UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 8-K

CURRENT REPORT
Pursuant to Section 13 or 15(d) of the
Securities Exchange Act of 1934
Date of Report (Date of earliest event reported)

April 29, 2020

NORTHROP GRUMMAN CORPORATION

(Exact name of registrant as specified in its charter)

Delaware	**1-16411**	**80-0640649**
(State or Other Jurisdiction of Incorporation or Organization)	**(Commission File Number)**	**(IRS Employer Identification Number)**

2980 Fairview Park Drive, Falls Church, VA 22042
(Address of principal executive offices)(Zip Code)

(703) 280-2900
(Registrant's telephone number, including area code)

(Former name or former address, if changed since last report)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock	NOC	New York Stock Exchange

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions:
☐ Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
☐ Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
☐ Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
☐ Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

Indicate by check mark whether the registrant is an emerging growth company as defined in Rule 405 of the Securities Act of 1933 (§230.405 of this chapter) or Rule 12b-2 of the Securities Exchange Act of 1934 (§240.12b-2 of this chapter).

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

ITEM 8.01. Other Events.

Northrop Grumman Corporation (“we” or the “company”) is filing this Current Report on Form 8-K to recast the presentation of its consolidated financial statements that were filed on January 30, 2020 with the Securities and Exchange Commission (“SEC”) in the company’s Annual Report on Form 10-K for the year ended December 31, 2019 (the “2019 Form 10-K”) to reflect the changes in the company’s organizational structure and reportable segments that are described immediately below. This Form 8-K recasts disclosures in certain portions of the 2019 Form 10-K to reflect these changes in each of the periods presented.

At December 31, 2019, the company was aligned in four operating sectors: Aerospace Systems, Innovation Systems, Mission Systems and Technology Services. Effective January 1, 2020, the company reorganized its sectors to better align the company’s broad portfolio to serve its customers’ needs. The four new sectors are: Aeronautics Systems, Defense Systems, Mission Systems and Space Systems.

The company’s financial statements and other disclosures included in our Quarterly Report on Form 10-Q for the quarter ended March 31, 2020 (the “First Quarter 2020 Form 10-Q”) reflect this new reporting structure. The company is including in this Form 8-K the following items from the 2019 Form 10-K and revising necessary portions of the disclosures contained in these items, for each of the periods presented, to reflect this change in the company’s organizational structure and reportable segments: Business (Item 1), Properties (Item 2), Management’s Discussion and Analysis of Financial Condition and Results of Operations (Item 7) and Financial Statements and Supplementary Data (Item 8, solely to reflect changes in Notes 1, 2, 8 and 16 to the consolidated financial statements).

Except for the segment changes described above, this Form 8-K does not modify or update disclosures as presented in the 2019 Form 10-K and does not reflect any changes, events or activities occurring after the date of the filing of the 2019 Form 10-K. Therefore, this Form 8-K should be read in conjunction with the 2019 Form 10-K and the company’s filings made with the SEC subsequent to the filing of the 2019 Form 10-K, including the First Quarter 2020 Form 10-Q.

ITEM 9.01. Financial Statements and Exhibits.

(d) Exhibits

Exhibit 23 Consent of Independent Registered Public Accounting Firm*

Exhibit 99.1 Item 1: Business*

Exhibit 99.2 Item 2: Properties*

Exhibit 99.3 Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations*

Exhibit 99.4 Item 8: Financial Statements and Supplementary Data*

* filed herewith

SIGNATURE

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

NORTHROP GRUMMAN CORPORATION
(Registrant)

By: /s/ Jennifer C. McGarey

(Signature)
Jennifer C. McGarey
Corporate Vice President and Secretary

Date: April 29, 2020

Exhibit Index

Exhibit No.

Exhibit 23 Consent of Independent Registered Public Accounting Firm

Exhibit 99.1 Item 1: Business

Exhibit 99.2 Item 2: Properties

Exhibit 99.3 Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations

Exhibit 99.4 Item 8: Financial Statements and Supplementary Data

Exhibit 101 — Northrop Grumman Corporation Current Report on Form 8-K dated April 29, 2020, formatted in XBRL (Extensible Business Reporting Language): Cover Page. The instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.

Exhibit 104 — Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

EXHIBIT 23

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statement Nos. 033-59815, 033-59853, 333-67266, 333-100179, 333-107734, 333-121104, 333-125120, 333-127317, and 333-175798 on Form S-8; and Registration Statement No. 333-237504 on Form S-3; of our report dated January 29, 2020 (April 28, 2020 as to the reclassification of segment information as described in Notes 1, 2, 8 and 16), relating to the financial statements of Northrop Grumman Corporation and subsidiaries, appearing in this Current Report on Form 8-K of Northrop Grumman Corporation dated April 29, 2020.

/s/ Deloitte & Touche LLP
McLean, Virginia
April 28, 2020

EXHIBIT 99.1

PART I

Item 1. Business

HISTORY AND ORGANIZATION

History

Northrop Grumman Corporation (herein referred to as “Northrop Grumman,” the “company,” “we,” “us,” or “our”) is a leading global security company. We offer a broad portfolio of capabilities and technologies that enable us to deliver innovative platforms, systems and solutions for applications that range from undersea to outer space and into cyberspace. We provide capabilities in autonomous systems; cyber; command, control, communications and computers, intelligence, surveillance and reconnaissance (C4ISR); space; strike; and logistics and modernization. We participate in many high-priority defense and government programs in the United States (U.S.) and abroad. We conduct most of our business with the U.S. government, principally the Department of Defense (DoD) and intelligence community. We also conduct business with foreign, state and local governments, as well as commercial customers. For a discussion of risks associated with our operations, see “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K.

The company originally was formed in Hawthorne, California, in 1939, as Northrop Aircraft Incorporated and was reincorporated in Delaware in 1985, as Northrop Corporation. Northrop Corporation was a principal developer of flying wing technology, including the B-2 Spirit bomber. The company developed into one of the largest defense contractors in the world through a series of acquisitions, as well as organic growth. In 1994, we acquired Grumman Corporation (Grumman), after which time the company was renamed Northrop Grumman Corporation. Grumman was a premier military aircraft systems integrator and builder of the Lunar Module that first delivered humans to the surface of the moon. In 1996, we acquired the defense and electronics businesses of Westinghouse Electric Corporation, a world leader in the development and production of sophisticated radar and other electronic systems for the nation’s defense, civil aviation, and other U.S. and international applications. In 2001, we acquired Litton Industries, Inc., a global electronics and information technology company, and one of the nation’s leading full service shipbuilders. Also in 2001, we acquired Newport News Shipbuilding Inc., a leading designer and builder of nuclear-powered aircraft carriers and submarines. In 2002, we acquired TRW Inc., a leading developer of military and civil space systems and payloads, as well as a leading global integrator of complex, mission-enabling systems and services. In 2011, we completed the spin-off to our shareholders of Huntington Ingalls Industries, Inc. (HII). HII operates our former Shipbuilding business, comprised largely of a part of Litton Industries and Newport News Shipbuilding.

