were excluded if they did not fulfill the study criteria, that is, companies from previous years with 2016 revenues of less than US\$500 million, companies from previous years that have been subsequently bought by others and companies from previous years' lists that have become (or will become) private, were not included in the 2016 analysis. Please refer to the methodology section for more details.

The study was conducted by assessing performance based on calculating 29 key financial metrics. These include key metrics, such as, revenue, operating earnings, operating margin, return on invested capital (ROIC), free cash flow (FCF), free cash margin (FCM), book-to-bill (BTB) ratio, employee productivity and equity market performance. All financial metrics in the study are based on a constant currency conversion (using US\$) method to eliminate the impact of foreign exchange fluctuations on company or sector performance. However, please note that we have not restated the effects of currency hedging policies. Where metrics were compared to previous years, we restated the previous year's numbers to be consistent.

Financial performance metrics at the company level are cited throughout this study, especially for the top performing companies and, selectively, for the lower performers. However, metrics for a given company should not be viewed in isolation, as there typically unique transactions for individual metrics by company, e.g., prior year acquisitions, special circumstances, etc. The combined metrics for a given company, taken as a whole, are more likely to form the basis for an overall assessment of the financial performance of both the global A&D sector and individual companies.

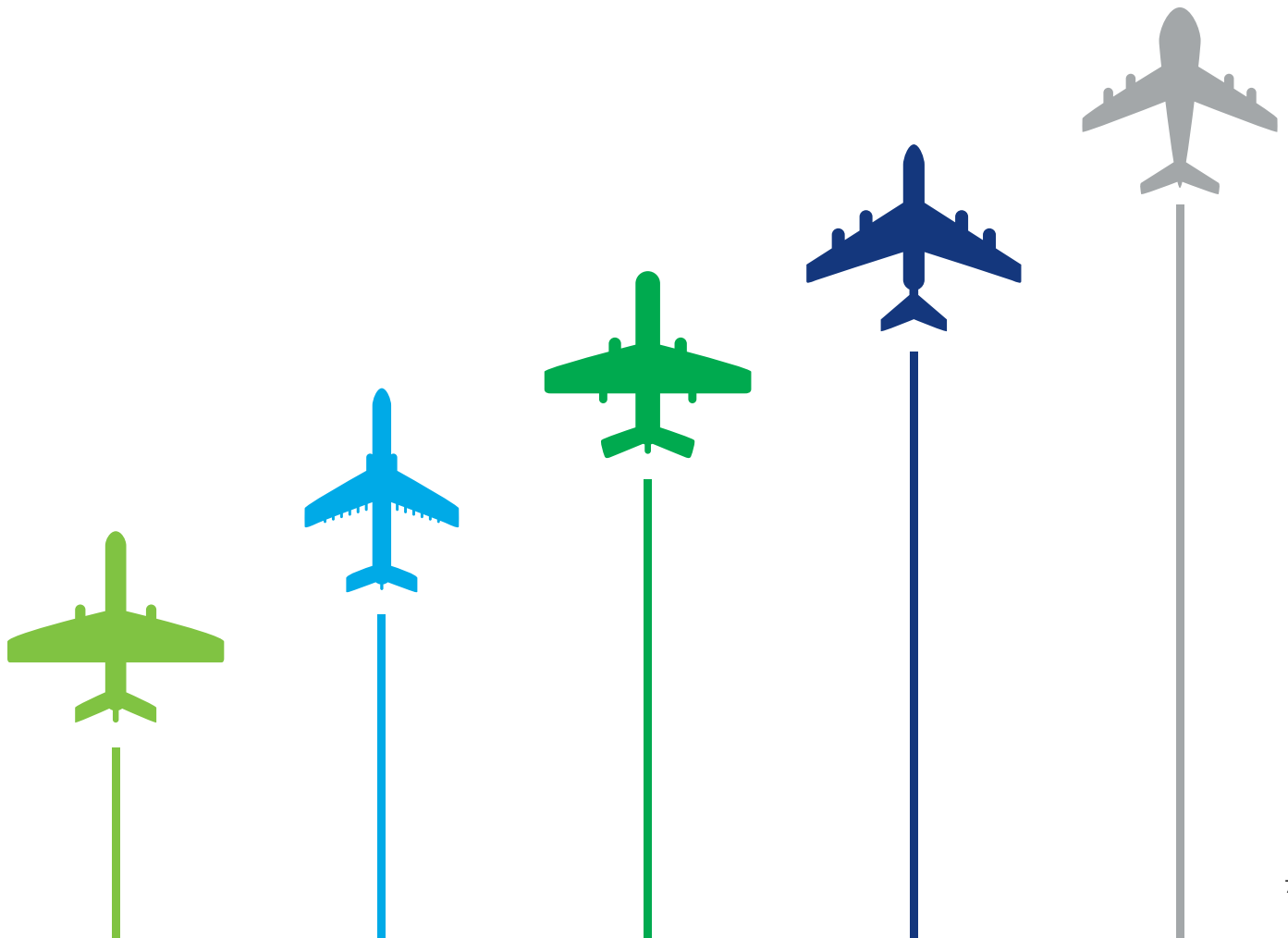


Figure 5. Global aerospace and defense companies included in the analysis**Global aerospace and defense companies or divisions included in this study ranked by 2016 revenue**

1. Boeing	35. Dassault Aviation	69. Oshkosh Defense*
2. Airbus Group	36. Triumph Group	70. BWX Technologies*
3. Lockheed Martin	37. Leidos Holdings	71. Woodward Aerospace*
4. General Dynamics	38. Saab	72. Curtiss-Wright*
5. United Technologies Corporation*	39. Rheinmetall Defence*	73. Vectrus Inc.
6. GE Aviation*	40. Elbit Systems	74. HEICO Corporation
7. Northrop Grumman	41. Transdigm Group	75. Fluor Corp*
8. BAE Systems	42. B/E Aerospace	76. LSI Aerospace
9. Raytheon	43. Korea Aerospace Industries	77. Austal Ltd.
10. Safran	44. Jacobs Engineering Group*	78. FACC AG
11. Thales Group	45. Cobham	79. QinetiQ*
12. Leonardo	46. BBA Aviation	80. Constellium*
13. Rolls-Royce	47. CACI	81. Senior Aerospace
14. Honeywell Aerospace*	48. Meggitt	82. Amphenol*
15. L3 Technologies	49. Parker Hannifin Aerospace	83. Cubic Corp.
16. Textron	50. Engility	84. Ultra Electronics*
17. Bombardier Aerospace*	51. CSRA Inc.	85. Aerospace Industrial Development
18. Mitsubishi Heavy Industries Aerospace*	52. Hanwha Techwin*	86. JAMCO Corp.
19. Harris Corp.	53. thyssenkrupp Marine Systems GmbH*	87. Ball Aerospace
20. Huntington Ingalls Industries	54. CAE Inc.	88. OHB Technology
21. Spirit Aerosystems	55. GenCorp/Aerojet Rocketdyne Holdings	89. SKF Group*
22. Embraer	56. Eaton Aerospace*	90. Magellan Aerospace
23. Zodiac Aerospace	57. Hexcel Corp.	91. DigitalGlobe Inc.
24. AviChina Industry & Tech.	58. Solvay Group*	92. Smiths Detection*
25. Arconic*	59. AAR Corp.	93. Kaman Aerospace*
26. Rockwell Collins	60. ManTech Int'l Corp.	94. Kratos Defense & Security Solutions
27. MTU Aero Engines	61. Allegheny Technologies*	95. Indra Sistemas*
28. Kawasaki Aerospace and Gas*	62. MOOG	96. Chemring
29. Singapore Technologies Engineering Ltd.	63. MacDonald, Dettwiler and Associates	97. Teledyne Technologies*
30. GKN Aerospace*	64. Esterline Technologies*	98. Astronics Corp*
31. Orbital ATK	65. Serco Defence	99. Kongsberg Defence Systems
32. SAIC	66. Wesco Aircraft	100. Ducommun*
33. Babcock International	67. Fuji Aerospace*	
34. IHI Aero Engine & Space*	68. KLX Inc*	

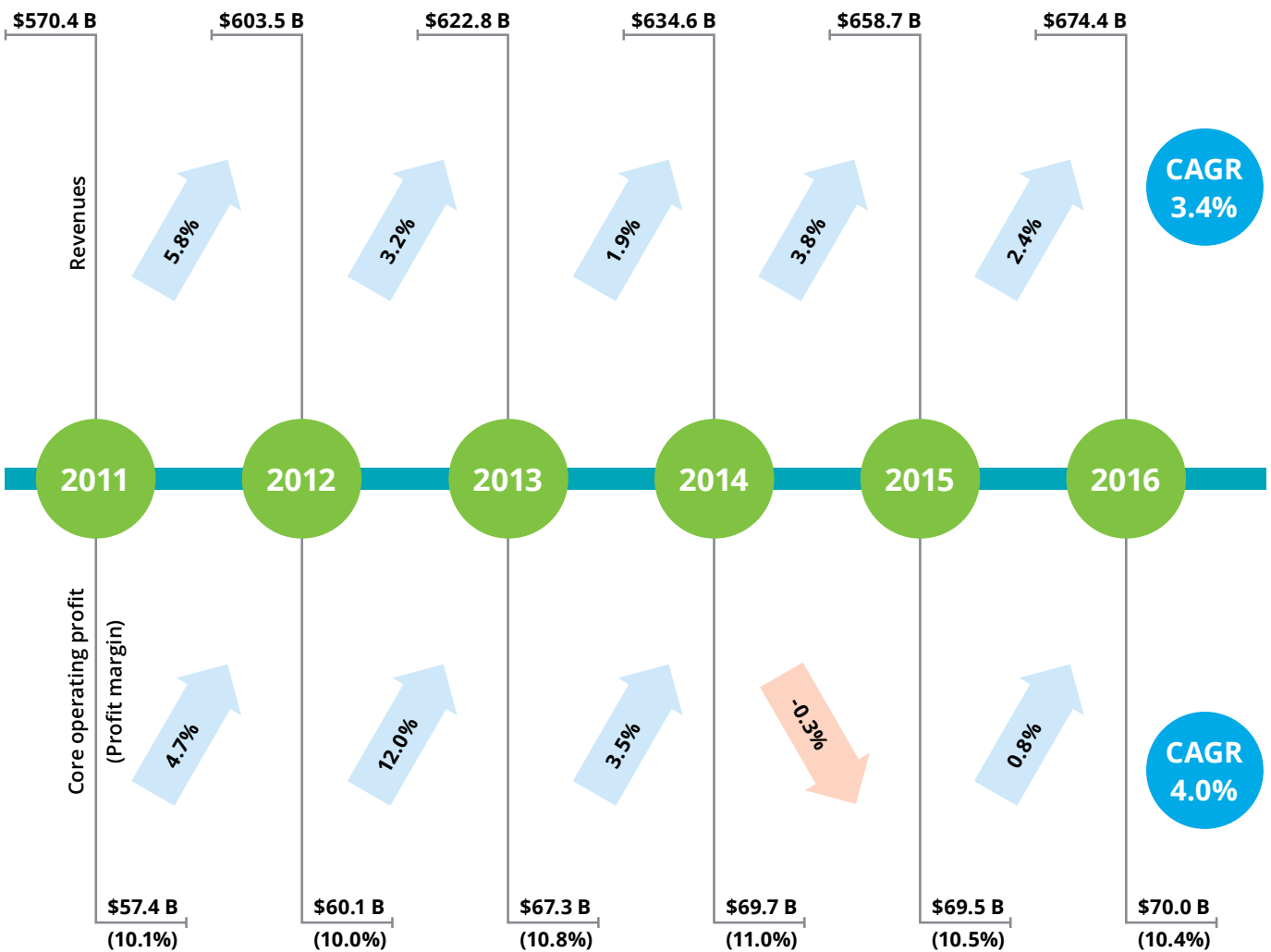
*Partial company results based on aerospace and defense (A&D) activity, identified by A&D specific business segment where possible. Ranking is based on A&D sector related revenues of the company.

Source: Deloitte Global analysis of the 100 major global A&D companies using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Global A&D sector performance: An overview

Revenues of the top 20 global A&D companies accounted for nearly 73.7 percent of the global A&D sector revenues in 2016 (in line with the 74.2 percent in 2015), reflecting continued sector concentration. Figure 6 illustrates revenue, operating profit and margin performance for the global A&D sector from 2011 to 2016.

Figure 6. Global aerospace and defense sector revenue and operating margin (2011 to 2016)



Note: A&D sector revenue and operating earnings calculations will differ from previous years' Deloitte Global A&D sector financial performance studies, as the set of companies included in this study is not directly comparable across the years. Also, 2015 and 2016 numbers are based on constant currency basis and 2012 to 2014 have been re-calculated using the growth rates for the respective period with 2015 revenues as the base.

