



State of Canada's Aerospace Industry

2017 Report

ISED and the AIAC have partnered to provide evidence-based, relevant, quality and timely analysis to both industry and government decision makers

For the State of Canada's Aerospace Industry 2017 Report:

- Innovation, Science and Economic Development Canada (ISED) developed detailed economic models, statistics and analysis based on Statistics Canada* and global private independent research organizations' data
- The Aerospace Industries Association of Canada (AIAC) consulted and validated research findings with its network on business drivers, issues and trends
- ISED and the AIAC jointly published the latest statistics

* Several aspects of the Statistics Canada Annual Survey of Research and Development (R&D) in Canadian Industry have been redesigned in 2016, including concepts, methodology, the collection method and the data processing system. The concepts and definitions employed in the collection and dissemination of R&D data are provided in the Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development (Organisation for Economic Cooperation and Development (OECD), 2015). According to this definition: "R&D comprises creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge"

Features of the State of Canada's Aerospace Industry 2017 Report



Aerospace industry ecosystem (2016)



Economic indicators (2016)



Regional activity (2015)



Global value chains (2016)



Global rankings (2016)



Research and development (2016)



Innovation practices (2014)



Key findings



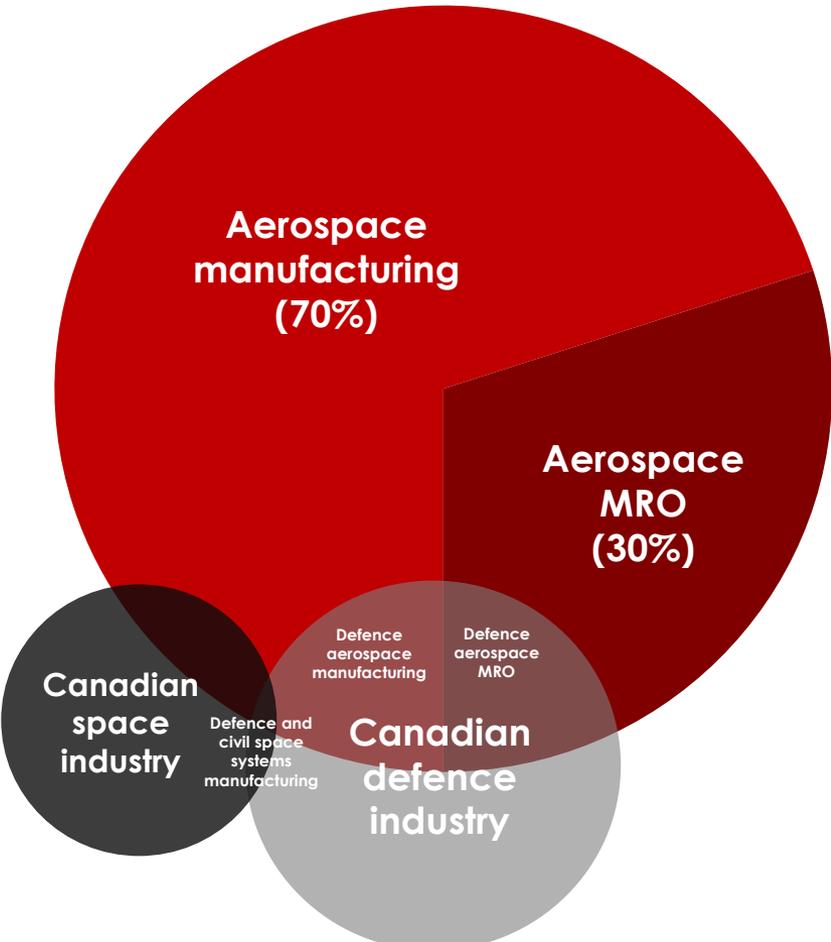
Annex

Features of the 2017 report



The Canadian aerospace industry ecosystem* is interlinked with the space and the defence industries