On June 6, 2018 (the “Merger date”), the company completed its acquisition of Orbital ATK, Inc. (“Orbital ATK”) (the “Merger”). On the Merger date, Orbital ATK became a wholly-owned subsidiary of the company and its name was changed to Northrop Grumman Innovation Systems, Inc., which we established as a new, fourth business sector (“Innovation Systems”). The operating results of legacy Innovation Systems subsequent to the Merger date have been included in the company’s consolidated results of operations and are reflected in the Space Systems, Defense Systems and Aeronautics Systems sectors. See Note 2 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information regarding the acquisition of Orbital ATK.

Organization

At December 31, 2019, the company was aligned in four operating sectors, which also comprised our reportable segments: Aerospace Systems, Innovation Systems, Mission Systems and Technology Services.

Subsequent Realignment – Effective January 1, 2020, the company reorganized its sectors to better align the company’s broad portfolio to serve its customers’ needs. The four new sectors are: Aeronautics Systems, Defense Systems, Mission Systems and Space Systems. This realignment is reflected in the business descriptions below and in the accompanying financial information contained in this report.

AERONAUTICS SYSTEMS

Aeronautics Systems, headquartered in Palmdale, California, is a leader in the design, development, integration and production of autonomous and manned aircraft systems used for battle management, strike and intelligence, surveillance and reconnaissance (ISR). Aeronautics Systems' primary customers are the U.S. Air Force, the U.S. Navy, other U.S. government agencies and foreign governments. The sector is reported in two business areas that reflect our core capabilities: Autonomous Systems and Manned Aircraft.

Autonomous Systems – designs, develops, manufactures, integrates and sustains autonomous aircraft systems for strategic and tactical ISR missions. Strategic ISR programs include high-altitude long-endurance (HALE) systems,

such as Global Hawk, which provides near real-time high resolution imagery of land masses for theater awareness; Triton, which provides real-time ISR over vast ocean and coastal regions for maritime domain awareness; and the North Atlantic Treaty Organization (NATO) Alliance Ground Surveillance (AGS) system for multinational theater operations. Tactical ISR programs include Fire Scout, a ship-based vertical take-off and landing (VTOL) system that provides situational awareness for maritime forces and precision targeting support; and the Firebird product line, which is available in manned, autonomous and optionally-piloted configurations, and provides flexibility through open architecture and plug-and-play mission payload integration.

Manned Aircraft – designs, develops, manufactures and integrates strategic long-range strike aircraft systems, tactical fighter aircraft and airborne battle management systems. Long-range strike aircraft programs include the B-21 Raider long-range strike bomber and modernization and sustainment services for the B-2 Spirit bomber. Tactical fighter aircraft programs include the design, development, manufacture and integration of F-35 Lightning II center fuselage and F/A-18 Super Hornet center/aft fuselage sections. Airborne battle management programs include the E-2D Advanced Hawkeye and E-8C Joint Surveillance Target Attack Radar System (JSTARS).

DEFENSE SYSTEMS

Defense Systems, headquartered in McLean, Virginia is a leader in the design, development, production, integration, sustainment and modernization of weapon and mission systems for U.S. military and civilian agency customers, and a broad range of international customers. Major products and services include integrated battle management command systems, weapons systems, mission system sustainment and modernization, information technology services and intelligence operations. The sector is reported in two business areas that reflect our core capabilities: Battle Management & Missile Systems, and Mission Readiness.

Battle Management & Missile Systems – designs, develops and integrates multi-domain command and control (C2) and weapons systems, including munitions and missiles. The business provides integration and interoperability of net-enabled battle management, sensors, targeting and surveillance systems, as well as air and missile defense C2 systems. It also develops and produces precision strike weapons; advanced propulsion, including high speed air-breathing systems; and high-performance gun systems and precision munitions. Competencies include system and software development; integration of weapon systems; tactical missile and component development and production; and production of advanced fuzes, munitions and defense electronics. Key programs include the Integrated Air and Missile Defense Battle Command System (IBCS) for the U.S. Army and Poland; Counter Rocket, Artillery and Mortar (C-RAM); Distributed Mission Operations Network (DMON); the U.S. Navy’s Advanced Anti-Radiation Guided Missile (AARGM); Precision Guidance Kit (PGK); and the Mission Command Training Program (MCTP).

Mission Readiness – provides full life cycle service and support for software, weapons systems and aircraft, and logistics support, sustainment, operations and modernization for air, sea and ground systems. It also provides full life cycle development, modernization and sustainment of information systems; security services including information and cyber operations; and intelligence analysis and support. Competencies include aircraft, electronics and software sustainment and engineering; electronic subsystems modernization; weapon systems logistics support; cyber; data analytics and decision support tools; and IT infrastructure including cloud. Key programs include the Social Security Administration Information Technology Support Services Contract (SSA-ITSSC); Counter Threat Messaging (CTM) for Joint Services; restricted intelligence operations; Program Systems Product Directorate (PSPD) for Department of Homeland Security; Consular Systems Modernization (CSM) for Department of State; AAQ-24 and APN-241 sensor sustainment; and system sustainment and operations support for the B-2 Spirit bomber, E-8C JSTARS surveillance aircraft, KC-30A multi-role tanker, C-27J transport, UK E-3D Airborne Early Warning and Control System, Global Hawk, Triton, and F-35.

MISSION SYSTEMS

Mission Systems, headquartered in Linthicum, Maryland, is a leader in advanced mission solutions and multifunction systems, primarily for the U.S. and ally defense and intelligence community customers. Major products and services include C4ISR systems; radar, electro-optical/infrared (EO/IR) and acoustic sensors; electronic warfare systems; cyber solutions; intelligence processing systems; navigation; and submarine power, propulsion and payload launch systems. The sector is reported in four business areas that reflect our core capabilities: Airborne Sensors & Networks; Cyber & Intelligence Mission Solutions; Maritime/Land Systems & Sensors; and Navigation, Targeting & Survivability.