Source: Deloitte Global analysis of the 100 major global A&D companies using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Figure 7 summarizes the key performance metrics of the global A&D sector. Each performance metric is discussed in detail in the subsequent sections of this study.

Figure 7. Global aerospace and defense sector performance in 2016, as compared to 2015

Metric	2015	2016	Change (2016 versus 2015)
Revenues (US\$ billion)	\$658.7	\$674.4	2.4%
Core operating earnings (US\$ billion)	\$69.5	\$70.0	0.8%
Core operating margin (percent)	10.5%	10.4%	(1.6%)
Return on invested capital (percent)	25.3%	26.8%	6.2%
Free cash flow (FCF) (US\$ billion)	\$40.7	\$45.5	11.8%
FCF margin (percent)	6.2%	6.8%	9.2%
Interest coverage ratio (times)	16.8 times	15.0 times	(10.7%)
Current ratio (times)	1.34 times	1.36 times	1.1%
Debt-to-equity ratio* (times)	1.18 times	1.65 times	(39.4%)*
Book-to-bill ratio	1.34 times	1.16 times	(13.2%)
Aerospace and defense (A&D) revenue/employee (US\$)	\$339,620	\$351,692	3.6%
A&D core operating earnings/employee (US\$)	\$35,821	\$36,504	1.9%
Number of A&D employees	1,939,614	1,917,643	(1.1%)

Source: Deloitte Global analysis of the 100 major global A&D companies using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

*A lower debt-to-equity ratio is usually stronger and indicates a more financially stable business, hence, the ratio has weakened 39.6 percent in 2016, even though it has increased in absolute terms.

Figure 8 lists the companies ranked as the top performers in the 29 metrics among the top 100 global A&D companies in this study, according to the methodology used for this report (see the methodology section for more information).

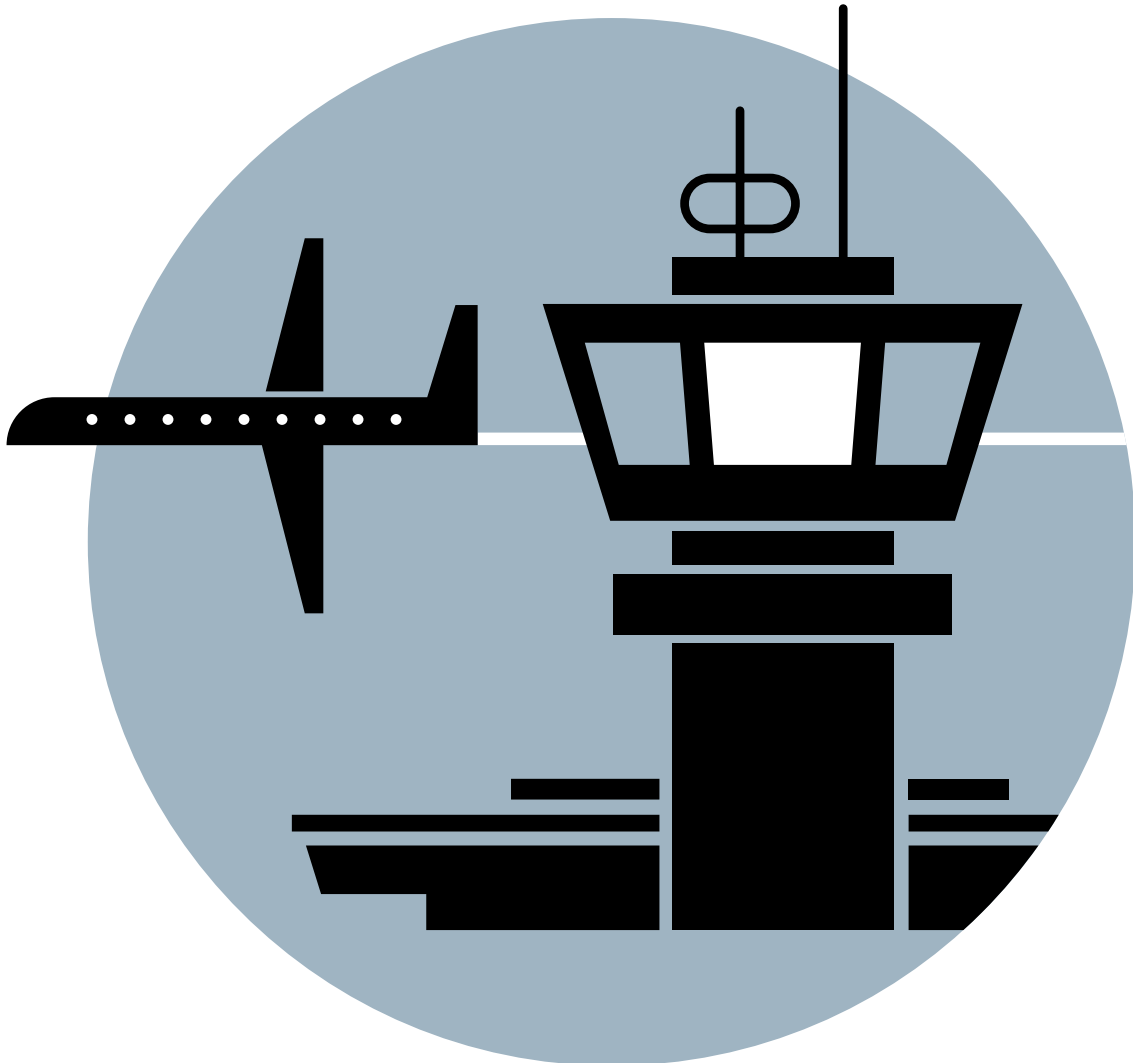
Figure 8. Top ranked company for each of the 29 key 2016 financial performance metrics

Metric	Top ranked company	2016 result
Revenue	Boeing	US\$94,571 million ⁶
Revenue growth	Harris Corp.	46.9 percent
Core operating earnings	GE Aviation	US\$6,115 million
Core operating earnings growth	Oshkosh Defense	1231.5 percent
Core operating margin	Transdigm Group	40.0 percent
Core operating margin growth	Oshkosh Defense	826.2 percent
Return on invested capital (ROIC)	QinetiQ	50.2 percent
ROIC change	Chemring	338.2 percent
Free cash flow (FCF)	GE Aviation	US\$5,775 million
FCF change	Woodward Aerospace	2814.9 percent
Free cash margin	GE Aviation	22.0 percent
FCM change	Woodward Aerospace	2644.0 percent
Cash and cash equivalents change	CSRA Inc.	2511.3 percent
Interest coverage ratio	Fuji Aerospace	226.3 times
Current ratio	KLX Inc.	7.7 times
Debt-to-equity ratio	Jacobs Engineering Group	0.09 times
Book-to-bill	Dassault Aviation	2.71 times
BTB change	Bombardier Aerospace	666.8 percent
Backlog	Airbus Group	US\$1,173,809 million
Backlog change	Ball Aerospace	126.9 percent
Number of aerospace and defense employees	Boeing	150,500 ⁷
Employee additions	Leidos Holdings	11,451
Employee additions growth	Leidos Holdings	93.4 percent
Revenue per employee	Fuji Aerospace	US\$956,139
Revenue per employee growth	Harris Corp.	56.0 percent
Core operating earnings per employee	KLX Inc.	US\$145,622
Core operating earnings per employee growth	Oshkosh Defense	819.9 percent
Share price change	SAIC	85.2 percent

Source: Deloitte Global analysis of the 100 major global A&D companies using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

The following sections discuss the 2016 financial performance of the global A&D sector based on company type and geography, as well as on a consolidated basis:

- Global A&D sector performance: A detailed analysis
- Global commercial aerospace subsector compared with defense subsector
- Comparison of US and European A&D sector performance
- Comparison of US and European defense subsector performance
- Segment performance



2016 global A&D sector performance: A detailed analysis

Revenue: Global A&D sector revenues grew by 2.4 percent to US\$674.4 billion in 2016 from US\$658.7 billion in 2015 (see Figure 9). Both the commercial aerospace and defense subsectors contributed to the growth in 2016, with revenues up 2.7 percent and 2.1 percent, respectively. For the commercial aerospace subsector, aircraft deliveries were strong in Europe, whereas the US experienced a marginal decline. Although commercial aircraft deliveries dropped slightly in the US, the industry still set a record high of 1,436 aircraft delivered globally.

Continued increase in production is driving parallel revenue growth for Tier 1 and Tier 2 suppliers and the aerostructures and propulsion segment companies. Airbus reported a strong revenue growth of 3.3 percent, while Boeing saw a 1.6 percent decline in revenue. Growth in the defense subsector increased to 2.1 percent year on year (YoY) in 2016, primarily driven by strong performance in the US. The US defense subsector revenues for the top 20 companies grew 1.8 percent YoY in 2016, whereas, Europe's top 20 defense contractors' revenues remained flat. Strong growth in the US defense subsector was primarily due to the increase in US Department of Defense (DoD) funding, whose budgets increased 3.6 percent in 2016.⁸

Boeing, the largest global A&D company in terms of revenues, reported a 1.6 percent decrease in revenues, to US\$94.6 billion, in 2016 from US\$96.1 billion the previous year. The decline was primarily due to fewer commercial deliveries and lower defense revenues. Boeing's Commercial Airplanes segment delivered 748 aircraft in 2016 compared to 762 aircraft in 2015.⁹ This led to a 1.5 percent decrease in revenues for the segment in 2016. Boeing's Defense, Space and Security division reported revenues of US\$29.5 billion, down 2.9 percent YoY due to lower revenues from its Boeing Military Aircraft and Network & Space Systems segments.¹⁰ Airbus Group, the second-largest global A&D company, recorded a 3.3 percent increase in revenues in 2016 to US\$73.7 billion. In 2016, Airbus delivered 688 aircraft, including 545 of the A320 family and 28 A380s, up from 635 aircraft deliveries in 2015.¹¹

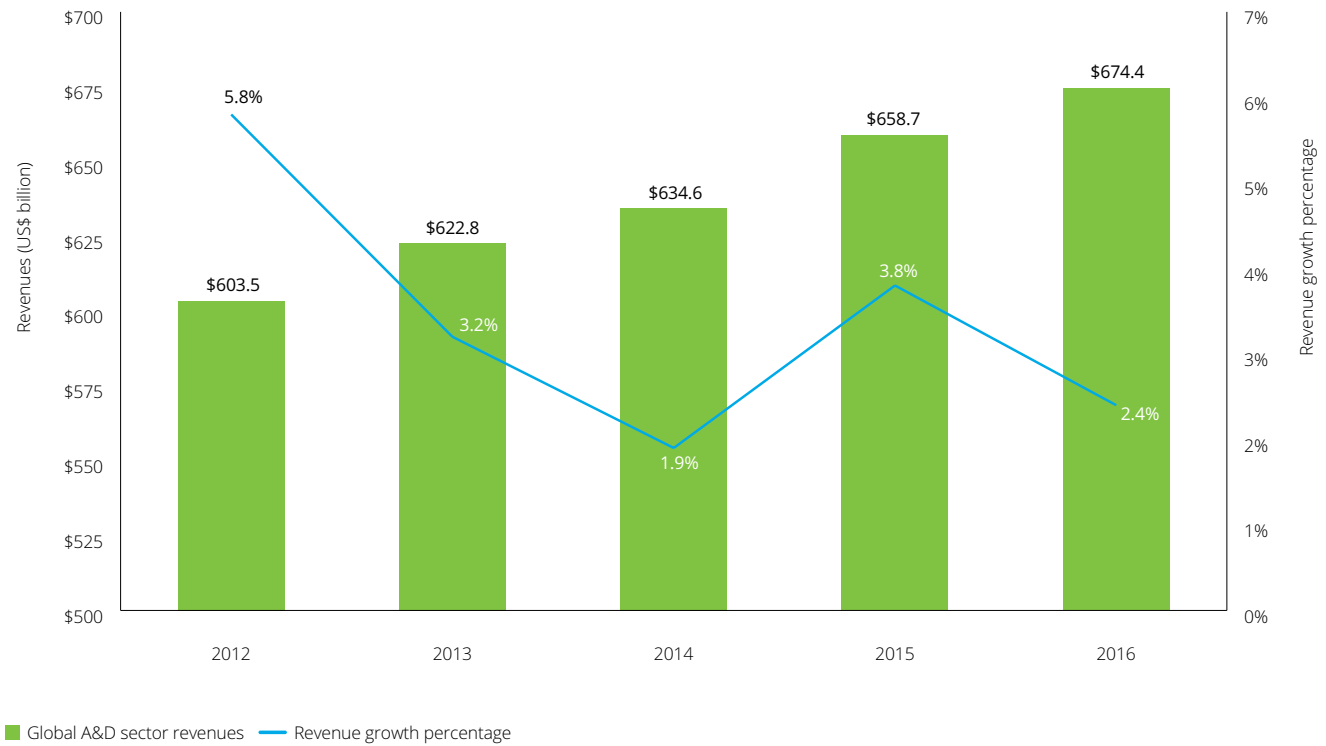
The third-largest revenue generator, Lockheed Martin, experienced a revenue increase of 4.1 percent to US\$47.2 billion in 2016, as compared to US\$45.4 billion in 2015. We have used Lockheed Martin's pro forma revenue for 2015 (as if Sikorsky would have been included in 2015 financial results) with its 2016 results. Revenue growth was mainly led by increased F-35 production and higher deliveries for the C-130 program.¹²

In terms of rank order of revenues, BAE Systems' position moved up to the eighth spot from ninth in 2016. Leonardo (previously known as Leonardo Finmeccanica) moved down to the twelfth spot as it experienced a decline in revenue in 2016, largely due to a weaker performance in the helicopters segment. Harris Corp. made an entry to the top 20 list after its acquisition of Exelis, while Precision Castparts exited the top 20 as a result of being acquired by Berkshire Hathaway. Although there was a minor change in the rankings of the top 10 A&D companies, the ranking movements in the top 20 list reflect industry consolidation as well as acquisition of A&D companies by non-A&D businesses.