Canadian aerospace industry ecosystem

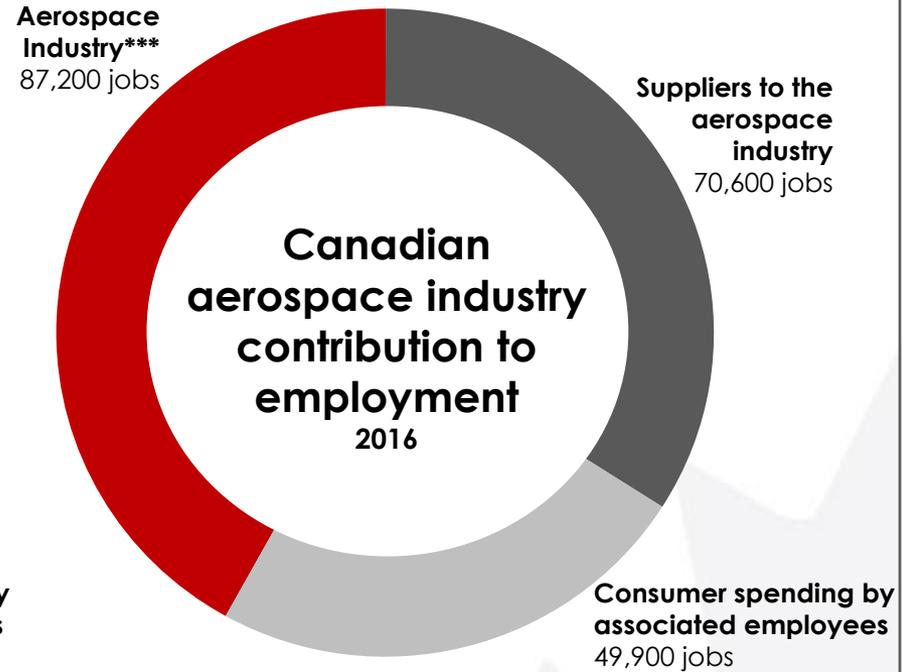
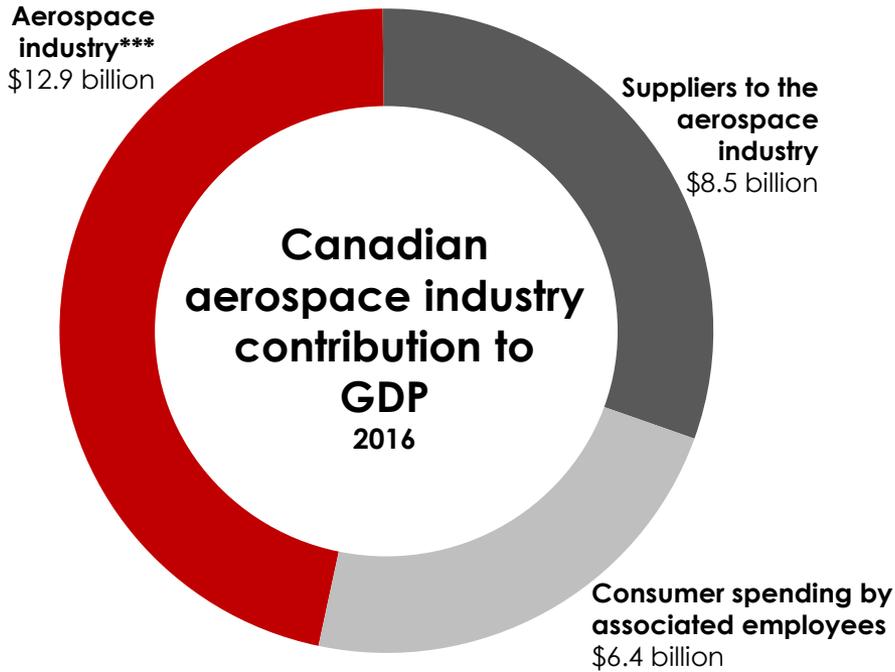


- The Canadian aerospace industry is broken down into two main activities: manufacturing (70% of GDP), and maintenance, repair and overhaul (MRO, 30% of GDP)*
- Beyond space systems manufacturing, the space industry includes satellite operations, value-added applications and space based broadcasting
- The Canadian aerospace industry includes both civil and defence activities

* 2014 GDP ISED economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency, the Canadian Space Agency and enterprise-level observations, 2017



The aerospace industry contributed close to \$28 billion in GDP* and 208,000 jobs to the Canadian economy** in 2016



- The aerospace industry generated \$27 billion in revenues and employed over 87,000 Canadians in 2016
- Canadian aerospace industry GDP and jobs remained relatively stable over the past 5 years, contracting slightly in the past 2 years****

Source: ISED's economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency and enterprise-level observations, National Input-Output Multipliers (2011) adjusted to 2016 GDP (in 2007 chained dollars), 2017

* Gross Domestic Product (GDP): total unduplicated value of the goods and services produced in an industry, country or region during a given period

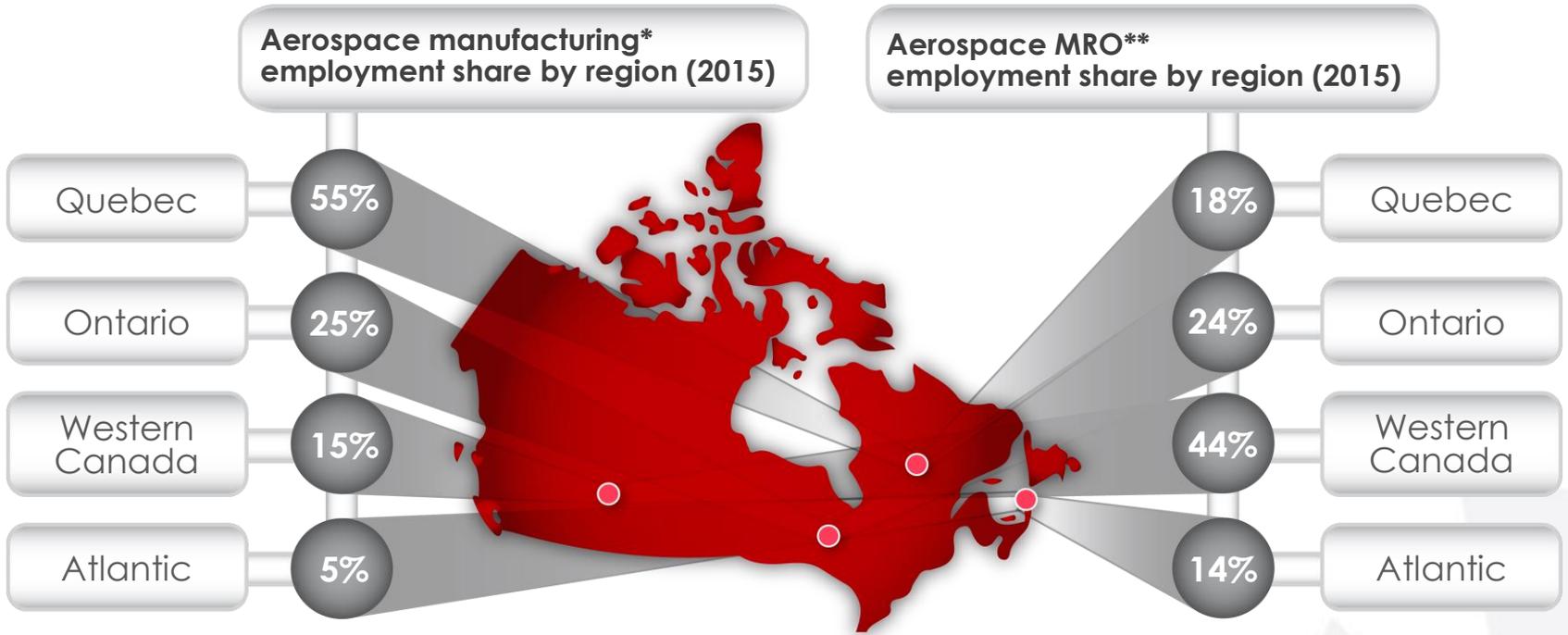
** Includes the aerospace industry (direct economic impact from enterprises for which aerospace is the main activity), suppliers to the aerospace industry (indirect economic impact from enterprises for which aerospace is not the main activity), and consumer spending by associated employees (induced economic impact)