Airborne Sensors & Networks – delivers products, systems and services that support airborne platforms with advanced communications and network systems; multi-function radio frequency (RF) and EO/IR systems; and radar, electronic warfare and situational awareness mission systems. Competencies include fire control, surveillance and

early warning and control radar systems; electronic attack and electronic support systems; software defined radios and network gateways, communications and counter-communications systems; and multi-sensor processing. Key programs include Airborne Early Warning & Control (AEW&C) and air-to-ground sensors; Battlefield Airborne Communications Node (BACN); F-35 fire control radar, Distributed Aperture System (DAS), and Communications, Navigation and Identification (CNI) integrated avionics system; LONGBOW Fire Control Radar (FCR); Joint Counter Radio-Controlled Improvised Explosive Device Electronic Warfare (JCREW); Scalable Agile Beam Radar (SABR); and restricted programs.

Cyber & Intelligence Mission Solutions – delivers products, systems and services that support full-spectrum cyber solutions, secure processing, transformational computing, advanced technology development, Signals Intelligence (SIGINT) mission systems and enterprise integration of multi-intelligence mission data across all domains. Competencies include cyber mission management; large-scale cyber solutions for national security applications; cyber survivability; ground software systems; SIGINT sensors and processing; and geospatial intelligence and data fusion, specializing in the collection, processing and exploitation of data. Key programs include exploitation and cyber programs; Enhanced Solutions for the Information Technology Enterprise (E-SITE); the Enterprise Application Managed Services (EAMS) program; the Unified Platform System Coordinator program; the Airborne Signals Intelligence Payload (ASIP); and restricted programs.

Maritime/Land Systems & Sensors – delivers products, systems and services that enable maritime and ground platform mission capabilities via sensors, targeting and surveillance systems; electronic warfare systems; mission module integration; power, propulsion and control systems; and missile launchers. Competencies include ground and maritime radar systems; nuclear ship propulsion and power generation systems; shipboard missile and encapsulated payload launch systems; integrated bridge systems; unmanned maritime vehicles; high-resolution undersea sensors; deep-sea packaging; and mission integration. Key programs include the Surface Electronic Warfare Improvement Program (SEWIP) Block III; Ground/Air Task Oriented Radar (G/ATOR); submarine power, propulsion, launch and sensing systems for Ohio, Virginia and Columbia class submarines; AQS-24B Minehunting System; Littoral Combat Ship Mission Module Integration; DDG Modernization; Offshore Patrol Cutter; and restricted programs associated with the maritime operating domain.

Navigation, Targeting & Survivability – delivers products, systems and services that support aircraft platforms with targeting, self-protection and situational awareness mission systems; and provides embedded navigation and positioning sensors for a range of platforms including ships, aircraft, spacecraft and weapons. Competencies include EO/IR and RF self-protection; targeting and surveillance systems; digitized cockpits; and inertial navigation systems. Key programs include the LITENING Advanced Targeting Pod; Large Aircraft and Common Infrared Countermeasures (LAIRCM, DoN LAIRCM, CIRCM) systems; APR-39 DV(2) and EV(2) Radar Warning Receiver programs; the Embedded Global Positioning System (GPS)/Inertial Navigation Systems-Modernization (EGI-M) program; the UH-60V Black Hawk integrated mission equipment package; and restricted programs.

SPACE SYSTEMS

Space Systems, headquartered in Dulles, Virginia, is a leader in delivering end-to-end mission solutions through the design, development, integration, production and operation of space, launch and strategic missile systems for national security, civil government, commercial and international customers. Major products include satellites and payloads; ground systems; launch vehicles and related propulsion systems; missile defense systems and targets; and strategic missiles. The sector is reported in two business areas that reflect our core capabilities: Launch & Strategic Missiles, and Space.

Launch & Strategic Missiles – designs, develops, manufactures and integrates small- and medium-class space launch vehicles to place satellites into earth orbit and escape trajectories; missile defense systems and target vehicles; and suborbital launch vehicles that place payloads into a variety of high-altitude trajectories. Competencies include strategic missile sustainment as well as the production of medium- and large-class rocket propulsion systems for human and cargo launch vehicles, hypersonic boosters and missile defense interceptors. Key programs include missile defense systems and interceptor boosters for the Missile Defense Agency's (MDA) Ground-based Midcourse Defense (GMD) system; the Antares rocket used in the execution of our Commercial Resupply Services (CRS) contracts with NASA; the development and production of solid rocket motors for the National Aeronautics and Space Administration’s (NASA) Space Launch System (SLS) heavy lift vehicle; medium-class solid rocket motors for the U.S. Navy's Trident II Fleet Ballistic Missile program; Ground Based Strategic Deterrent (GBSD) Technology Maturation and Risk Reduction (TMRR) program; and the Intercontinental Ballistic Missile (ICBM) Ground Subsystem Support Contract (GSSC).

Space – designs, develops, manufactures and integrates spacecraft systems, subsystems, sensors, payloads and ground systems to deliver mission capability to national security, science and environmental, communications, on-orbit servicing, and human-rated space systems for earth orbit and deep-space exploration missions. Much of this business is performed through restricted programs. Key unrestricted programs include the Cygnus spacecraft used in the execution of our CRS contracts with NASA; Advanced Extremely High Frequency (AEHF) and Enhanced Polar System (EPS) payloads providing survivable, protected communications to U.S. forces; Next-Generation Overhead Persistent Infrared Program (OPIR) satellites and payloads providing data for missile defense; and the James Webb Space Telescope (JWST), a large infrared telescope being built for NASA that will be deployed in space to study the origins of the universe.

SELECTED FINANCIAL DATA

For a summary of selected consolidated financial information, see “Selected Financial Data” in Part II, Item 6 of the 2019 Form 10-K.

CUSTOMER CONCENTRATION

Our largest customer is the U.S. government. Sales to the U.S. government accounted for 83 percent, 82 percent and 85 percent of sales during the years ended December 31, 2019, 2018 and 2017, respectively. For further information on sales by customer type, contract type and geographic region, see Note 16 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K. No single program accounted for more than ten percent of total sales during any period presented. See “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K for further discussion regarding risks related to customer concentration.

COMPETITIVE CONDITIONS

We compete with many companies in the defense, intelligence and federal civil markets. BAE Systems, Boeing, Booz Allen Hamilton, General Dynamics, L3Harris Technologies, Leidos, Leonardo, Lockheed Martin, Raytheon and Thales are some of our primary competitors. Key characteristics of our industry include long operating cycles and intense competition, which is evident through the number of competitors bidding on program opportunities and the number of bid protests (competitor protests of U.S. government procurement awards).