Of the 100 companies in this study, 29 reported a decline in revenues in 2016 versus 34 that experienced negative growth in revenues in 2015, with Amphenol, Bombardier Aerospace, MOOG, OHB Technology and QinetiQ having two consecutive years of revenue decline. Of the 29 companies, Dassault Aviation experienced the largest revenue decline of 14.1 percent or US\$653 million in 2016, primarily due to lower defense sales and decline in Falcon deliveries.¹³

The following chart illustrates a five year perspective on revenue growth, showing continued and consistent growth, but with a slowdown in the rate of growth starting in 2012, hitting a low in 2014, with a return to higher growth in 2015.

Figure 9. Five-year history of global aerospace and defense sector revenue and growth performance



Note: A&D sector revenue calculations will differ from previous years' Deloitte Global A&D sector financial performance studies, as the set of companies included in this study is not directly comparable across the years. Also, 2015 and 2016 numbers are based on constant currency basis and 2012 to 2014 have been re-calculated using the growth rates for the respective period with 2015 revenues as the base.

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.



Figure 10. Top 20 aerospace and defense companies by 2016 revenue

Rank	Company	US\$ million
1.	Boeing	\$94,571
2.	Airbus Group	\$73,699
3.	Lockheed Martin	\$47,248
4.	General Dynamics	\$31,353
5.	United Technologies	\$28,925
6.	GE Aviation	\$26,261
7.	Northrop Grumman	\$24,508
8.	BAE Systems	\$24,129
9.	Raytheon	\$24,069
10.	Safran	\$18,247
11.	Thales	\$15,037
12.	Leonardo	\$13,287
13.	Rolls-Royce	US\$12,150
14.	Honeywell Aerospace	US\$11,696
15.	L3 Technologies	US\$10,511
16.	Textron	US\$9,916
17.	Bombardier Aerospace	US\$8,765
18.	Mitsubishi Heavy Industries Aerospace	US\$8,244
19.	Harris Corp.	US\$7,467
20.	Huntington Ingalls Industries	US\$7,068

Figure 11. Top 20 aerospace and defense companies by 2016 revenue growth

Rank	Company	%
1.	Harris Corp.	46.9%
2.	Oshkosh Defense	43.8%
3.	SKF	43.7%
4.	GKN Aerospace	43.4%
5.	Hanwha Techwin	34.8%
6.	Chemring	26.5%
7.	Meggitt	23.8%
8.	BBA Aviation	20.5%
9.	FACC AG	19.2%
10.	JAMCO Corp.	19.0%
11.	HEICO Corp.	18.5%
12.	Transdigm Group Inc.	17.6%
13.	Kaman Aerospace	17.5%
14.	Senior Aerospace	15.7%
15.	Rheinmetall Defence	13.7%
16.	Smiths Detection	12.6%
17.	Leidos Holdings, Inc.	12.5%
18.	CAE Inc.	11.5%
19.	CACI	10.0%
20.	Indira Sistemas	7.7%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

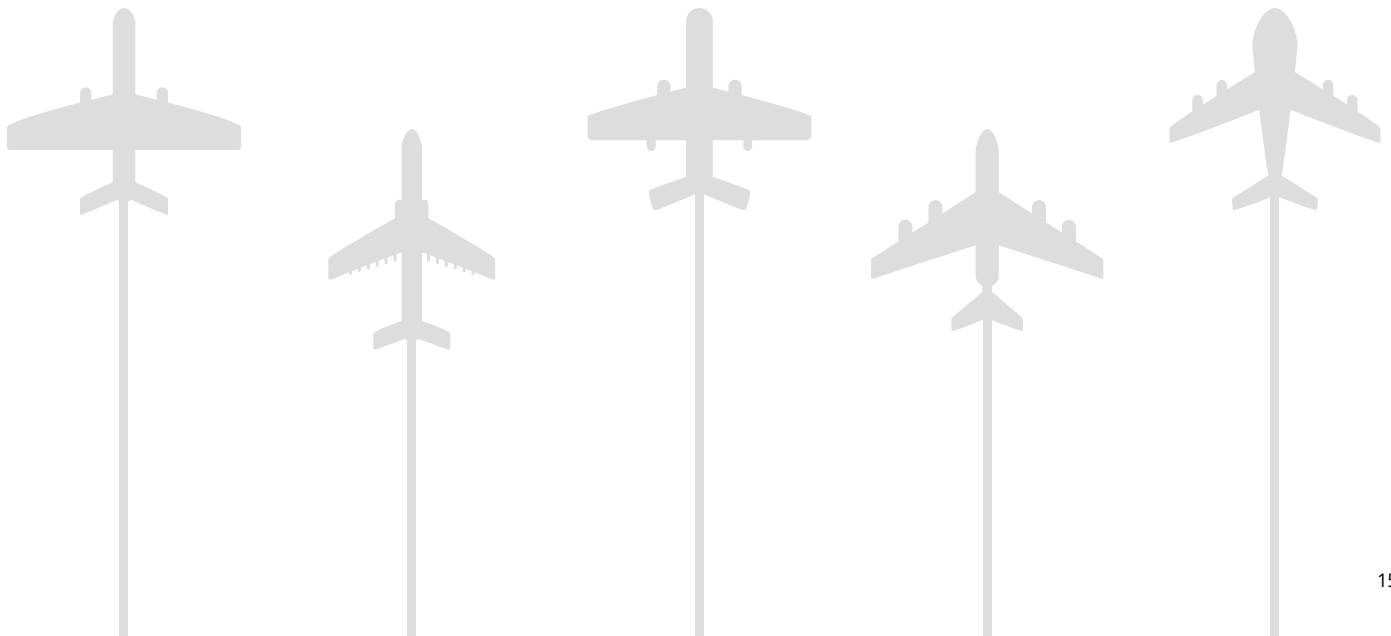


Figure 12. Top 10 aerospace and defense companies by revenues in 2016 and their movement in rank compared to 2015

Company	2015 Revenues (US\$ million)	Rank in 2015	Movement in rank	2016 Revenues (US\$ million)	Rank in 2016
Boeing	\$96,114	1	↔	\$94,571	1
Airbus Group	\$71,340	2	↔	\$73,699	2
Lockheed Martin	\$45,366	3	↔	\$47,248	3
General Dynamics	\$31,469	4	↔	\$31,353	4
United Technologies	\$27,797	5	↔	\$28,925	5
GE Aviation	\$24,660	6	↔	\$26,261	6
Northrop Grumman	\$23,526	7	↔	\$24,508	7
BAE Systems	\$22,769	9	↑	\$24,129	8
Raytheon	\$23,247	8	↓	\$24,069	9
Safran	\$17,959	10	↔	\$18,247	10

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

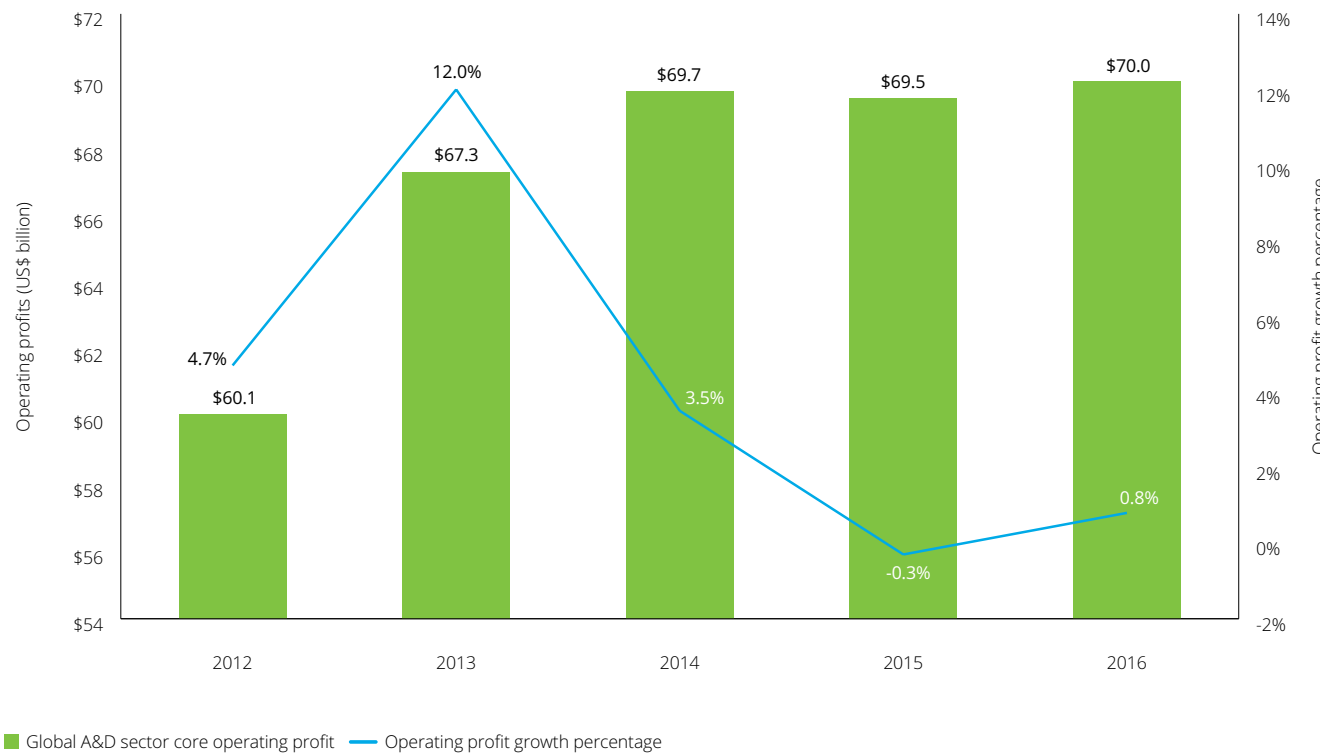


Operating earnings: The global A&D sector’s reported operating income rose 7.9 percent in 2016. However, this significant boost was primarily due to a loss reported by Bombardier in 2015 (due to one-time program adjustments on the C Series program), which suppressed the sector operating profit for 2015.¹⁴ On an adjusted basis, core operating earnings for the sector were up marginally by 0.8 percent in 2016, led by strong operating performance of the global defense subsector and offset by a decline in earnings for the commercial aerospace subsector.

Defense subsector core earnings grew by 7.6 percent and outperformed the operating performance of the commercial aerospace subsector, which experienced a 7.0 percent dip in core operating profit in 2016. The decrease in core operating earnings for the commercial aerospace subsector was likely the result of overall increases in costs. In the A&D sector, profitability is not uniform across the different segment and supplier tiers as OEMs and platform companies historically experienced significantly lower margins than many of their suppliers. Top performing engine and Tier 2 suppliers historically have earned close to 20 percent operating margins. On the other hand, the services segment and Tier 3 suppliers typically lag A&D sector averages in profitability.

Figure 13 shows the sector’s operating profit and growth in operating profit, with only minor improvement seen in the past three years.