*** Enterprises whose main activity is aerospace, see Annex 1 for aerospace industry GDP and employment contributions to the Canadian economy

**** See Annex 3 for a breakdown of aerospace GDP and employment contributions to the Canadian economy by year (2011-2016), 2017



The Canadian aerospace industry is national

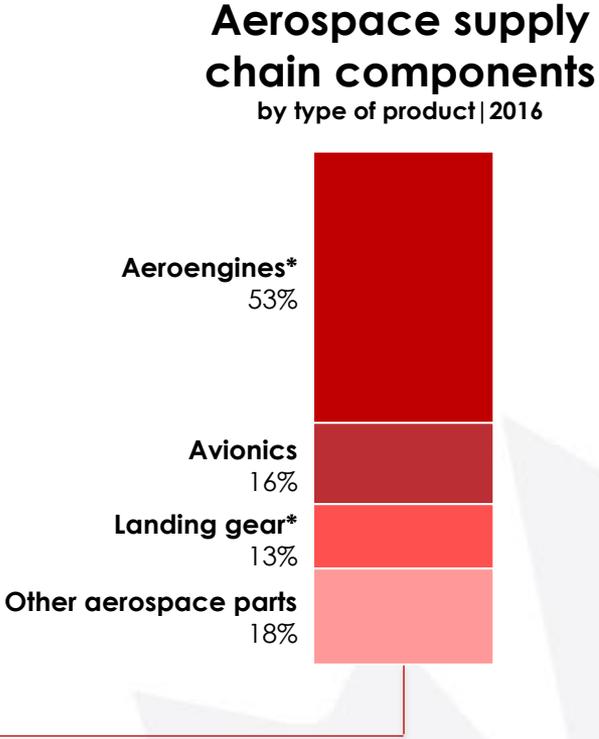
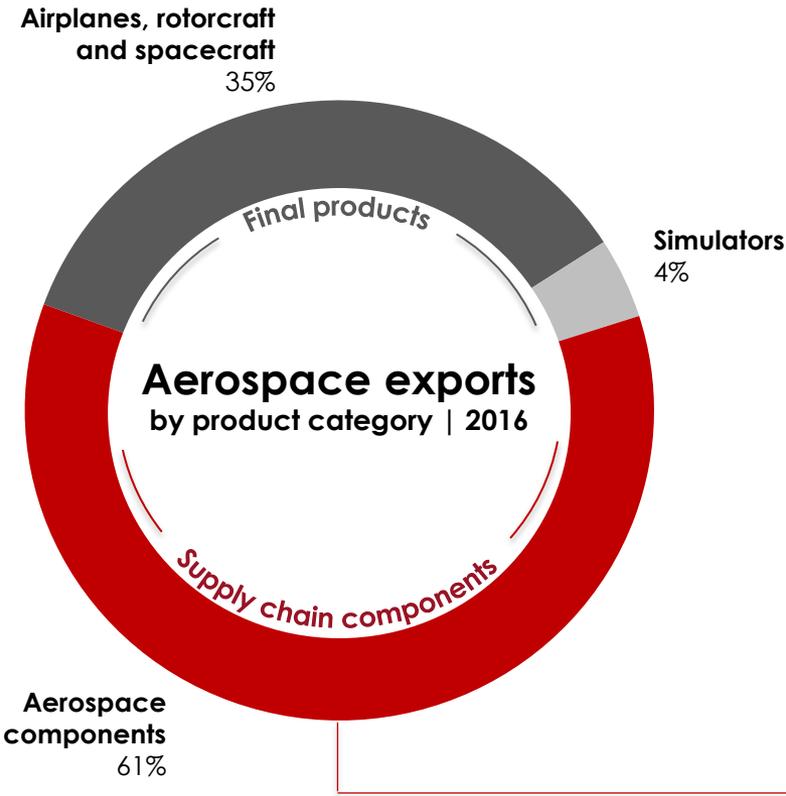


- The majority of aerospace manufacturing activity in 2015 was located in Central Canada
- Western and Atlantic Canada captured close to 60% of aerospace MRO activities

Source: ISED's economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency and enterprise-level observations, 2017
* Represents the share of aerospace manufacturing employment by region (2015), 2017
** Represents the share of aerospace MRO employment by region (2015), 2017



More than 60% of Canadian aerospace product exports were supply chain related



- The share of supply chain exports increased by more than 20% over the past 15 years

Source: Global Trade Atlas (2016), 2017
* Aeroengines and landing gear include their respective systems and components

 In a country comparison, Canada ranked* in the top three in terms of civil airplanes, helicopters, engines and flight simulators