It is common in the defense industry for work on major programs to be shared among a number of companies. A company competing to be a prime contractor may, upon ultimate award of the contract to another competitor, become a subcontractor to the ultimate prime contracting company. It is not unusual to compete for a contract award with a peer company and, simultaneously, perform as a supplier to or a customer of that same competitor on other contracts, or vice versa.

SEASONALITY

No material portion of our business is considered to be seasonal.

BACKLOG

At December 31, 2019, total backlog, which is equivalent to the company’s remaining performance obligations, was $64.8 billion as compared with $53.5 billion at December 31, 2018. For further information, see “Backlog” in “Management’s Discussion and Analysis of Financial Condition and Results of Operations” (MD&A) in Part II, Item 7 of Exhibit 99.3 of this Form 8-K and Note 1 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

INTELLECTUAL PROPERTY

We routinely apply for and own a number of U.S. and foreign patents related to the technologies we develop. We also develop and protect intellectual property as trade secrets. In addition to owning a large portfolio of proprietary intellectual property, we license some intellectual property rights to third parties and we license or otherwise obtain access to intellectual property from third parties. The U.S. government typically holds licenses to patents developed in the performance of U.S. government contracts and may use or authorize others to use the inventions covered by these patents for certain purposes. See “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K for further discussion regarding risks related to intellectual property.

RAW MATERIALS

We have not experienced significant delays in the supply or availability of raw materials, nor have we experienced a significant price increase for raw materials. See “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K for further discussion regarding risks related to raw materials.

EMPLOYEE RELATIONS

We believe that we maintain good relations with our approximately 90,000 employees. Approximately 5,000 are covered by 17 collective agreements in the U.S., of which we negotiated two renewals and one new agreement in 2019 and expect to negotiate six renewals in 2020. See "Risk Factors" in Part I, Item 1A of the 2019 Form 10-K for further discussion regarding risks related to employee relations.

REGULATORY MATTERS

Government Contract Security Restrictions

We are prohibited by the U.S. government from publicly discussing the details of certain classified programs. These programs are generally referred to as "restricted" in this Form 8-K and the 2019 Form 10-K. The consolidated financial statements and financial information in this Form 8-K and the 2019 Form 10-K reflect the operating results of our entire company, including restricted programs.

Contracts

We generate the majority of our business from long-term contracts with the U.S. government for development, production and support activities. Unless otherwise specified in a contract, allowable and allocable costs are billed to contracts with the U.S. government pursuant to the Federal Acquisition Regulation (FAR) and U.S. government Cost Accounting Standards (CAS). Examples of costs incurred by us and not billed to the U.S. government in accordance with the FAR and CAS include, but are not limited to, certain legal costs, charitable donations, advertising costs, interest expense and unallowable employee compensation costs.

We monitor our contracts on a regular basis for compliance with our policies and procedures and applicable government laws and regulations. In addition, costs incurred and allocated to contracts with the U.S. government are routinely audited by the Defense Contract Audit Agency (DCAA).

Our long-term contracts typically fall into one of two contract types:

Cost-type contracts – Cost-type contracts include cost plus fixed fee, cost plus award fee and cost plus incentive fee contracts. Cost-type contracts generally provide for reimbursement of a contractor's allowable costs incurred plus fee. As a result, cost-type contracts have less financial risk associated with unanticipated cost growth but generally provide lower profit margins than fixed-price contracts. Cost-type contracts typically require that the contractor use its best efforts to accomplish the scope of the work within some specified time and stated dollar limitation. Fees on cost-type contracts can be fixed in terms of dollar value or can be variable due to award and incentive fees, which are generally based on performance criteria such as cost, schedule, quality and/or technical performance. Award fees are determined and earned based on customer evaluation of the company's performance against contractual criteria. Incentive fees are generally based on cost or schedule and provide for an initially negotiated fee to be adjusted later, based on the relationship of total allowable costs to total target costs or as schedule milestones are met. Award and incentive fees are included in total estimated sales to the extent it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. We estimate variable consideration as the most likely amount to which we expect to be entitled.

Fixed-price contracts – Firm fixed-price contracts include a specified scope of work for a price that is a pre-determined, negotiated amount and not generally subject to adjustment regardless of costs incurred by the contractor, absent changes in scope by the customer. As a result, fixed-price contracts have more financial risk associated with unanticipated cost growth, but generally provide the opportunity for higher profit margins than cost-type contracts. Certain fixed-price incentive fee contracts provide for reimbursement of the contractor's allowable costs plus a fee up to a cost ceiling amount, typically through a cost-sharing ratio that affects profitability. These contracts effectively become firm fixed-price contracts once the cost-share ceiling is reached. Time-and-materials contracts are considered fixed-price contracts as they specify a fixed hourly rate for each labor hour charged.

Profit margins on our contracts may vary materially depending on, among other things, the contract type, contract phase (e.g., development, low-rate production or mature production), negotiated fee arrangements, achievement of performance objectives, and cost, schedule and technical performance.

See Note 1 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K and "Risk Factors" in Part I, Item 1A of the 2019 Form 10-K for further information regarding our contracts and Note 16 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for sales by contract type.

The following table summarizes sales for the year ended December 31, 2019, recognized by contract type and customer category:

$ in millions	U.S. Government[1]	International[2]	Other Customers	Total	Percentage of Total Sales
Cost-type contracts	$ 15,720	$ 683	$ 76	$ 16,479	49%
Fixed-price contracts	12,214	4,471	677	17,362	51%
Total sales	$ 27,934	$ 5,154	$ 753	$ 33,841	100%

[1] Sales to the U.S. government include sales from contracts for which we are the prime contractor, as well as those for which we are a subcontractor and the ultimate customer is the U.S. government. Each of the company's segments derives substantial revenue from the U.S. government.

[2] International sales include sales from contracts for which we are the prime contractor, as well as those for which we are a subcontractor and the ultimate customer is an international customer. These sales include foreign military sales contracted through the U.S. government.

Environmental

Our operations are subject to and affected by federal, state, local and foreign laws, regulations and enforcement actions relating to protection of the environment. In 2015, we announced our 2020 environmental sustainability goals: to reduce absolute greenhouse gas emissions by 30 percent from 2010 levels; to reduce potable water use by 20 percent from 2014 levels; and to achieve a 70 percent solid waste diversion rate (away from landfills).

We have incurred and expect to continue to incur capital and operating costs to comply with applicable environmental laws and regulations and to achieve our environmental sustainability commitments. See "Risk Factors" in Part I, Item 1A of the 2019 Form 10-K and Notes 1 and 12 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information regarding environmental matters.