Figure 13. Five-year history of aerospace and defense sector core earnings and growth performance metrics



Note: A&D sector operating income calculations will differ from previous years’ Deloitte Global A&D sector financial performance studies, as the set of companies included in this study is not directly comparable across the years. Also, 2015 and 2016 numbers are based on constant currency basis and 2012 to 2014 have been re-calculated using the growth rates for the respective period with 2015 revenues as the base.

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates. Note that all figures are in US\$.

Seventy one companies reported positive YoY growth in core operating earnings. The top 20 companies accounted for US\$55.6 billion, or 79.4 percent, of the total sector core operating earnings, reflecting the concentration of sector profits.

GE Aviation was the sector leader in terms of profitability, with core operating earnings of US\$6,115 million in 2016, up 11.0 percent. The strong growth in core operating earnings was primarily driven by higher prices for commercial engines, higher services volume and a favorable business mix. Lockheed Martin ranked second, with 2016 core operating earnings of US\$5,629 million, followed by Boeing, which reported US\$5,464 million in core operating earnings in 2016, down 29.4 percent.

In terms of percent growth, Oshkosh Defense reported the highest growth rate in operating earnings at 1,231.5 percent due to a favorable product mix, price increases and lower research & development related to the Joint Light Tactical Vehicle (JLTV) program.¹⁵ The second highest gainer, AAR Corp. grew operating earnings by 652.9 percent. On the other hand, Bombardier Aerospace reported the largest decline in core operating earnings in 2016 at minus 249.4 percent as a result of the ramp up of the C Series program.

Figure 14. Top 20 aerospace and defense companies by 2016 core operating earnings

Rank	Company	US\$ million
1.	GE Aviation	\$6,115
2.	Lockheed Martin	\$5,629
3.	Boeing	\$5,464
4.	Airbus Group	\$5,372
5.	General Dynamics	\$4,309
6.	Safran	\$3,573
7.	United Technologies	\$3,519
8.	Raytheon	\$3,240
9.	Northrop Grumman	\$3,193
10.	Honeywell Aerospace	\$2,372
11.	BAE Systems	\$2,346
12.	Rolls-Royce	\$2,072
13.	Thales	\$1,505
14.	Transdigm Group Inc.	\$1,227
15.	Textron	\$1,084
16.	L3 Technologies	\$1,008
17.	Rockwell Collins	\$999
18.	Leonardo	\$952
19.	Huntington Ingalls Industries	\$858
20.	Spirit AeroSystems	\$737

Figure 15. Top 20 aerospace and defense companies by 2016 core operating earnings growth

Rank	Company	%
1.	Oshkosh Defense	1,231.5%
2.	AAR Corp.	652.9%
3.	FACC AG	265.0%
4.	Wesco Aircraft	178.5%
5.	Indra Sistemas	113.4%
6.	Constellium	80.5%
7.	Embraer	66.3%
8.	Rheinmetall Defence	63.3%
9.	SKF	62.0%
10.	Solvay Group (Cytec Industries)	56.0%
11.	DigitalGlobe Inc.	55.7%
12.	BBA Aviation	47.5%
13.	Chemring	41.0%
14.	Aerospace Industrial Development Corp.	39.2%
15.	Teledyne Tech	32.2%
16.	JAMCO Corp.	29.6%
17.	Arconic	28.7%
18.	Engility	28.5%
19.	Harris Corp.	28.1%
20.	Smiths Detection	25.5%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates. Note that all figures are in US\$.

Operating margin: Globally, the A&D sector's core operating margin declined slightly, to 10.4 percent, in 2016 from 10.5 percent in 2015. However, reported operating margin was up 5.4 percent to 9.4 percent, as compared to 8.9 percent the previous year. Reported operating profit in 2015 was suppressed by a US\$5.3 billion operating loss at Bombardier, which normalized in 2016. Overall one-time write-offs/non-recurring charges declined from US\$10.5 billion to US\$6.4 billion in 2016. Meggitt recorded one of the highest operating margin of 30.8 percent in 2016, a drop from 34.1 percent.

Oshkosh Defense reported the most significant improvement in operating margin growth, at 826.2 percent, led by a favorable product mix, price increases and lower research-and-development costs (see Figure 17). While AAR Corp. and FACC experienced strong growth in margins, these gains were resulted from negative margins being reported the previous year. Wesco Aircraft reported a robust increase of 182.4 percent YoY in operating margin in 2016, due to lower operating costs, which were primarily labor-related expenses. Out of the 100 companies analyzed, 62 achieved a YoY improvement in operating margins.

For those that saw declines, Triumph Group's operating margin fell 141.3 percentage in 2016 compared to 2015, which was the largest decline among A&D companies and was due to an operating loss at the aerostructures segment. This was led by loss provisions on the Bombardier and 747-8 programs, cost increases from acquisition of Tulsa programs as well as higher labor and supplier costs for other programs. Austal Ltd. also reported a 246.8 percent decline in its margin as the company experienced a loss in 2016 as a result of increased cost of sales through a reset of its estimated actual cost on the littoral combat ship program.

Figure 16. Top 20 aerospace and defense companies by 2016 core operating margin

Rank	Company	%
1.	Transdigm Group Inc.	40.0%
2.	Meggitt	30.8%
3.	GE Aviation	23.3%
4.	BWX Technologies, Inc.	21.2%
5.	Solvay Group (Cytec Industries)	21.0%
6.	Honeywell Aerospace	20.3%
7.	Amphenol	19.8%
8.	Safran	19.6%
9.	Eaton Aerospace	19.3%
10.	HEICO Corporation	19.3%
11.	Rockwell Collins	19.0%
12.	Woodward Aerospace	18.8%
13.	Teledyne Tech	18.2%
14.	Hexcel Corp.	17.9%
15.	B/E Aerospace	17.3%
16.	Rolls-Royce	17.1%
17.	KLX Inc	16.7%
18.	Kaman Aerospace	16.4%
19.	DigitalGlobe Inc	15.0%
20.	Parker Hannifin Aerospace	15.0%

Figure 17. Top 20 aerospace and defense companies by 2016 core operating margin growth

Rank	Company	%
1.	Oshkosh Defense	826.2%
2.	AAR Corp.	630.2%
3.	FACC AG	238.4%
4.	Wesco Aircraft	182.4%
5.	Indra Sistemas	112.4%
6.	Constellium	89.8%
7.	Solvay Group (Cytec Industries)	63.6%
8.	Embraer	58.6%
9.	DigitalGlobe Inc	50.8%
10.	Rheinmetall Defence	43.7%
11.	Aerospace Industrial Development Corporation	37.2%
12.	Engility	29.0%
13.	Teledyne Tech	27.4%
14.	ThyssenKrupp Marine Systems	23.4%
15.	Arconic	22.9%
16.	BBA Aviation	22.4%
17.	Rolls Royce	20.4%
18.	Woodward Aerospace	16.4%
19.	SAIC	15.8%
20.	Textron	15.3%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Return on invested capital (ROIC) for the sector improved to 26.8 percent in 2016, up from 25.3 percent in 2015. QinetiQ topped the list with a 50.2 percent return in 2016. However, it was down YoY from 72.0 percent as a result of lower profitability in 2016. Moreover, the company does not have any debt obligations. Of the 100 companies analyzed, 4 reported negative ROIC metrics, with Triumph Group recording the lowest at minus 33.6 percent in 2016, due to an operating loss.

Figure 18. Top 20 aerospace and defense companies by 2016 return on invested capital

Rank	Company	%
1.	QinetiQ	50.2%
2.	MTU Aero Engines	38.9%
3.	Fuji Aerospace	36.9%
4.	BWX Technologies, Inc.	33.4%
5.	Safran	30.5%
6.	Huntington Ingalls Industries	28.5%
7.	Lockheed Martin	26.7%
8.	Thales	26.6%
9.	BAE Systems	25.8%
10.	Northrop Grumman	23.6%
11.	Airbus Group	22.1%
12.	Spirit AeroSystems	20.8%
13.	Rockwell Collins	20.1%
14.	B/E Aerospace	18.7%
15.	Honeywell Aerospace	18.5%
16.	General Dynamics	18.1%
17.	Raytheon	17.5%
18.	Parker Hannifin Aerospace	17.3%
19.	Amphenol	16.8%
20.	Singapore Technologies (ST) Engineering Ltd.	16.7%

Source: Deloitte Global analysis of the 100 major global aerospace and defense companies using public company filings and press releases. See methodology section for further information and definitions of financial metric, as well as company name, reports, and dates.

Free cash flow (FCF): represents the cash generated by a company through its operations after accounting for capital expenditure. Global A&D sector FCF improved 11.8 percent, to US\$45.5 billion, in 2016 compared to 2015, driven by both revenue and operational cash-flow growth. The top 10 companies in terms of FCF contributed 71.7 percent to the total sector FCF in 2016, as compared to 68.2 percent the previous year. The top three companies Boeing (US\$7,886 million), GE Aviation (US\$5,775 million) and Lockheed Martin (US\$4,126 million) – represented 39.7 percent of the total FCF, once again showing the concentration of the sector.

Boeing's FCF increased 14.1 percent to US\$7,886 million. GE Aviation's FCF more than doubled, to US\$5,775 million, led by strong operational performance.

Of the 100 companies analyzed, 11 reported negative FCF. Bombardier Aerospace's FCF was minus US\$571 million in 2016 as the company reported a loss likely due to the impairment charges on its C Series program.

Figure 19. Top 20 aerospace and defense companies by 2016 free cash flow

Rank	Company	US\$ million
1.	Boeing	\$7,886
2.	GE Aviation	\$5,775
3.	Lockheed Martin	\$4,126
4.	Airbus Group	\$3,521
5.	United Technologies	\$2,357
6.	Raytheon	\$2,291
7.	Northrop Grumman	\$1,893
8.	General Dynamics	\$1,806
9.	Honeywell Aerospace	\$1,310
10.	Safran	\$1,208
11.	BAE Systems	\$1,114
12.	Thales	\$949
13.	L3 Technologies	\$881
14.	Harris Corporation	\$675
15.	Transdigm Group Inc.	\$605
16.	Textron	\$566
17.	Huntington Ingalls Industries	\$537
18.	Rockwell Collins	\$530
19.	Leonardo	\$480
20.	Spirit AeroSystems	\$463

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates. Note that all figures are in US\$.

Free cash margin: In 2016, the global A&D sector FCM rose to 6.8 percent from 6.2 percent in 2015. This was largely driven by strong growth in global FCF, which was up 11.8 percent in 2016. Meanwhile, global A&D revenue growth was 2.4 percent in the same year, resulting in a higher FCM. Forty-four of the 100 companies analyzed reported FCM of more than 5.0 percent while 18 companies reported FCM of greater than 10.0 percent in 2016.

GE Aviation ranked first, with the highest FCM, 22.0 percent, as its FCF more than doubled in 2016. Curtiss-Wright ranked in the top three, with a FCM of 17.9 percent, a significant jump from 5.8 percent in 2015 that was led by higher cash inflow from operational activities.

Overall, only 11 of the 100 companies analyzed reported negative FCM in 2016. In some cases, this can be explained by significant investments in property, plant and equipment and/or intangible assets. A few companies also reported negative operating cash flows, resulting in a negative FCM.

Figure 20. Top 20 aerospace and defense companies by 2016 free cash margin performance

Rank	Company	%
1.	GE Aviation	22.0%
2.	Transdigm Group Inc.	19.7%
3.	Curtiss-Wright	17.9%
4.	QinetiQ	17.6%
5.	HEICO Corporation	15.9%
6.	DigitalGlobe Inc	15.1%
7.	Fuji Aerospace	15.1%
8.	Amphenol	14.1%
9.	Woodward Aerospace	12.6%
10.	BWX Technologies, Inc	12.1%
11.	Leidos Holdings, Inc.	11.6%
12.	Chemring	11.5%
13.	Honeywell Aerospace	11.2%
14.	Ultra Electronics	10.9%
15.	Magellan Aerospace	10.9%
16.	Teledyne Tech	10.8%
17.	Eaton Aerospace	10.4%
18.	Rockwell Collins	10.1%
19.	Babcock International	9.7%
20.	Smiths Detection	9.6%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Book-to-bill ratio (BTB) ratio, a key indicator of future revenues, is determined by comparing sales order bookings to company revenues. The sector's BTB ratio declined 13.2 percent to 1.16 times in 2016 compared to 1.34 times in 2015. The decline in BTB ratio was likely due to a slowing in new orders at General Dynamics and Embraer, though it was partially offset by increases at Airbus Group, United Technologies and Northrop Grumman. The sector backlog increased 3.7 percent to US\$2.78 trillion in 2016, led by the continued demand for commercial aircraft. However, aircraft orders experienced a slowdown in 2016, resulting in a decline in BTB. Yet continued topline growth and a sector BTB ratio of 1.16 times in 2016 signal the potential for further expansion of global A&D sector revenues, as the sector backlog remains modestly greater than 1.0.