#1 Civil flight simulation 

#3 Civil aircraft production 

#2 in business aircraft production #3 in helicopter production

#3 in regional aircraft production #4 in general aviation** production

#4 in large jet production

#3 Civil engine production 

#1 in turboprop engine production #1 in helicopter engine production

#4 in turbofan engine production

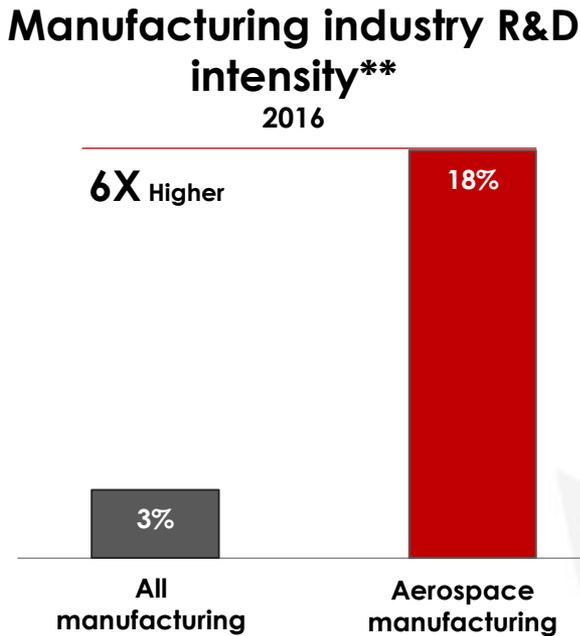
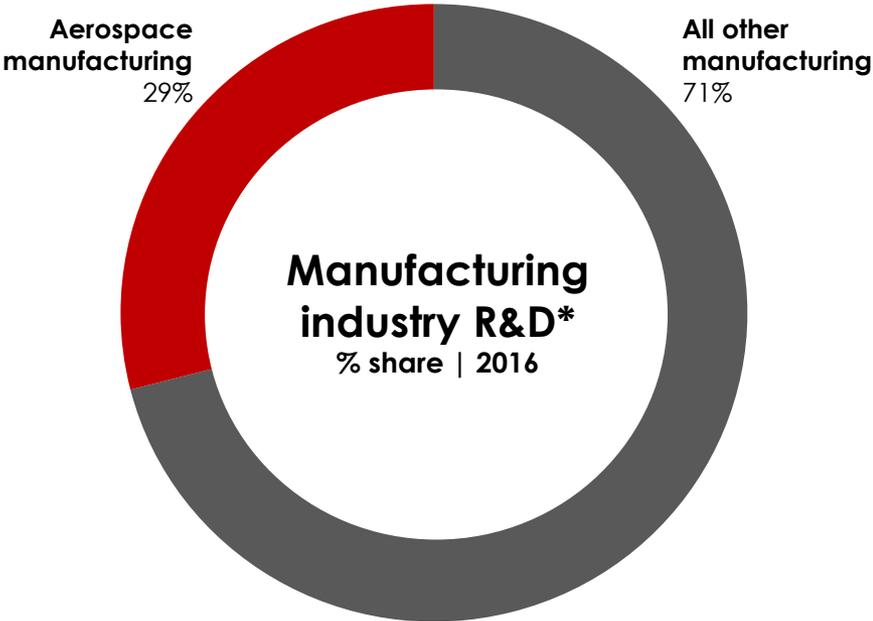
Source: Flight simulation: Frost & Sullivan, Commercial Flight Training and Simulation Market (2016); Aircraft production: average of Forecast International and Teal Group data (2017); Engine production: Forecast International (2017), 2017

* Rankings based on final assembly production volume

** General Aviation: includes all aircraft not used in either commuter services or airline service (excluding business jets and rotorcraft)



Aerospace was the number one R&D player across all Canadian manufacturing industries in 2016



- R&D performed by aerospace manufacturing totalled \$1.64 billion in 2016***
- The aerospace manufacturing industry generated close to 30% of overall Canadian manufacturing R&D and was six times as R&D intensive** as the manufacturing industry average

Source: ISED's economic model estimates are based on data from Statistics Canada, the Canada Revenue Agency and enterprise-level observations, 2017
 * Several aspects of the Statistics Canada Annual Survey of Research and Development in Canadian Industry have been redesigned in 2016, including concepts, methodology, the collection method and the data processing system. The concepts and definitions employed in the collection and dissemination of R&D data are provided in the Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development (Organisation for Economic Cooperation and Development (OECD), 2015). According to this definition: "R&D comprises creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge"

** R&D intensity: R&D/GDP
 *** See Annex 2 for a detailed breakdown of Canadian aerospace manufacturing R&D figures



Innovation practices in the Canadian aerospace manufacturing industry

- ISED analyzed innovation practice data for the 2012-2014 period which were released in 2016 by Statistics Canada*



Four types of business innovation^{**}: product, process, organizational, and marketing innovation



Development and customization of advanced technologies



Adoption of advanced manufacturing and supply chain management innovation



Collaboration practices for innovation with industry, academia and government research institutions