EXECUTIVE OFFICERS

See "Directors, Executive Officers and Corporate Governance" in Part III, Item 10 of the 2019 Form 10-K for information about our executive officers.

AVAILABLE INFORMATION

Our principal executive offices are located at 2980 Fairview Park Drive, Falls Church, Virginia 22042. Our telephone number is (703) 280-2900 and our home page is www.northropgrumman.com.

Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and proxy statement for the annual shareholders' meeting, as well as any amendments to those reports, are available free of charge through our website as soon as reasonably practicable after we file them with the U.S. Securities and Exchange Commission (SEC). You can learn more about us by reviewing our SEC filings on the investor relations page of our website.

The SEC also maintains a website at www.sec.gov that contains reports, proxy statements and other information about SEC registrants, including Northrop Grumman Corporation.

References to our website and the SEC's website in this report are provided as a convenience and do not constitute, and should not be viewed as, incorporation by reference of the information contained on, or available through, such websites. Such information should not be considered a part of this report, unless otherwise expressly incorporated by reference in this report.

EXHIBIT 99.2

Item 2. Properties

At December 31, 2019, we had approximately 54 million square feet of floor space at 545 separate locations, primarily in the U.S., for manufacturing, warehousing, research and testing, administration and various other uses.

At December 31, 2019, we leased to third parties approximately 304,000 square feet of our owned and leased facilities.

At December 31, 2019, we had major operations at the following locations:

Aeronautics Systems

El Segundo, Mojave, Palmdale, Redondo Beach and San Diego, CA; Melbourne and St. Augustine, FL; Iuka and Moss Point, MS; Beavercreek, OH; Oklahoma City, OK; and Clearfield, UT.

Defense Systems

Huntsville, AL; Mesa and Sierra Vista, AZ; Los Angeles, CA; Warner Robins, GA; Lake Charles, LA; Baltimore, Cumberland and Elkton, MD; Elk River and Plymouth, MN; Independence, MO; Fort Worth, TX; Herndon, McLean, Radford and Richmond, VA; and Keyser, WV. Locations outside the U.S. include Australia.

Mission Systems

McClellan, San Diego, Sunnyvale and Woodland Hills, CA; Apopka, FL; Rolling Meadows, IL; Annapolis, Annapolis Junction, Elkridge, Halethorpe, Linthicum and Sykesville, MD; Bethpage and Williamsville, NY; Cincinnati, OH; Salt Lake City, UT; and Chantilly, Charlottesville and Fairfax, VA. Locations outside the U.S. include France, Germany, Italy and the United Kingdom.

Space Systems

Huntsville, AL; Chandler, Gilbert and Tempe, AZ; Azusa, Carson, Goleta, Los Angeles, Manhattan Beach, Oxnard, Redondo Beach and San Diego, CA; Aurora and Colorado Springs, CO; Devens, MA; Beltsville, MD; Eden Prairie, MN; Brigham City, Clearfield, Magna, Ogden, Salt Lake City and Tremonton, UT; and Dulles and Sterling, VA.

Corporate

Falls Church and Lebanon, VA and Irving, TX.

The following is a summary of our floor space at December 31, 2019:

Square feet (in thousands)	Owned	Leased	U.S. Government Owned/Leased	Total
Aeronautics Systems	3,415	6,153	3,255	12,823
Defense Systems	1,364	4,685	4,767	10,816
Mission Systems	7,935	4,468	—	12,403
Space Systems	9,349	6,662	621	16,632
Corporate	614	492	—	1,106
Total	22,677	22,460	8,643	53,780

We maintain our properties in good operating condition and believe the productive capacity of our properties is adequate to meet current contractual requirements and those for the foreseeable future.

EXHIBIT 99.3

FORWARD-LOOKING STATEMENTS AND PROJECTIONS

This Current Report on Form 8-K, our 2019 Form 10-K and the information we are incorporating by reference contain statements that constitute “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act of 1995. Words such as “will,” “expect,” “anticipate,” “intend,” “may,” “could,” “should,” “plan,” “project,” “forecast,” “believe,” “estimate,” “outlook,” “trends,” “goals” and similar expressions generally identify these forward-looking statements. Forward-looking statements include, among other things, statements relating to our future financial condition, results of operations and/or cash flows. Forward-looking statements are based upon assumptions, expectations, plans and projections that we believe to be reasonable when made, but which may change over time. These statements are not guarantees of future performance and inherently involve a wide range of risks and uncertainties that are difficult to predict. Specific risks that could cause actual results to differ materially from those expressed or implied in these forward-looking statements include, but are not limited to, those identified under “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K and other important factors disclosed in this report and from time to time in our other filings with the SEC. They include:

- our dependence on the U.S. government for a substantial portion of our business
- significant delays or reductions in appropriations for our programs, and U.S. government funding and program support more broadly
- investigations, claims, disputes, enforcement actions, litigation and/or other legal proceedings
- the use of estimates when accounting for our contracts and the effect of contract cost growth and/or changes in estimated contract revenues and costs
- our exposure to additional risks as a result of our international business, including risks related to geopolitical and economic factors, suppliers, laws and regulations
- the improper conduct of employees, agents, subcontractors, suppliers, business partners or joint ventures in which we participate and the impact on our reputation and our ability to do business
- cyber and other security threats or disruptions faced by us, our customers or our suppliers and other partners
- the performance and financial viability of our subcontractors and suppliers and the availability and pricing of raw materials and components
- changes in procurement and other laws, regulations, contract terms and practices applicable to our industry, findings by the U.S. government as to our compliance with such requirements, and changes in our customers’ business practices globally
- increased competition within our markets and bid protests
- the ability to maintain a qualified workforce with the required security clearances and requisite skills
- our ability to meet performance obligations under our contracts, including obligations that require innovative design capabilities, are technologically complex, require certain manufacturing expertise or are dependent on factors not wholly within our control
- environmental matters, including unforeseen environmental costs and government and third party claims
- natural disasters
- the adequacy and availability of our insurance coverage, customer indemnifications or other liability protections
- products and services we provide related to hazardous and high risk operations, including the production and use of such products, which subject us to various environmental, regulatory, financial, reputational and other risks
- the future investment performance of plan assets, changes in actuarial assumptions associated with our pension and other postretirement benefit plans and legislative or other regulatory actions impacting our pension and postretirement benefit obligations
- our ability appropriately to exploit and/or protect intellectual property rights

- our ability to develop new products and technologies and maintain technologies, facilities, and equipment to win new competitions and meet the needs of our customers
- unanticipated changes in our tax provisions or exposure to additional tax liabilities
- changes in business conditions that could impact business investments and/or recorded goodwill or the value of other long-lived assets

We urge you to consider the limitations on, and risks associated with, forward-looking statements and not unduly rely on the accuracy of forward-looking statements. These forward-looking statements speak only as of the date this report is first filed or, in the case of any document incorporated by reference, the date of that document. We undertake no obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by applicable law.