As Figure 21 illustrates, Dassault Aviation ranked highest in terms of BTB, at 2.71 times and a backlog of US\$22.5 billion, compared to its backlog of US\$15.7 billion in 2015. The surge was driven by a large contract win for RAFALE aircraft from India¹⁶ Ball Aerospace ranked second, reporting a BTB ratio of 1.96 times in 2016, with its backlog up 126.9 percent YoY to US\$1.4 billion due to major contract awards.¹⁷ BWX Technologies' BTB of 1.92 was the third highest, growing from 0.60 times in 2015 as the company announced large contract awards for its nuclear operations division.¹⁸

Fifty-three of the 100 companies in this study reported a BTB ratio of 1.0 times or more. This included a mix of commercial aerospace and defense companies, implying growth, albeit at a lower rate, in commercial aerospace and increasing growth in defense. Bombardier Aerospace recorded a 666.8 percent growth in BTB, which was primarily due to a considerably low BTB ratio in 2015, when its backlog declined significantly.

Figure 21. Top 20 aerospace and defense companies by 2016 book-to-bill performance

Rank	Company	BTB ratio
1.	Dassault Aviation	2.71
2.	Ball Aerospace	1.96
3.	BWX Technologies, Inc.	1.92
4.	Airbus Group	1.82
5.	CSRA Inc.	1.73
6.	Oshkosh Defense	1.68
7.	CAE Inc.	1.52
8.	Leonardo	1.50
9.	ManTech Int'l Corp.	1.46
10.	Rolls-Royce	1.45
11.	Northrop Grumman	1.38
12.	MTU Aero Engines	1.36
13.	Aerojet Rocketdyne Holdings	1.34
14.	United Technologies	1.33
15.	CACI	1.31
16.	BAE Systems	1.29
17.	Orbital ATK	1.28
18.	Cobham	1.24
19.	Safran	1.22
20.	SAIC	1.18

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Interest coverage ratio: The interest coverage ratio indicates a company's ability to pay its interest payments on debt from its available earnings. The ratio deteriorated 10.8 percent YoY in 2016, to 15.0 times, compared to 16.8 times in 2015, likely due to higher interest outflow in 2016 as debt levels increased.

With negligible interest payments, In Figure 22, Fuji Aerospace reported the strongest interest coverage ratio, at 226.3 times, as well as a healthy operational performance (See Figure 22). Thales and ManTech International Corp. ranked second and third, with an interest coverage ratio of 97.1 times and 82.9 times, respectively.

Of the 100 companies analyzed, 12 reported an interest coverage ratio below 1.0 times, which may indicate a challenge of meeting interest obligations with indicators that they are not generating sufficient operating earnings to cover their interest payments. However, the percentage of companies reporting an interest coverage ratio of below 1.0 times was down from 16 in 2015.

Figure 22. Top 20 aerospace and defense companies by 2016 interest coverage ratio

Rank	Company	Interest coverage ratio
1.	Fuji Aerospace	226.3
2.	Thales	97.1
3.	ManTech Int'l Corp.	82.9
4.	Safran	65.5
5.	Kawasaki Aerospace and Gas Turbine	43.9
6.	General Dynamics	43.5
7.	MTU Aero Engines	35.7
8.	QinetiQ	32.7
9.	HEICO Corporation	32.1
10.	JAMCO Corporation	30.7
11.	BWX Technologies, Inc.	28.5
12.	LISI Aerospace	26.5*
13.	Magellan Aerospace	24.3
14.	Solvay Group (Cytec Industries)	22.6
15.	Jacobs Engineering Group	22.2
16.	Babcock International	21.4
17.	Honeywell Aerospace	20.1
18.	Astronics Corp.	16.8
19.	Amphenol	16.6
20.	Hexcel Corp.	16.3

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and date.

Note: *Interest coverage ratio for LISI Aerospace is on a consolidated basis and not specific to the company's A&D business.

Current ratio: This ratio is a measure of the short-term liquidity position. Current ratio for the sector improved 1.1 percent YoY to 1.36 times versus 1.34 times. The ratio is greater than 1.0 times, indicating the sector has a reasonably healthy short-term liquidity position. The two strongest current ratios in 2016 belonged to KLX Inc. (7.7 times) and Wesco Aircraft (4.9 times).

Of the 100 companies analyzed in the study, only four reported a current ratio of below 1.0 times and are potentially at risk of not meeting short-term financial commitments. The remainder of the companies in this study exhibited relatively strong liquidity positions, with a majority recording a current ratio above 1.0 times.

Figure 23. Top 20 aerospace and defense companies by 2016 current ratio

Rank	Company	Current ratio
1.	KLX Inc	7.7
2.	Wesco Aircraft	4.9
3.	Transdigm Group Inc.	3.9
4.	Esterline Technologies	3.0
5.	Astronics Corp.	2.9
6.	MOOG	2.7
7.	HEICO Corporation	2.7
8.	AAR Corp.	2.7
9.	Allegheny Technologies	2.5
10.	SKF	2.5
11.	Hexcel Corp.	2.2
12.	Parker Hannifin Aerospace	2.2
13.	ManTech Int'l Corp.	2.2
14.	Amphenol	2.2
15.	B/E Aerospace	2.2
16.	Arconic	2.1
17.	Embraer	2.1
18.	Curtiss Wright	2.1
19.	Kaman Aerospace	2.0
20.	Woodward Aerospace	2.0

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and date.

Debt equity ratio: Debt equity ratio measures the company's financial leverage and indicates the amount of debt the company is using to finance its assets relative to its shareholders' equity. The global A&D sector's debt to equity ratio weakened to 1.65 times in 2016 as compared to 1.18 times in 2015, implying that companies are increasingly using debt to finance stock buybacks, acquisitions, and product development plans. Jacobs Engineering, Fuji Aerospace and AAR Corp. were the top performers with low debt levels and debt to equity ratio of 0.09 times, 0.12 times and 0.17 times, respectively, in 2016.

Out of the 100 companies, 29 reported debt equity ratio of more than 1.0 times, and indicating relatively high debt on their balance sheets.

Figure 24. Top 20 aerospace and defense companies by 2016 debt equity ratio

Rank	Company	Debt equity ratio
1.	Jacobs Engineering Group	0.09
2.	Fuji Aerospace	0.12
3.	AAR Corp.	0.17
4.	SAAB	0.24
5.	Magellan Aerospace	0.25
6.	LISI Aerospace	0.25
7.	MTU Aero Engines	0.28
8.	Thales	0.29
9.	AviChina Industry & Tech.	0.31
10.	Dassault Aviation	0.33
11.	Zodiac Aerospace	0.34
12.	General Dynamics	0.35
13.	Chemring	0.36
14.	Austal Limited	0.38
15.	FACC AG	0.39
16.	Teledyne Tech	0.40
17.	GKN Aerospace	0.42
18.	Oshkosh Defense	0.43
19.	Senior Aerospace	0.43
20.	Singapore Technologies (ST) Engineering Ltd.	0.43

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Aerospace and defense sector employment: Total global A&D sector employment fell 1.1 percent to 1.92 million in 2016 from 1.94 million in 2015. However, the number of companies increasing their headcount in 2016 was up, with 58 companies adding people, compared to 55 the year before. That said, the magnitude of reduction in workforce by A&D companies was higher than that of businesses increasing their employee base, with the total number of employees declining at some of the big companies in 2016.¹⁹

Regionally, employment at the US A&D companies declined 1.3 percent in 2016, from 1.11 million employees in 2015 to 1.09 million in 2016. European A&D companies reported a similar decline in employment numbers, with a 1.7 percent drop in 2016, from 637,000 to 626,000 employees in 2016.

With 44.7 percent of the total global A&D employees, the OEMs are the single largest employer in the sector. However, employment at this segment declined 4.9 percent YoY.

In 2016, the top three companies increasing their headcount included Leidos Holdings, which reported an increase of 11,451 employees, or 93.4 percent, led by the acquisition of Lockheed Martin's IS&GS segment; United Technologies, which added 6,240 employees in 2016; and Singapore Technologies Engineering, which added 4,205 to its workforce.

Companies that reported a YoY reduction in the size of their global workforces in their public filings include Lockheed Martin and Bombardier Aerospace. Among European companies, Safran reduced their workforce by 3,878 employees.²⁰

Figure 25. Top 20 aerospace and defense companies by 2016 employee additions

Rank	Company	Employee additions
1.	Leidos Holdings, Inc.	11,451
2.	United Technologies	6,240
3.	Singapore Technologies (ST) Engineering Ltd.	4,205
4.	GKN Aerospace	3,794
5.	AviChina Industry & Tech.	3,145
6.	BBA Aviation	2,319
7.	Northrop Grumman	2,000
8.	Raytheon	2,000
9.	CACI	1,869
10.	Thales	1,856
11.	Fluor Corp.'s Government Segment	1,368
12.	Zodiac Aerospace	1,279
13.	SKF	1,257
14.	Transdigm Group Inc.	1,098
15.	Solvay Group (Cytec Industries)	1,068
16.	BAE Systems	1,000
17.	Huntington Ingalls Industries	1,000
18.	Oshkosh Defense	917
19.	Arconic	830
20.	B/E Aerospace	818

Figure 26. Top 20 aerospace and defense companies by 2016 employee additions growth

Rank	Company	%
1.	Leidos Holdings, Inc.	93.4%
2.	Fluor Corp.'s Government Segment	58.8%
3.	SKF	47.3%
4.	DigitalGlobe Inc	45.8%
5.	Oshkosh Defense	44.8%
6.	Solvay Group (Cytec Industries)	39.4%
7.	Singapore Technologies (ST) Engineering Ltd.	24.2%
8.	GKN Aerospace	21.8%
9.	BBA Aviation	17.9%
10.	CACI	16.8%
11.	Kaman Aerospace	15.3%
12.	Allegheny Technologies	15.1%
13.	Transdigm Group Inc.	13.9%
14.	OHB Technology AG	11.8%
15.	FACC AG	11.7%
16.	BWX Technologies, Inc.	9.3%
17.	Teledyne Tech	8.7%
18.	Astronics Corp.	8.6%
19.	JAMCO Corporation	8.3%
20.	Ball Aerospace	8.2%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Employee productivity: Overall employee productivity, defined as core operating earnings per employee, improved 1.9 percent to US\$36,504 in 2016 from US\$35,821 in 2015. The propulsion segment generated the highest operating earnings per employee, at US\$86,765, compared to US\$76,824 in 2015, for a growth rate of 12.9 percent. Tier 2 segment's operating earnings per employee improved 11.8 percent from US\$39,276 in 2015 to US\$43,907 in 2016. Aerostructure segment's employee productivity was down 53.1 percent to US\$18,078.

Out of the top 20 companies in employee productivity, only five companies, including GE Aviation, Safran, Honeywell Aerospace, Rolls-Royce and Lockheed Martin generated revenue greater than US\$10.0 billion. The majority of the other top 20 performers are companies with revenues lower than US\$5.0 billion.

KLX Inc. and GE Aviation were the most productive companies on a per-employee basis. KLX Inc.'s operating earnings per employee were US\$145,622 in 2016, up 9.4 percent compared to 2015, as its operating earnings grew 8.8 percent while, whereas headcount remained almost flat in 2016. GE Aviation's operating earnings per employee improved 11.0 percent to US\$135,889 in 2016, primarily due to an 11.0 percent growth in operating profits in 2016, with employee base unchanged.