Skills development practices for the adoption of advanced technologies

* Statistics Canada Survey of Advanced Technology (2014), 2016

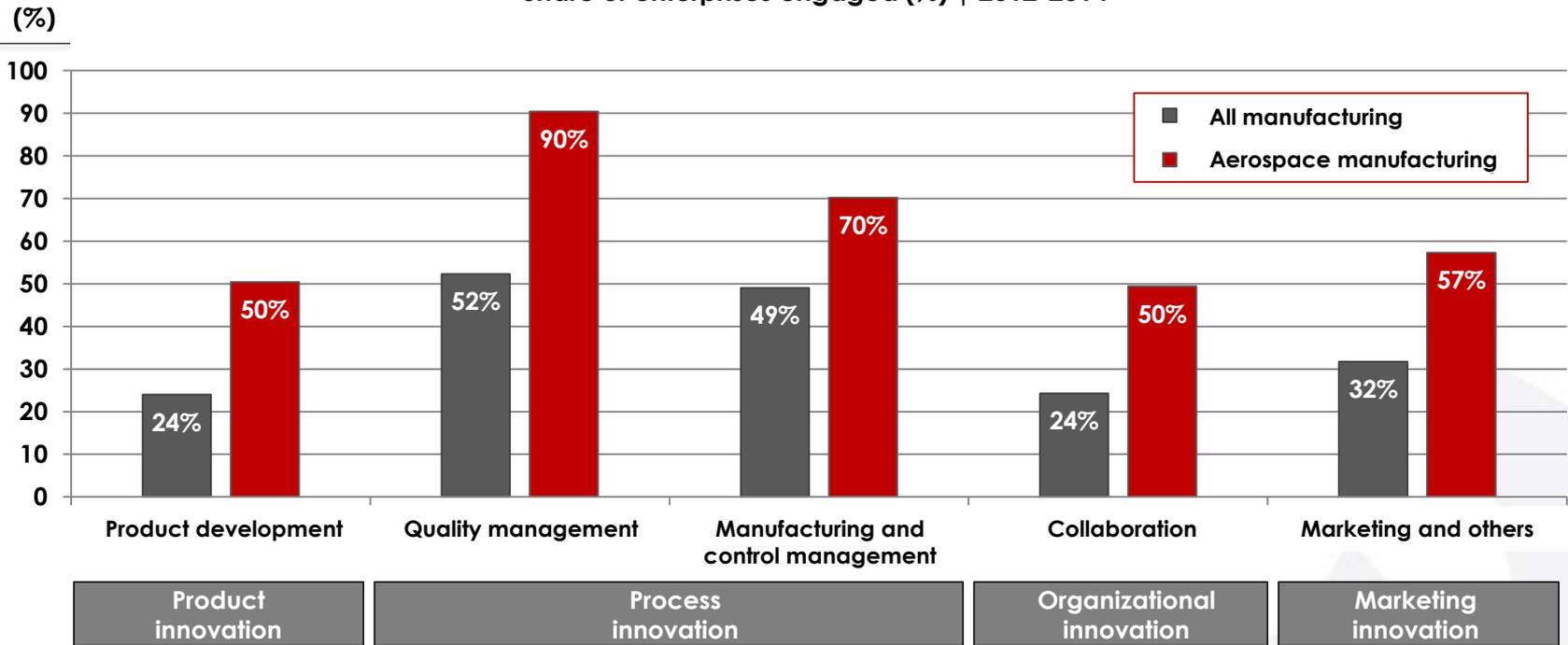
** Four types of business innovation practices based on the Organisation for Economic Co-operation and Development (OECD) Oslo Manual Guidelines for Collecting and Interpreting Innovation Data: product innovation, process innovation, organizational innovation and marketing innovation



Aerospace manufacturers outpaced the manufacturing average in the use of all types* of innovation practices

Business innovation practices

Share of enterprises engaged (%) | 2012-2014



- Process innovation was more prevalent than product innovation among Canadian aerospace manufacturers

Source: Statistics Canada Survey of Advanced Technology (2014), 2016

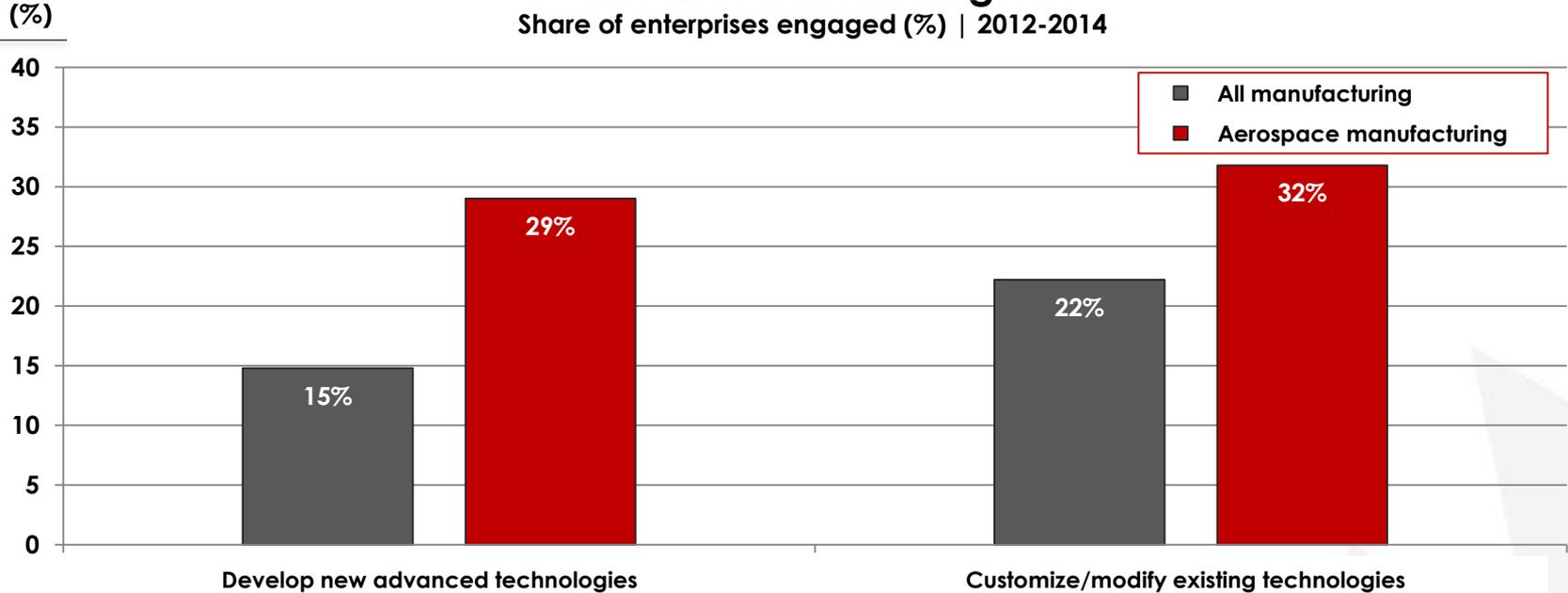
* Four types of business innovation practices based on the Organisation for Economic Co-operation and Development (OECD) Oslo Manual Guidelines for Collecting and Interpreting Innovation Data: product innovation, process innovation, organizational innovation and marketing innovation