PART II

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

OVERVIEW

The following discussion should be read along with the financial statements included in Part II, Item 8 of Exhibit 99.4 of this Form 8-K. Except as recast in this Form 8-K to reflect changes in the company's organizational structure and reportable segments, the following discussion should also be read along with Part II, "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations" of our Form 10-K for the year ended December 31, 2018, which provides additional information on comparisons of years 2018 and 2017.

Acquisition of Orbital ATK

On June 6, 2018 (the "Merger Date"), the company completed its previously announced acquisition of Orbital ATK, Inc. ("Orbital ATK") (the "Merger"). On the Merger date, Orbital ATK became a wholly-owned subsidiary of the company and its name was changed to Northrop Grumman Innovation Systems, Inc. We established Innovation Systems as a new, fourth business sector. The operating results of legacy Innovation Systems subsequent to the Merger Date have been included in the company's consolidated results of operations and are reflected in the Space Systems, Defense Systems and Aeronautics Systems sectors. See Note 2 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information regarding the acquisition of Orbital ATK.

In June 2018, the U.S. Federal Trade Commission (FTC) issued a Decision and Order enabling the acquisition to proceed and providing for solid rocket motors to be available on a non-discriminatory basis under certain circumstances and processes. The company has taken and continues to take robust actions to help ensure compliance with the terms of the Order. Similarly, the Compliance Officer, appointed under the Order, and the FTC have taken and continue to take various actions to oversee compliance. In October 2019, the company received a civil investigative demand from the FTC requesting certain information relating to a potential issue of the company's compliance with the Order in connection with a pending strategic missile competition. The company has provided information in response to the request. We believe the company has been and continues to be in full compliance with the Order, but we cannot predict any potential impact on the procurement.

Global Security and Economic Environment

The U.S. and its allies continue to face a global security environment of heightened tensions and instability, threats from state and non-state actors as well as terrorist organizations, emerging nuclear tensions, diverse regional security concerns and political instability. Global threats persist across all domains, from undersea to space to cyber. The market for defense products, services and solutions globally is driven by these complex and evolving security challenges, considered in the broader context of political and socioeconomic priorities.

The global geopolitical and economic environments also continue to be impacted by uncertainty. Geopolitical relationships are changing and global economic growth is expected to remain in the low single digits in 2020, reflecting the impact of and uncertainty surrounding geopolitical tensions globally and financial market volatility. The global economy may also be affected by Britain's anticipated exit from the European Union, the full impact of which is not known at this time. Additionally, economic tensions and changes in international trade policies, including higher tariffs on imported goods and materials and renegotiation of free trade agreements, could impact the global market for defense products, services and solutions.

U.S. Political and Economic Environment

The U.S. continues to face an uncertain political environment and substantial fiscal and economic challenges, which affect funding for discretionary and non-discretionary budgets. The Budget Control Act of 2011 (BCA) mandated spending caps for all federal discretionary spending across a ten-year period (FY 2012 through FY 2021), including

specific limits for defense and non-defense spending. In prior years, these spending caps have been revised by separate bills for specific fiscal years.

In 2019, the President proposed an FY 2020 budget requesting $750 billion for national security. The President's budget request addresses various capabilities highlighted in the U.S. National Security Strategy, the National Defense Strategy and the Missile Defense Review. On August 2, 2019, the Bipartisan Budget Act of 2019 was enacted, increasing spending caps under the Budget Control Act (BCA) for FY 2020 and FY 2021, the final two fiscal years covered by the BCA, and suspending the debt ceiling through July 31, 2021. On December 20, 2019, FY 2020 appropriations for all federal agencies were enacted, representing a 3 percent increase from FY 2019. We believe our capabilities, particularly in space, missiles, missile defense, hypersonics, counter-hypersonics, low observable technology and cyber will allow us to continue to profitably grow our business in support of our customers' needs.

The political environment, federal budget and debt ceiling are expected to continue to be the subject of considerable debate, which could have significant impacts on defense spending broadly and the company's programs in particular.

For further information on the risks we face from the current political and economic environment, see "Risk Factors" in Part I, Item 1A of the 2019 Form 10-K.

Operating Performance Assessment and Reporting

We manage and assess our business based on our performance on contracts and programs (typically larger contracts or two or more closely-related contracts). We recognize sales from our portfolio of long-term contracts as control is transferred to the customer, primarily over time on a cost-to-cost basis (cost incurred relative to costs estimated at completion). As a result, sales tend to fluctuate in concert with costs incurred across our large portfolio of contracts. Due to Federal Acquisition Regulation (FAR) rules that govern our U.S. government business and related Cost Accounting Standards (CAS), most types of costs are allocable to U.S. government contracts. As such, we do not focus on individual cost groupings (such as manufacturing, engineering and design labor, subcontractor, material, overhead and general and administrative (G&A) costs), as much as we do on total contract cost, which is the key driver of our sales and operating income.

In evaluating our operating performance, we look primarily at changes in sales and operating income. Where applicable, significant fluctuations in operating performance attributable to individual contracts or programs, or changes in a specific cost element across multiple contracts, are described in our analysis. Based on this approach and the nature of our operations, the discussion of results of operations below first focuses on our four segments before distinguishing between products and services. Changes in sales are generally described in terms of volume, while changes in margin rates are generally described in terms of performance and/or contract mix. For purposes of this discussion, volume generally refers to increases or decreases in sales or cost from production/service activity levels and performance generally refers to non-volume related changes in profitability. Contract mix generally refers to changes in the ratio of contract type and/or life cycle (e.g., cost-type, fixed-price, development, production, and/or sustainment).