Figure 27. Top 20 aerospace and defense companies by 2016 employee reductions

Rank	Company	Employee reductions
1.	Lockheed Martin	(29,000)
2.	Boeing	(10,900)
3.	Safran	(3,878)
4.	Bombardier Aerospace	(2,800)
5.	Airbus Group	(2,792)
6.	Embraer	(2,702)
7.	Honeywell Aerospace	(2,062)
8.	Cobham	(1,813)
9.	Leonardo	(1,525)
10.	Jacobs Engineering Group	(1,426)
11.	Harris Corporation	(1,300)
12.	General Dynamics	(1,100)
13.	Spirit AeroSystems	(800)
14.	Engility	(700)
15.	CSRA Inc.	(666)
16.	Triumph Group	(551)
17.	Rockwell Collins	(500)
18.	Ultra Electronics	(454)
19.	Vectrus Inc.	(400)
20.	Meggitt	(386)

Figure 28. Top 20 aerospace and defense companies by 2016 employee reduction percentage

Rank	Company	%
1.	Lockheed Martin	-23.0%
2.	Cobham	-14.3%
3.	Jacobs Engineering Group	-11.9%
4.	Embraer	-11.7%
5.	Ultra Electronics	-11.0%
6.	Bombardier Aerospace	-10.2%
7.	Chemring	-9.5%
8.	Engility	-7.1%
9.	CSRA Inc.	-7.1%
10.	Boeing	-6.8%
11.	Vectrus Inc.	-6.7%
12.	Safran	-6.3%
13.	Harris Corporation	-5.8%
14.	Spirit AeroSystems	-5.3%
15.	Honeywell Aerospace	-5.0%
16.	Smiths Detection	-4.7%
17.	Meggitt	-3.9%
18.	Triumph Group	-3.6%
19.	Leonardo	-3.2%
20.	AAR Corp.	-3.1%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Figure 29. Top 20 aerospace and defense companies by 2016 core operating earnings per employee

Rank	Company	US\$
1.	KLX Inc	\$145,622
2.	Transdigm Group Inc.	\$136,318
3.	GE Aviation	\$135,889
4.	Fuji Aerospace	\$113,886
5.	Solvay Group (Cytac Industries)	\$93,652
6.	Korea Aerospace Industries	\$79,133
7.	IHI Aero Engine & Space	\$78,349
8.	Meggitt	\$74,218
9.	Rolls-Royce	\$69,538
10.	DigitalGlobe Inc	\$62,724
11.	Safran	\$62,087
12.	Honeywell Aerospace	\$60,841
13.	MTU Aero Engines	\$59,906
14.	Hexcel Corp.	\$58,452
15.	Wesco Aircraft	\$58,278
16.	Lockheed Martin	\$58,031
17.	Woodward Aerospace	\$56,903
18.	HEICO Corporation	\$56,456
19.	Kaman Aerospace	\$56,297
20.	BWX Technologies, Inc.	\$55,595

Source: Deloitte Global analysis of the 100 major global aerospace and defense companies using public company filings and press releases. See methodology section for further information and definitions of financial metric, as well as company name, reports, and dates. Note that all figures are in US\$.

Note: Companies analyzed on the basis of partial results based on aerospace and defense (A&D) activity have an advantage over others as they do not have corporate overheads.

Equity markets: The US A&D sector's share price performance was strong in 2016, after experiencing the weakest performance in the previous five years in 2015. The Dow Jones (DJ) A&D index grew 17.9 percent and outperformed the Standard & Poor's (S&P) 500 index, which was up 11.2 percent (see Figure 30). The European A&D companies' performance was moderate, with a 4.9 percent growth in 2016. However, it outperformed the STOXX 600 Index, which grew only 1.3 percent (see Figure 31). After experiencing downward pressure from the effects of US Government budget reductions in 2015, share price performance of the US A&D sector recovered. This is also likely due to investor anticipation of the new US administration's plans to increase defense spending.

Of the companies in this study, SAIC (+85.2 percent), DigitalGlobe Inc. (+83.0 percent) and Kratos Defense & Security Solutions (+80.5 percent) experienced the highest increase in share prices in 2016. However, greater increases in share prices did not essentially correlate to a strong financial performance. The top three companies' with the strongest share price performance reported only moderate revenue growth in 2016 – SAIC's revenue increased only 3.1 percent, DigitalGlobe Inc. reported a 3.3 percent revenue growth, and Kratos Defense & Security Solutions' revenue grew only 1.8 percent. Moreover, of the top three companies, only DigitalGlobe Inc. experienced a strong operational performance, with margins up from 9.9 percent in 2015 to 15.0 percent in 2016.

Figure 30. US equity market comparisons to US aerospace and defense sector (2011 to 2016)

	2011	2012	2013	2014	2015	2016
Dow Jones aerospace and defense Index	3.2%	11.2%	54.1%	10.0%	2.8%	17.9%
Standard & Poor 500 Index	0.0%	13.4%	29.6%	11.4%	-0.7%	11.2%
Basis point difference	322	-216	2,450	-140	350	670

Source: Deloitte Global analysis of data from Bloomberg database, accessed in April 2017. Figures include historical prices of the respective indices over the 2011 to 2016 period.

Figure 31. European equity market comparisons to European aerospace and defense sector (2011 to 2016)

	2011	2012	2013	2014	2015	2016
STOXX Europe total market index aerospace and defense	0.8%	22.8%	41.6%	(8.5%)	14.3%	4.9%
STOXX Europe 600	(11.3%)	14.4%	17.4%	5.1%	7.2%	1.3%
Basis point difference	1,213	843	2,420	(1,360)	710	360

Source: Deloitte Global analysis of data from Bloomberg database, accessed in April 2017. Figures include historical prices of the respective indices over the 2011 to 2016 periods.

Global defense subsector compared with commercial aerospace subsector

Global defense subsector continued to recover as defense spending increased worldwide. The defense subsector revenues grew 2.1 percent in 2016 to US\$351.3 billion, led by a 3.1 percent growth in US defense revenues. However, the global commercial subsector outpaced global defense subsector growth at 2.7 percent but growth was down from 6.3 percent in 2015. Global commercial A&D growth was US\$8.4 billion with Airbus as the major contributor. Although growth slowed in the global commercial A&D subsector, backlogs of commercial aircraft continued to remain at an all-time high at 13,687 and given the strong demand for new commercial aircraft, it is estimated that approximately 35,000 jets will be delivered worldwide over the 2016 to 2035 period.²¹

Defense subsector's operating margin at 11.5 percent continued to outperform the commercial aerospace subsector, which recorded margins of 9.1 percent in 2016. Defense subsector margins increased 60 bps from 10.9 percent in 2015 to 11.5 percent led by increased profitability at Airbus, Rolls-Royce, and Lockheed Martin. Inversely, margins for the commercial aerospace subsector declined from 10.1 percent to 9.1 percent led by the overall increase in costs during the year.

Figure 32. Commercial aerospace, as compared to defense subsector performance comparison (2015 to 2016)

	Commercial aerospace			Defense		
	2015	2016	Change (2016 versus 2015)	2015	2016	Change (2016 versus 2015)
Revenues (US\$ billion)	US\$314.7	US\$323.1	2.7%	US\$344.1	US\$351.3	2.1%
Core operating earnings (US\$ billion)	US\$31.8	US\$29.6	(7.0%)	US\$37.4	US\$40.2	7.6%
Core operating margin	10.1%	9.1%	-9.4%	10.9%	11.5%	5.3%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates. Note that all figures are in US\$.

Note: The total A&D sector revenues will not match when we add commercial A&D revenues together. The reason is certain large A&D companies have corporate eliminations/others as input in their total revenues, which cannot be distributed among commercial A&D subsectors.

Comparison of US and European A&D sector performance

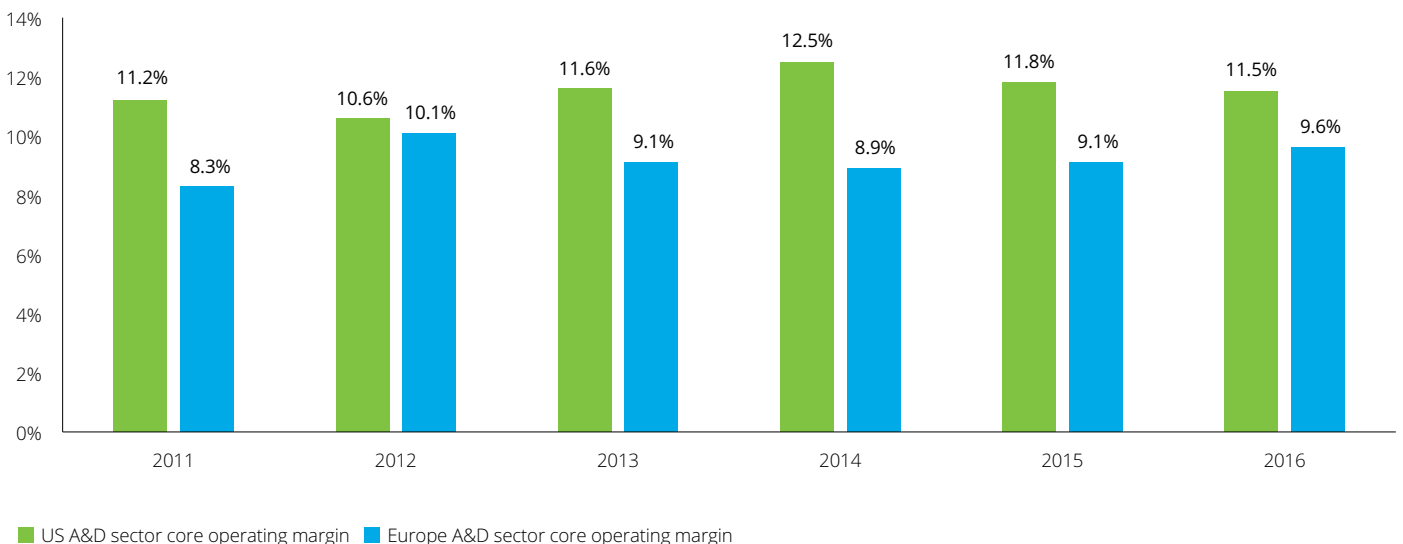
US-based companies comprise a majority of the revenues for the global A&D sector representing 60.4 percent of global A&D revenue. European headquartered companies represent 30.8 percent of total global revenues, while companies domiciled in Canada, Brazil, Japan, China, Australia and other countries share the balance.

In 2016, A&D companies headquartered in the US contributed US\$407.6 billion to the global A&D sector's revenue (see Figure 34) of US\$674.4 billion and European companies accounted for US\$207.7 billion. Revenue for the US companies' grew 2.4 percent, while European companies' experienced stronger revenue growth of 3.7 percent. The defense subsector drove the growth in the US, whereas, in Europe, it was led by commercial aerospace subsector.

European defense subsector revenues grew only 0.6 percent despite an increase in defense spending in the Europe. This was primarily due to a US\$1.3 billion negative impact on Airbus' topline. Commercial aerospace subsector in Europe recorded strong growth of 6.7 percent, whereas, the US subsector grew marginally, up 1.3 percent in 2016. This was the result of a 1.8 percent decline in aircraft deliveries in the US, while, Europe recorded an 8.3 percent growth during the year.²²

Operating margin differences between the US and Europe continued to remain. However, the gap is gradually narrowing with margins in Europe improving. In 2016, the core operating margin for the US A&D sector was down at 11.5 percent as compared to 11.8 percent in 2015. For Europe, operating margin in 2016 was up at 9.6 percent from 9.1 percent in 2015. The difference between the US and Europe in profit margin performance has existed for many years, but, the gap is decreasing as European A&D sector rationalizes assets and reduces operating expenses. Continued improvements in financial performance by the European A&D companies, with slower improvements in the US, will likely continue to close the gap in operating margin performance.

Figure 33. US aerospace and defense sector margins compared to European sector (2011 to 2016)



Note: A&D sector operating margin calculations will differ from previous years' Deloitte Global A&D sector financial performance studies, as the set of companies included in this study is not directly comparable across the years. Also, 2015 and 2016 numbers are based on constant currency basis and 2012 to 2014 have been re-calculated using the growth rates for the respective period with 2015 margin as the base.

Source: Deloitte Global analysis of the 100 major global A&D companies using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

In overall relative performance, US companies continue to outperform their European counterparts in several key measures. In addition to core operating margin percentage discussed above, US companies maintain an advantage in return on invested capital by 1.7 times, free cash flow margin of 1.8 times, and core operating margin per employee by 1.3 times.

Interest coverage ratio for the US was 13.9 times, below Europe, which was at 17.0 times in 2016, indicating European A&D companies are generating slightly higher earnings compared to the US to cover their interest payments. With respect to the debt to equity ratio, it deteriorated for both US and Europe, however, Europe continued to outperform US in 2016. European A&D sector recorded debt to equity ratio of 1.58 times in 2016 compared to 2.40 times for the US. As interest rates remained low, higher debt levels, especially in the US, were used to finance stock repurchases, acquisitions as well as product development.