Two times more aerospace manufacturers developed new technologies than the manufacturing average

Method of acquisition or integration of advanced technologies

Share of enterprises engaged (%) | 2012-2014



- 50% more aerospace manufacturers also customized/modified existing technologies compared to the Canadian manufacturing average

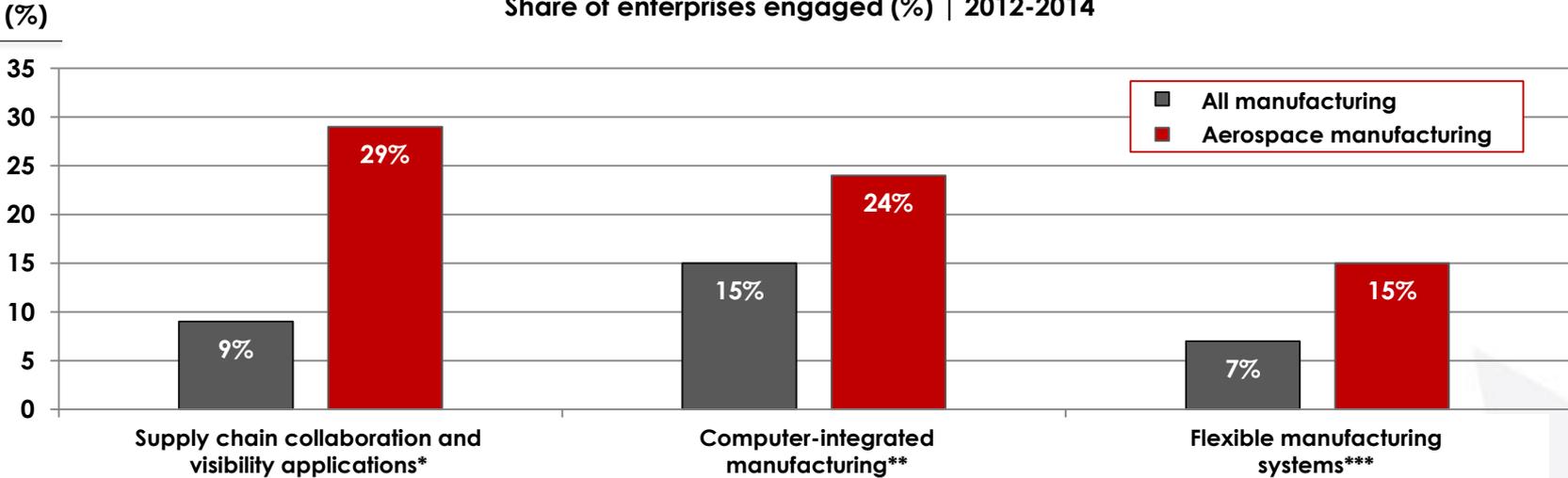
Source: Statistics Canada Survey of Advanced Technology (2014), 2016



Aerospace manufacturers surpassed the manufacturing average in advanced manufacturing technologies

Adoption of advanced manufacturing technologies

Share of enterprises engaged (%) | 2012-2014



- Nearly twice the share of small**** Canadian aerospace manufacturers adopted computer-integrated manufacturing compared to other small manufacturers