CONSOLIDATED OPERATING RESULTS

For purposes of the operating results discussion below, we assess our performance using certain financial measures that are not calculated in accordance with GAAP. These non-GAAP financial measures exclude Mark-to-market pension and OPB ("MTM") (expense) benefit and related tax impacts, and are described as MTM-adjusted net earnings and MTM-adjusted diluted earnings per share. These non-GAAP measures may be useful to investors and other users of our financial statements as supplemental measures in evaluating the company's underlying financial performance by presenting the company's operating results before the non-operational impact of pension and OPB actuarial gains and losses. These measures are also consistent with how management views the underlying performance of the business as the impact of MTM accounting is not considered in management's assessment of the company's operating performance or in its determination of incentive compensation awards. We reconcile these non-GAAP financial measures to their most directly comparable GAAP financial measures below. These non-GAAP measures may not be defined and calculated by other companies in the same manner and should not be considered in isolation or as an alternative to operating results presented in accordance with GAAP.

Selected financial highlights are presented in the table below:

	Year Ended December 31			% Change in	
$ in millions, except per share amounts	**2019**	2018	2017	**2019**	2018
Sales	**$ 33,841**	$ 30,095	$ 26,004	**12 %**	16 %
Operating costs and expenses	**29,872**	26,315	22,786	**14 %**	15 %
Operating costs and expenses as a % of sales	**88.3%**	87.4%	87.6%		
Operating income	**3,969**	3,780	3,218	**5 %**	17 %
Operating margin rate	***11.7%***	*12.6%*	*12.4%*		
Mark-to-market pension and OPB (expense) benefit	**(1,800)**	(655)	536	**175 %**	NM
Federal and foreign income tax expense	**300**	513	1,360	**(42)%**	(62)%
Effective income tax rate	***11.8%***	*13.7%*	*32.2%*		
Net earnings	**2,248**	3,229	2,869	**(30)%**	13 %
Diluted earnings per share	**13.22**	18.49	16.34	**(29)%**	13 %

Sales

2019 sales increased $3.7 billion, as compared with 2018, due to higher volume at all four sectors, including a $2.6 billion increase due to a full year of sales from legacy Innovation Systems businesses.

2018 sales increased $4.1 billion, as compared with 2017, due to higher volume at all four sectors, including $3.1 billion of sales subsequent to the Merger date from legacy Innovation Systems businesses.

See “Segment Operating Results” below for further information by segment and “Product and Service Analysis” for product and service detail. See Note 16 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for information regarding the company’s sales by customer type, contract type and geographic region for each of our segments.

Operating Income and Margin Rate

2019 operating income increased $189 million, or 5 percent, as compared with 2018, primarily due to a $462 million increase in segment operating income, including a $315 million increase due to a full year of operating income from legacy Innovation Systems businesses. This was partially offset by a $148 million decrease in the net FAS (service)/CAS pension adjustment and a $125 million increase in unallocated corporate expense, all of which are further discussed in “Segment Operating Results.” Operating margin rate declined to 11.7 percent from 12.6 percent due to the pension and unallocated corporate expense items noted above, partially offset by a higher segment operating margin rate, as described in “Segment Operating Results.”

2019 G&A costs as a percentage of sales decreased to 9.7 percent from 10.0 percent in 2018, primarily due to higher sales as well as cost management, including cost synergies realized in connection with the 2018 acquisition of Orbital ATK.

2018 operating income increased $562 million, or 17 percent, as compared with 2017, primarily due to a $544 million increase in segment operating income, including the addition of $342 million of operating income from legacy Innovation Systems businesses, and a $42 million decrease in unallocated corporate expense, partially offset by a $25 million decrease in our net FAS (service)/CAS pension adjustment, all of which are further discussed in “Segment Operating Results.” Lower operating costs and expenses as a percentage of sales increased our operating margin rate to 12.6 percent from 12.4 percent in the prior year period and was principally driven by a higher segment operating margin rate, as described in “Segment Operating Results,” and the previously noted decrease in unallocated corporate expense, partially offset by the decrease in our net FAS (service)/CAS pension adjustment.

2018 G&A costs as a percentage of sales decreased to 10.0 percent from 10.4 percent in 2017, principally due to higher sales volume.

For further information regarding product and service operating costs and expenses, see “Product and Service Analysis” below.

Mark-to-Market Pension and OPB (Expense) Benefit

The primary components of pre-tax MTM (expense) benefit are presented in the table below:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Actuarial (losses) gains on projected benefit obligation	**$ (4,866)**	$ 2,772	$ (1,570)
Actuarial gains (losses) on plan assets	**3,066**	(3,426)	2,119
Other	**—**	(1)	(13)
MTM (expense) benefit	**$ (1,800)**	$ (655)	$ 536

2019 MTM expense of $1.8 billion was primarily driven by a 92 basis point decrease in the discount rate from year end 2018 as well as a change in our mortality assumptions, partially offset by actual net plan asset returns of approximately 19.1 percent compared to our 8.0 percent asset return assumption.

Federal and Foreign Income Taxes

The 2019 effective tax rate decreased to 11.8 percent from 13.7 percent in 2018. MTM expense reduced the 2019 effective tax rate by 3.7 percentage points and the 2018 effective tax rate by 1.1 percentage points. See Note 7 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for additional information.

Net Earnings

The table below reconciles net earnings to MTM-adjusted net earnings:

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Net earnings	**$ 2,248**	$ 3,229	$ 2,869	**(30)%**	13%
MTM expense (benefit)	**1,800**	655	(536)	**175 %**	NM
MTM-related deferred state tax (benefit) expense[1]	**(81)**	(29)	24	**179 %**	NM
Federal tax (benefit) expense of items above[2]	**(361)**	(131)	108	**176 %**	NM
MTM expense (benefit), net of tax	**1,358**	495	(404)	**174 %**	NM
MTM-adjusted net earnings	**$ 3,606**	$ 3,724	$ 2,465	**(3)%**	51%

[1] Deferred state taxes are recorded in unallocated corporate expense within operating income.

[2] Based on a 21% federal statutory tax rate.

Net earnings decreased $981 million in 2019 principally due to an $863 million increase in our MTM expense, net of tax. Excluding these impacts, MTM-adjusted net earnings decreased by $118 million, or 3 percent, primarily due to a $397 million decrease in the total net FAS/CAS pension adjustment and $170 million of higher intangible asset amortization and PP&E step-up depreciation. These decreases were partially offset by $462 million of higher segment operating income.