Figure 34. US aerospace and defense sector compared to European sector (2015 to 2016)

	US			Europe		
	2015	2016	Change (2016 versus 2015)	2015	2016	Change (2016 versus 2015)
Revenues (US\$ billion)	\$398.1	\$407.6	2.4%	\$200.4	\$207.7	3.7%
Core operating earnings (US\$ billion)	\$46.8	\$46.7	(0.2%)	\$18.3	\$20.0	9.2%
Core operating margin percentage	11.8%	11.5%	(2.5%)	9.1%	9.6%	5.3%
Return on invested capital percentage	27.8%	32.9%	18.1%	24.0%	19.0%	(20.8%)
Free cash flow (US\$ billion)	\$32.3	\$35.5	9.8%	\$7.7	\$9.7	25.7%
Free cash flow margin percentage	8.1%	8.7%	7.3%	3.8%	4.7%	21.3%
Book-to-bill ratio	1.04 times	0.99 times	(5.0%)	1.81 times	1.35 times	(25.6%)
Interest coverage ratio	16.6 times	13.9 times	(16.2%)	18.2 times	17.0 times	(6.3%)
Current ratio	1.48 times	1.50 times	1.6%	1.07 times	1.08 times	0.1%
Debt equity ratio	1.79 times	2.40 times	34.3%	1.04 times	1.58 times	51.9%
Aerospace and defense (A&D) revenue/employee (US\$)	\$360,393	\$373,642	3.7%	\$314,699	\$331,839	5.4%
A&D core operating earnings/employee (US\$)	\$42,350	\$42,817	1.1%	\$28,783	\$31,970	11.1%
Number of A&D employees	1,104,725	1,090,838	(1.2%)	636,796	625,971	(1.7%)

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Comparison of US and European defense subsector performance

The US defense subsector experienced recovery in 2016, with revenue growth of 3.1 percent as the country's defense budgets increased 3.6 percent and overall defense spending in the US was up 1.7 percent.²³ Over the last few years, US defense revenues have either declined or remained flat. The US defense subsector experienced 2.5 percent decline in 2011, was flat in 2012 and 2013, and declined 2.2 and 0.9 percent in 2014 and 2015. This has been primarily driven by the drawdown of large armed forces engaged in operations in the Middle East and continued decline in funding outlays by the US Department of Defense, the largest subsector customer. Defense budgets are expected to remain strong with signals that the new US administration plans to increase defense spending. In March, 2017, the US administration announced a US\$54 billion increase in defense budgets for 2018, which is nearly a 10 percent increase from 2017.²⁴

Revenues for the US defense subsector grew 3.1 percent to US\$235.3 billion in 2016 compared to US\$228.3 billion in 2015 with the top 20 US defense companies reporting a 2.8 percent growth to US\$211.6 billion. There is heavy sector concentration in the US as the top 20 US companies accounted for 90 percent share of the total US defense subsector revenues in 2016.

On the contrary, the European defense subsector revenues grew only 0.6 percent to US\$94.9 billion, despite a 2.8 percent increase in defense spending.²⁵ This was mainly due to a US\$1.3 billion negative impact on the topline of Airbus, one of the largest OEM's in Europe. The top 20 defense companies in Europe recorded only a 0.5 percent growth in revenues in 2016 and represented 97 percent of the total European subsector revenue in 2016.

Figure 35. US defense subsector performance as compared to Europe defense subsector (2015 to 2016)

	US defense			Europe defense		
	2015	2016	Change (2016 versus 2015)	2015	2016	Change (2016 versus 2015)
Revenues (US\$ billion)	US\$228.3	US\$235.3	3.1%	US\$94.4	US\$94.9	0.6%
Core operating earnings (US\$ billion)	US\$26.6	US\$28.3	6.3%	US\$9.2	US\$11.3	22.1%
Core operating margin	11.7%	12.0%	3.2%	9.8%	11.9%	21.5%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Individual segment performance

Revenues for the original equipment manufacturers (OEM) segment increased 0.9 percent in 2016 (see Figure 36) to US\$366.3 billion, up from US\$362.9 billion in 2015. This is below the sector's overall revenue growth of 2.4 percent and was due to a decline in the pace of growth in commercial aerospace. Revenue growth of the OEM segment leaders was mixed. Boeing experienced a revenue decline of 1.6 percent in 2016, while Airbus Group reported stronger growth of 3.3 percent. Tier 2 and Tier 3 suppliers generated significantly stronger revenue growth of 7.6 percent and 7.7 percent, respectively. Revenue growth for the aerostructures segment lagged and was significantly lower at 0.5 percent compared to the global A&D growth. The Tier 1, electronics, propulsion and services segments experienced moderate growth in 2016 and outpaced global A&D sector growth. The propulsion segment outpaced global A&D sector growth at 3.0 percent.

Figure 36 summarizes the segment financial performance metrics as described above.

Figure 36. Segment performance in 2015 and 2016

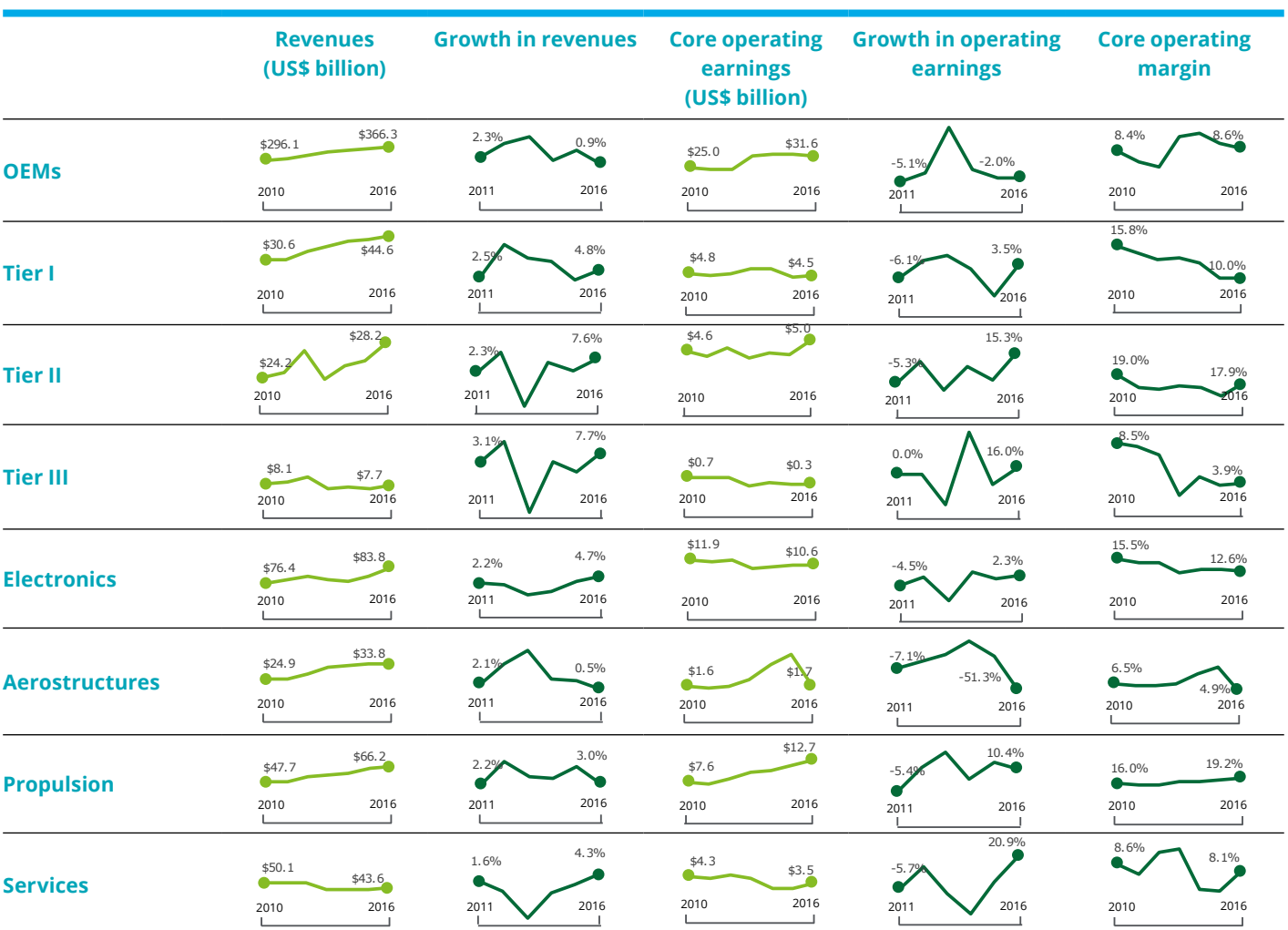
Segment	Revenues (US\$ billion)			Core operating earnings (US\$ billion)			Core operating margin		
	2015	2016	Change (2016 versus 2015)	2015	2016	Change (2016 versus 2015)	2015	2016	Change (2016 versus 2015)
Original equipment manufacturers	\$362.9	\$366.3	0.9%	\$32.3	\$31.6	-2.0%	8.9%	8.6%	-2.9%
Tier 1	\$42.6	\$44.6	4.8%	\$4.3	\$4.5	3.5%	10.2%	10.0%	-1.2%
Tier 2	\$26.2	\$28.2	7.6%	\$4.4	\$5.0	15.3%	16.7%	17.9%	7.2%
Tier 3	\$7.1	\$7.7	7.7%	\$0.3	\$0.3	16.0%	3.6%	3.9%	7.7%
Electronics	\$80.1	\$83.8	4.7%	\$10.4	\$10.6	2.3%	12.9%	12.6%	-2.3%
Aerostructures	\$33.7	\$33.8	0.5%	\$3.4	\$1.7	-51.3%	10.1%	4.9%	-51.6%
Propulsion	\$64.3	\$66.2	3.0%	\$11.6	\$12.7	10.4%	18.0%	19.2%	7.1%
Services	\$41.8	\$43.6	4.3%	\$2.9	\$3.5	20.9%	7.0%	8.1%	15.8%

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

OEM core operating earnings declined 2.0 percent to US\$31.6 billion in 2016. Service providers falling behind the overall global A&D segment which grew 0.8 percent. Services segment and Tier 3 suppliers recorded a 20.9 percent and 16.0 percent growth, respectively, and outdid year on year, significantly outperforming the overall global A&D sector. Inversely, Aerostructures' core operating profit was halved. In terms of core operating margin growth, services (15.8 percent increase) and propulsion (7.1 percent increase) were the top performers. This was offset by aerostructures (51.6 percent decline), electronics (2.3 percent decline), OEMs (2.9 percent decline) and Tier 1 suppliers (1.2 percent decline). The propulsion segment reported the highest operating margins, of 19.2 percent in 2016, followed by Tier 2 suppliers (17.9 percent). Lowest margins were recorded for the Tier 3 suppliers in 2016, at 3.9 percent.

The OEM segment experienced a 9.5 percent jump in its return on invested capital, from 35.0 percent in 2015 to 38.4 percent in 2016. Inversely, aerostructures segment's return on invested capital declined 57.3 percent to 6.7 percent. OEMs reported a 8.6 percent YoY improvement in free cash flow to US\$22.2 billion, outpacing the global A&D sector, which experienced stronger growth of 11.8 percent. With aircraft orders slowing, the book to bill ratio for the OEMs declined to 1.16 times, in line with the global A&D sector's book to bill ratio. The OEM segment's book to bill ratio was down 18.1 percent YoY as backlog at Boeing, Embraer, and General Dynamics declined 3.8 percent, 9.6 percent, and 12.6 percent, respectively, in 2016²⁶