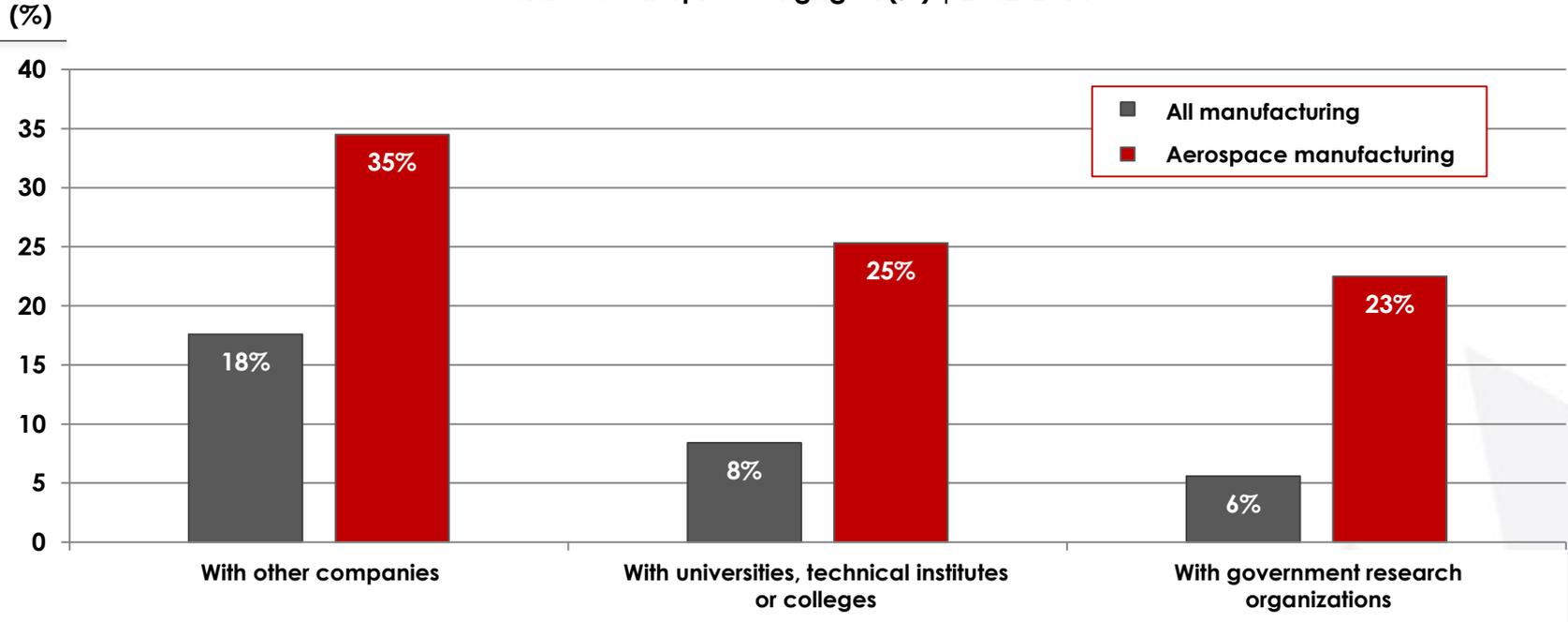
Source: Statistics Canada Survey of Advanced Technology (2014), 2016
* Supply chain collaboration and visibility systems refer to the ability to track parts, components or products in transit from the manufacturer to their final destination. The goal is to improve and strengthen the supply chain by making data readily available to all stakeholders, including the customer
** Computer-integrated manufacturing (CIM) refers to completely automated production, in which a central computer controls and integrates all manufacturing processes
*** Flexible Manufacturing Systems (FMS) refers to single or multiple machines with fully integrated materials handling capabilities controlled by computers or programmable controllers; capable of single or multiple-path acceptance of raw material and single or multiple-path delivery of the finished product
**** Enterprise size definitions: small enterprises (10-99 employees); medium enterprises (100-249 employees); large enterprises (more than 249 employees)



Aerospace manufacturers collaborated significantly more than the Canadian manufacturing average

Collaboration practices

Share of enterprises engaged (%) | 2012-2014



- Small* Canadian aerospace manufacturers collaborated three times more with academia and four times more with government research organizations compared to other small Canadian manufacturing enterprises

Source: Statistics Canada Survey of Advanced Technology (2014), 2016

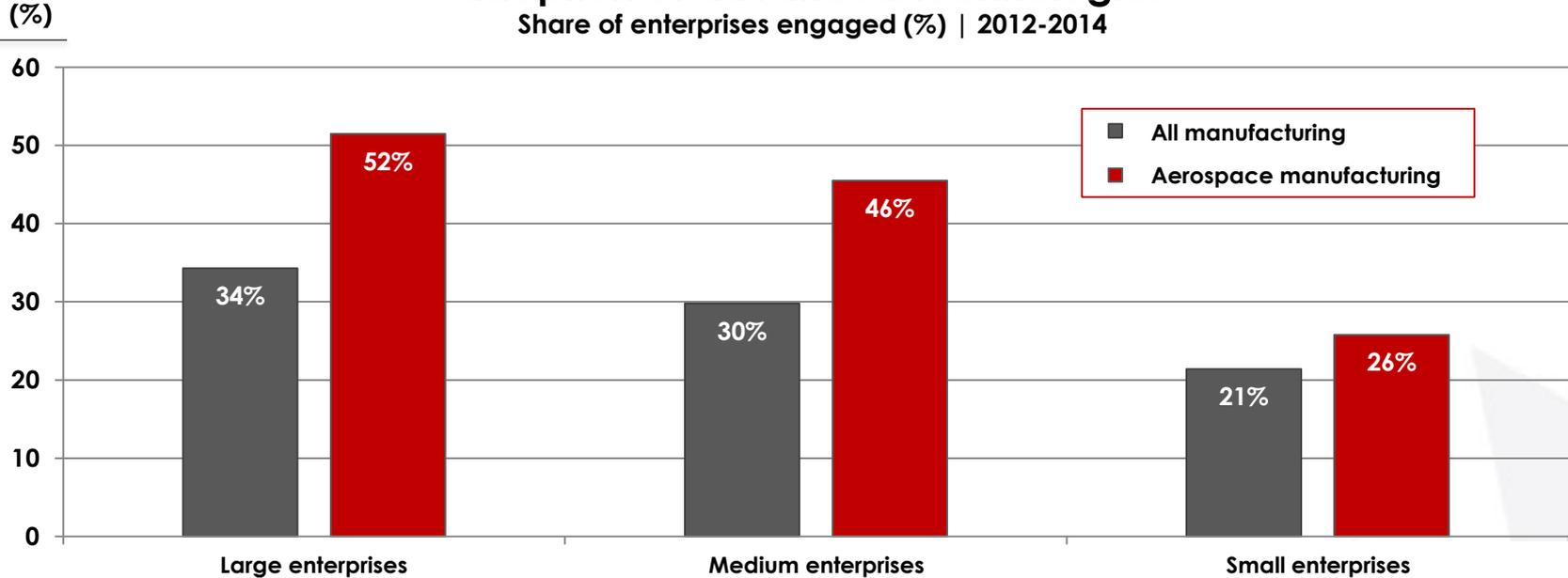
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Significantly more aerospace manufacturers increased their employment of skilled workers to introduce innovation than the manufacturing average

Recruitment of employees for the adoption of advanced technologies

Share of enterprises engaged (%) | 2012-2014



- All sizes* of aerospace manufacturers outperformed their Canadian manufacturing industry counterparts in terms of increasing their employment of skilled workers to introduce innovation

Source: Statistics Canada Survey of Advanced Technology (2014), 2016

* Enterprise size definitions: small enterprises (10-99 employees); medium enterprises (100-249 employees); large enterprises (more than 249 employees)



Key findings

- The Canadian aerospace industry contributed close to \$28 billion in GDP and 208,000 jobs to the Canadian economy
- Canadian aerospace manufacturing supply chain exports have grown faster than final products
- Canada maintained its global leadership position in civil airplanes, helicopters, engines and flight simulators
- Canadian aerospace manufacturing demonstrated innovation leadership by:
 - ✓ Being the number one manufacturing R&D player
 - ✓ Outpacing the manufacturing average in terms of use of all four types of innovation practices: product, process, organizational, and marketing innovation
 - ✓ Collaborating significantly more with industry, academia and government than the Canadian manufacturing industry average
 - ✓ Increasing its employment of skilled workers significantly more than the manufacturing average to introduce innovation



Annex

- **Annex 1 – Economic impact indicators, 2016**
- **Annex 2 – Industrial indicators, 2016**
- **Annex 3 – Industrial indicators, 2011-2016**



Annex 1 – Economic impact indicators, 2016

Canadian aerospace industry economic and employment impacts*

| Industry | Impact on Canadian GDP (\$ millions) | | | | Impact on Canadian employment (jobs) | | | |
|--------------------------------|---|---------------------------------|---|---------------|---|---------------------------------|---|----------------|
| | Aerospace industry | Suppliers to aerospace industry | Consumer spending by associated employees | Total** | Aerospace industry | Suppliers to aerospace industry | Consumer spending by associated employees | Total** |
| Aerospace manufacturing | 8,995 | 5,222 | 4,216 | 18,433 | 55,724 | 41,694 | 32,971 | 130,389 |
| Aerospace MRO | 3,897 | 3,269 | 2,134 | 9,300 | 31,448 | 28,895 | 16,912 | 77,255 |
| Aerospace total | 12,892 | 8,491 | 6,350 | 27,733 | 87,172 | 70,589 | 49,883 | 207,644 |

Source: ISED's economic model estimates based on data from the Statistics Canada Business Registry and CANSIM, the Canada Revenue Agency, and enterprise-level observations, 2017

* National Input-Output Multipliers (2011) adjusted to 2016 GDP (in 2007 chained dollars) and employment. Revenues and R&D are in current annual dollars

** Includes the aerospace industry (direct economic impact from enterprises for which aerospace is the main activity), suppliers to the aerospace industry (indirect economic impact from enterprises for which aerospace is not the main activity), and consumer spending by associated employees (induced economic impact)



Annex 2 – Industrial indicators, 2016

Canadian aerospace industry economic indicators*

| Metric | Aerospace manufacturing | Aerospace MRO | Aerospace total |
|--------------------------|-------------------------|---------------|-----------------|
| GDP (\$ millions) | 8,995 | 3,897 | 12,892 |
| Employment (jobs) | 55,724 | 31,448 | 87,172 |
| Revenues (\$ millions) | 19,509 | 7,696 | 27,205 |
| R&D** (\$ millions) | 1,640 | 40 | 1,680 |
| Exports*** (\$ millions) | 15,775 | N/A | N/A |

Source: ISED's economic model estimates are based on data from the Statistics Canada Business Registry and CANSIM, the Canada Revenue Agency, and enterprise-level observations, 2017

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*** Export figures are sourced from Global Trade Atlas (2016), 2017



Annex 3 – Industrial indicators, 2011-2016

Canadian aerospace industry economic indicators*

| Metric | Industry activity | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | % change from 2011 to 2016 |
|---------------------------------|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------------------|
| GDP (\$ millions) | Aerospace manufacturing | 8,712 | 9,082 | 9,616 | 10,147 | 9,613 | 8,995 | +3.3% |
| | Aerospace MRO | 3,211 | 3,291 | 3,347 | 3,520 | 3,769 | 3,897 | +21.4% |
| | Aerospace total | 11,923 | 12,373 | 12,963 | 13,667 | 13,382 | 12,892 | +8.1% |
| | Aerospace contribution to Canadian economy** | 25,516 | 26,467 | 27,695 | 29,195 | 28,457 | 27,733 | +8.7% |
| Employment (jobs) | Aerospace manufacturing | 54,067 | 56,649 | 58,078 | 60,140 | 57,647 | 55,724 | +3.1% |
| | Aerospace MRO | 27,049 | 28,541 | 28,695 | 30,242 | 31,314 | 31,448 | +16.3% |
| | Aerospace total | 81,116 | 85,190 | 86,773 | 90,382 | 88,961 | 87,172 | +7.5% |
| | Aerospace contribution to Canadian economy** | 192,962 | 202,668 | 206,391 | 215,015 | 211,814 | 207,644 | +7.6% |
| Revenues (\$ millions) | Aerospace manufacturing | 16,147 | 15,860 | 17,397 | 19,959 | 21,588 | 19,509 | +20.8% |
| | Aerospace MRO | 6,620 | 6,985 | 7,022 | 7,401 | 7,663 | 7,696 | +16.3% |
| | Aerospace total | 22,767 | 22,845 | 24,419 | 27,360 | 29,251 | 27,205 | +19.5% |
| R&D*** (\$ millions) | Aerospace total | 1,662 | 1,837 | 1,990 | 2,050 | 1,845 | 1,680 | +1.1% |

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