Figure 37. Segment performance from 2010 to 2016

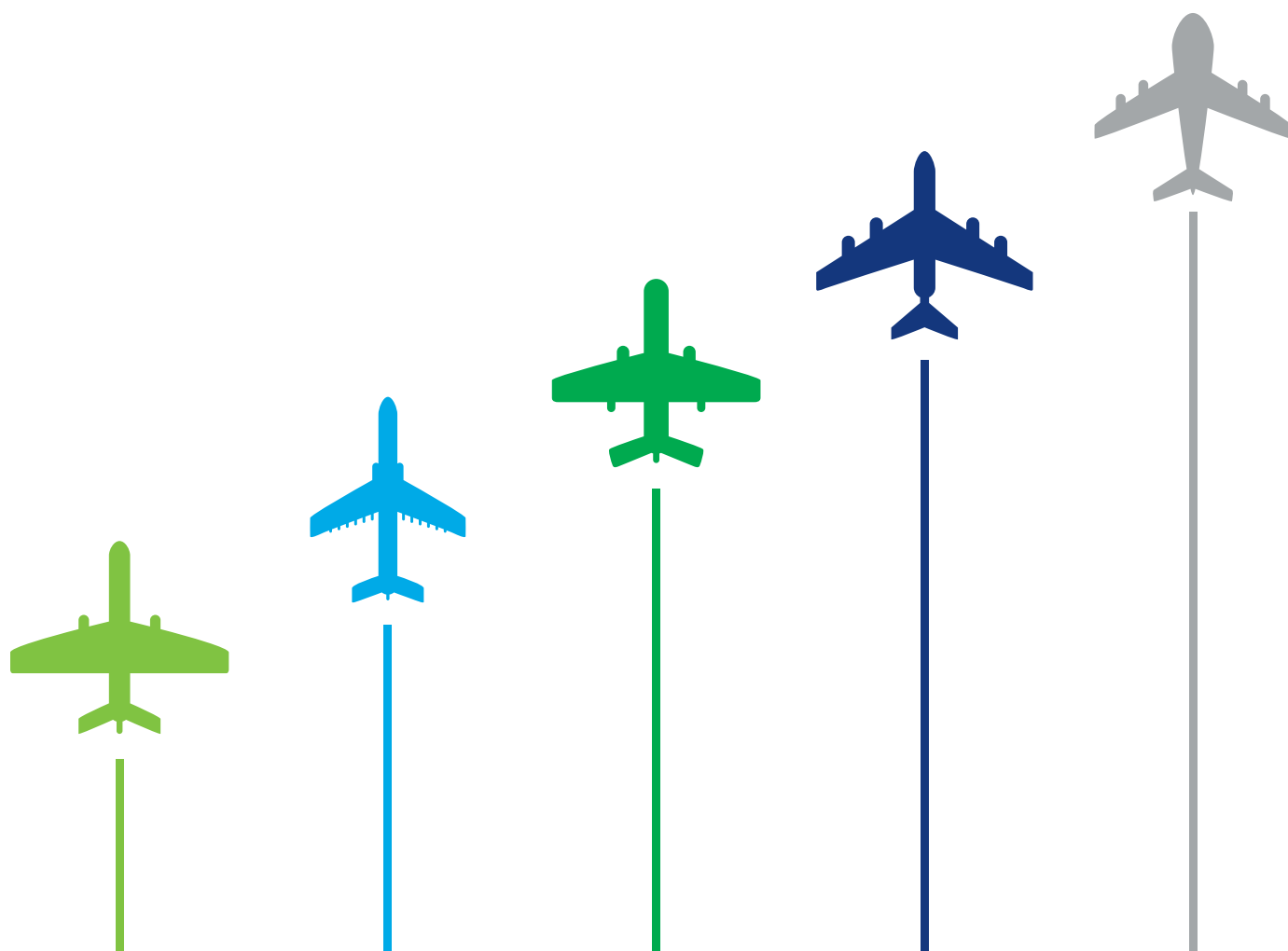


Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.

Figure 38. Select segment performance metrics in 2016

	Revenue (US\$ billion)	Core operating earnings (US\$ billion)	Operating margin	ROIC	FCF (US\$ billion)	FCM	BTB ratio	Number of A&D employees (million)	A&D revenue/ employee (US\$ '000)	A&D operating earnings/ employee (US\$ '000)
OEMs	\$366.3	\$31.6	8.6%	38.4%	\$22.2	6.1%	1.17	0.86	\$427.74	\$36.94
Tier 1	\$44.6	\$4.5	10.0%	10.7%	\$2.2	4.8%	0.95	0.20	\$221.55	\$22.22
Tier 2	\$28.2	\$5.0	17.9%	9.1%	\$2.6	9.0%	0.68	0.11	\$245.60	\$43.91
Tier 3	\$7.7	\$0.3	3.9%	(8.5%)	(\$0.2)	(2.3%)	1.16	0.03	\$294.85	\$11.37
Electronics	\$83.8	\$10.6	12.6%	16.6%	\$7.2	8.5%	1.06	0.27	\$306.19	\$38.73
Aerostructures	\$33.8	\$1.7	4.9%	6.7%	\$1.2	3.4%	0.93	0.09	\$367.79	\$18.08
Propulsion	\$66.3	\$12.8	19.2%	14.1%	\$7.5	11.4%	1.22	0.15	\$450.84	\$86.77
Services	\$43.6	\$3.5	8.1%	9.3%	\$2.9	6.8%	0.93	0.21	\$211.81	\$17.13

Source: Deloitte Global analysis of the 100 major global A&D companies, using public company filings and press releases. See methodology section for further information and definitions of financial metrics, as well as company name, reports and dates.



Study methodology

This study is based on the key financial performance metrics for 100 global A&D companies or segments of industrial conglomerates with A&D businesses, which generated global A&D revenues greater than US\$500 million in 2016. Using the data from the companies' respective 10-Ks, annual reports and other official financial releases, Deloitte Global analyzed the sector's 2016 performance. The study used audited results for all companies and highlights specific companies that had a positive or negative impact on the A&D sector's performance while also analyzing category-by-category performance based on business types and geography.

The presentation of the companies' 2016 financial performance data is based on the companies' respective 2016 fiscal year. Similar treatment applies to the presentation of the companies' 2015 financial performance data.

Certain companies were excluded from the analysis, including government-controlled entities, private companies that do not release public filings and public companies that do not report A&D segment information. Additionally, certain companies from the previous year's study were excluded, likely because they did not meet study criteria; e.g. lower revenues than the threshold of US\$500 million, companies that were acquired and companies going private.

All data in this study are presented in US dollar currency. Forty-two of the 100 companies analyzed in this study are headquartered in countries other than the US. For such companies, the study applied a constant currency conversion rate to remove the impact of exchange-rate fluctuations in the analysis (2016 average exchange rate). The conversion rates used for Euro/US\$ include 2016 average conversion rate of 1.107²⁷. Embraer, Elbit Systems, BBA Aviation and Bombardier Aerospace are four non-US companies that report financials in US dollars.

The study used the standard constant approach to eliminate the effect of significant currency fluctuations from year to year. For instance, Airbus Group's revenue in native currency increased from €64.5 billion in 2015 to €66.6 billion in 2016, up 3.3 percent²⁸. However, Airbus' foreign exchange hedging policy significantly affects the theoretical foreign exchange conversion performed in this study. As a result, the 2016 average exchange rate was used for converting both 2015 and 2016 data for non-US denominated companies.

Many companies provided their commercial-versus-defense revenues. However, there were only a few companies that explicitly stated commercial-versus-defense operating earnings. In absence of explicit detail, the study used the commercial and defense percentage of revenue as a proxy to estimate the respective operating earnings.

1. A&D sector revenue

- To calculate the A&D revenue for a company, we determined the percentage of revenue associated with A&D activities. In calculating this percentage, we first checked to see if the company explicitly stated an A&D revenue figure. In such a case, the explicitly stated percentage was directly used. If the percentage was not explicitly stated, the company's various business segments or end-markets were analyzed. Only those that were related to A&D in estimating the revenue percentage were considered.
- In determining A&D sector revenue, a calculated summation of the revenue was included of the constituent 100 companies.

2. Operating earnings/margin

- The study examined the operating earnings as stated, if these were reported by the company. If the operating earnings were not published by the company, they were calculated as follows: Operating earnings = Sales – Cost of goods sold – SG&A expenses – Research and development expenses – Restructuring/acquisition costs – Impairments/amortizations.
- The companies' respective A&D operating margins were calculated by dividing their respective A&D operating earnings by their respective A&D revenues.
- Operating earnings for the A&D sector is a summation of operating earnings of the constituent companies.
- Operating margin for the A&D sector was calculated as the total sector operating earnings, as a percentage of total sector revenue.

3. Return on invested capital (ROIC)

- ROIC was calculated for the entire company, as companies report ROIC at the company level and not at the segmental level. ROIC was calculated based on component values in home currencies to eliminate the impact of currency conversion.
- The ROIC value was included if the company reported it. If the company did not publish the ROIC value, it was calculated by the following formula: $ROIC = (\text{Net operating earnings after tax}) / (\text{Average shareholder equity} + \text{Average net financial debt})$.
 - Net operating earnings after tax (NOPAT) is calculated as $NOPAT = \text{Operating earnings} * (1 - \text{Effective tax rate})$.
 - A company's 2016 average shareholder equity is calculated as the simple averages of its 2016 and 2015 fiscal year end shareholder equity values. A company's 2015 average shareholder equity is calculated as the simple averages of its 2015 and 2014 fiscal year end shareholder equity values. Analogous treatment applies to the calculation of a company's 2016 and 2015 average net financial debt values.
 - Net financial debt is calculated as $\text{net financial debt} = \text{Short-term interest-bearing liabilities} + \text{Long-term interest-bearing liabilities} - ((0.8 * (\text{Cash and cash equivalents}))$.
 - Eighty percent of cash and cash equivalents is used in the calculation of net financial debt and assumed that 20 percent of a company's cash is reserved for running the operations of the company and, thus, not available for investment.
- ROIC for the A&D sector is a revenue-weighted average. It was calculated as the following: $A\&D \text{ sector ROIC} = \Sigma (\text{Company ROIC} * \text{company A\&D revenue}) / \text{Total A\&D sector revenue}$. ROIC stated in the study differs from Return on capital employed.

4. Free cash flow (FCF)/Free cash margin (FCM)

- FCF was calculated for the A&D business based on the A&D revenues of the company.
- If the company published the FCF value, it was used directly. If the company did not publish the FCF value, it was calculated as $FCF = \text{Operating cash flow} - \text{Net capital expenditures}$.
 - Net capital expenditures are calculated as $\text{Net capital expenditure} = \text{Purchases of property, plant and equipment} - \text{Proceeds (PP\&E)} - \text{proceeds from the sale of PP\&E}$.
 - A&D sector FCF was calculated as a summation of the FCFs of the constituent companies.
 - FCM was calculated for the A&D business based on the A&D revenues of the company. FCM for a company was calculated as $A\&D \text{ FCM} = A\&D \text{ FCF} / A\&D \text{ revenue}$.
 - FCM for the A&D sector is a revenue-weighted average. It was calculated as: $A\&D \text{ sector FCM} = \Sigma (\text{Company FCM} * \text{Company A\&D revenue}) / \text{Total A\&D sector revenue}$.

5. Interest coverage ratio

- Interest coverage ratio was calculated for the entire company, as it is not practical to allocate interest expense to a company's A&D and non-A&D segments.
 - Interest coverage ratio = $\text{Operating earnings} / \text{Interest expense}$.
 - Interest coverage ratio for the A&D sector is a revenue, weighted average. It was calculated as the following: $A\&D \text{ sector Interest coverage ratio} = \Sigma (\text{Company Interest coverage ratio} * \text{Company A\&D revenue}) / \text{Total A\&D sector revenue}$.

6. Current ratio

- Current ratio was calculated for the entire company, as it is not practical to allocate current assets and current liabilities to a company's A&D and non-A&D segments.

– Current ratio = Current assets/Current liabilities.

– Current ratio for the A&D sector is a revenue, weighted average. It was calculated as the following: A&D sector current ratio = Σ (Company current ratio*Company A&D revenue)/Total A&D sector revenue.

7. Debt equity ratio

- Debt-to-Equity ratio was calculated for the entire company, as it is not practical to allocate total debt and equity to a company's A&D and non-A&D segments.

– Debt-to-Equity ratio = Total debt/Total shareholders' equity.

– Debt-to-Equity ratio for the A&D sector is a revenue, weighted average. It was calculated as the following: A&D sector Debt-to-Equity ratio = Σ (Company debt-to-equity ratio*Company A&D revenue)/Total A&D sector revenue.

8. Book to bill ratio

- BTB ratio was taken as stated, if reported by the company. If the BTB ratio was not published by the company, it was calculated as $BTB = 1 + ((\text{Current fiscal year total backlog} - \text{Previous fiscal year total backlog})/(\text{Current fiscal year revenue}))$.
- The BTB ratio for the A&D sector is a revenue-weighted average. It was calculated as the following: A&D sector BTB = Σ (Company BTB*Company A&D revenue)/Total sector A&D revenue.
- BTB ratio was calculated based on component values as reported in home currencies to eliminate the impact of currency conversion.

9. Number of aerospace and defense employees

- Where reported by the companies, the average employee numbers for the respective fiscal years were used. If average employee numbers were not available, employee figures were factored in as of the end of the respective fiscal years.

10. Employee productivity

- Employee productivity was measured for individual companies and the A&D sector, including A&D operating earnings per employee.
- The number of employees associated with the A&D business was used as reported by the company, when stated explicitly. However, if the number was not explicitly stated, the number of employees associated with the A&D business was estimated based on revenues.
- Operating earnings per employee for the sector were calculated as: Operating earnings per employee in the A&D sector = Total operating earnings of the sector/Total number of employees in the sector.

Note: i) Likely due to rounding, numbers presented throughout this report may not add up precisely to the totals provided and percentages may not precisely reflect the absolute figures. Also, the total A&D sector revenues will not precisely match when commercial A&D subsector revenues are added together. This is because many large A&D companies have corporate eliminations/others as input in their total revenues, which cannot be distributed among commercial A&D subsectors.

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