Diluted Earnings Per Share

The table below reconciles diluted earnings per share to MTM-adjusted diluted earnings per share:

	Year Ended December 31			% Change in	
	2019	2018	2017	**2019**	2018
Diluted earnings per share	**$ 13.22**	$ 18.49	$ 16.34	**(29)%**	13%
MTM expense (benefit) per share	**10.59**	3.76	(3.06)	**182 %**	NM
MTM-related deferred state tax (benefit) expense per share[1]	**(0.48)**	(0.17)	0.14	**182 %**	NM
Federal tax (benefit) expense of items above per share[2]	**(2.12)**	(0.75)	0.62	**183 %**	NM
MTM expense (benefit) per share, net of tax	**7.99**	2.84	(2.30)	**181 %**	NM
MTM-adjusted diluted earnings per share	**$ 21.21**	$ 21.33	$ 14.04	**(1)%**	52%

(1) Deferred state taxes are recorded in unallocated corporate expense within operating income.

(2) Based on a 21% federal statutory tax rate.

Diluted earnings per share decreased $5.27, or 29 percent, principally due to a $5.15 reduction associated with our MTM expense, net of tax. Excluding these impacts, MTM-adjusted diluted earnings per share decreased $0.12, or 1 percent, reflecting a 3 percent decrease in MTM-adjusted net earnings and a 3 percent decrease in weighted-average diluted shares outstanding.

SEGMENT OPERATING RESULTS

Basis of Presentation

At December 31, 2019, the company was aligned in four operating sectors: Aerospace Systems, Innovation Systems, Mission Systems and Technology Services. Effective January 1, 2020, the company reorganized its sectors to better align the company's broad portfolio to serve its customers' needs. The four new operating sectors, which also comprise our reportable segments, are: Aeronautics Systems, Defense Systems, Mission Systems and Space Systems. The operating results for all periods presented have been recast to reflect this realignment and include sales and operating income from legacy Innovation Systems businesses subsequent to the Merger date. For a more complete description of each segment's products and services, see "Business" in Part I, Item 1 of Exhibit 99.1 of this Form 8-K.

We present our sectors in the following business areas, which are reported in a manner reflecting core capabilities:

Aeronautics Systems	**Defense Systems**	**Mission Systems**	**Space Systems**
Autonomous Systems	Battle Management & Missile Systems	Airborne Sensors & Networks	Launch & Strategic Missiles
Manned Aircraft	Mission Readiness	Cyber & Intelligence Mission Solutions	Space
		Maritime/Land Systems & Sensors	
		Navigation, Targeting & Survivability	

This section discusses segment sales, operating income and operating margin rates. A reconciliation of segment operating income to total operating income is provided below.

Segment Operating Income and Margin Rate

Segment operating income, as reconciled in the table below, and segment operating margin rate (segment operating income divided by sales) are non-GAAP (accounting principles generally accepted in the United States of America) measures that reflect total earnings from our four segments, including allocated pension expense we have recognized under FAR and CAS, and excluding FAS pension expense and unallocated corporate items (certain corporate-level expenses, which are not considered allowable or allocable under applicable CAS or FAR, and costs not considered part of management's evaluation of segment operating performance). These non-GAAP measures may be useful to investors and other users of our financial statements as supplemental measures in evaluating the financial performance and operational trends of our sectors. These measures may not be defined and calculated by other companies in the same manner and should not be considered in isolation or as alternatives to operating results presented in accordance with GAAP.

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Segment operating income	**$ 3,909**	$ 3,447	$ 2,903	**13 %**	19 %
Segment operating margin rate	***11.6%***	*11.5%*	*11.2%*		
CAS pension expense	**832**	1,017	1,026	**(18)%**	(1)%
Less: FAS (service) pension expense	**(367)**	(404)	(388)	**(9)%**	4 %
Net FAS (service)/CAS pension adjustment	**465**	613	638	**(24)%**	(4)%
Intangible asset amortization and PP&E step-up depreciation	**(390)**	(220)	—	**NM**	NM
MTM-related deferred state tax benefit (expense)[1]	**81**	29	(24)	**179 %**	NM
Other unallocated corporate expense	**(96)**	(89)	(299)	**8 %**	(70)%
Unallocated corporate expense	**(405)**	(280)	(323)	**45 %**	(13)%
Total operating income	**$ 3,969**	$ 3,780	$ 3,218	**5 %**	17 %

[1] Represents the deferred state tax impact of MTM (expense) benefit, which is recorded in unallocated corporate expense consistent with other changes in deferred state taxes.

Segment Operating Income and Margin Rate

2019 segment operating income increased $462 million, or 13 percent, as compared with 2018, due to higher operating income at all four sectors, including a $315 million increase due to a full year of operating income from legacy Innovation Systems businesses. Segment operating margin rate of 11.6 percent was comparable to the prior year.

2018 segment operating income increased $544 million, or 19 percent, as compared with 2017, due to higher operating income at all four sectors, including the addition of $342 million of operating income from legacy Innovation Systems businesses. The higher operating income includes $69 million of favorable EAC adjustments on multiple restricted programs at Aeronautics Systems. Segment operating margin rate increased to 11.5 percent from 11.2 percent in 2017 principally due to a higher segment margin rate at Aeronautics Systems.

Net FAS (service)/CAS Pension Adjustment

The decrease in our 2019 net FAS (service)/CAS pension adjustment, as compared with 2018, is primarily due to lower CAS expense largely as a result of changes in actuarial assumptions as of December 31, 2018, partially offset by a full year of CAS expense from legacy Innovation Systems.

The decrease in our 2018 net FAS (service)/CAS pension adjustment, as compared with 2017, is primarily due to lower CAS expense for legacy Northrop Grumman resulting from higher assets returns in 2017 and a change in the legacy Northrop Grumman mortality assumption as of December 31, 2017, which more than offset the additional net FAS (service)/CAS pension adjustment from the addition of legacy Innovation Systems.

Unallocated Corporate Expense

The increase in 2019 unallocated corporate expense is primarily due to the absence in 2019 of a $223 million benefit recognized for the finalization of certain prior year cost claims, as well as $170 million of higher intangible asset amortization and PP&E step-up depreciation. This increase was partially offset by $140 million of lower deferred state taxes and an $89 million benefit recognized in 2019 related to the favorable resolution of a cost accounting litigation matter.

Net Estimate-At-Completion (EAC) Adjustments - We record changes in estimated contract earnings at completion (net EAC adjustments) using the cumulative catch-up method of accounting. Net EAC adjustments can have a significant effect on reported sales and operating income and the aggregate amounts are presented in the table below:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Favorable EAC adjustments	**$ 1,040**	$ 1,019	$ 717
Unfavorable EAC adjustments	**(560)**	(442)	(357)
Net EAC adjustments	**$ 480**	$ 577	$ 360

Net EAC adjustments by segment are presented in the table below:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Aeronautics Systems[1]	**$ 143**	$ 271	$ 113
Defense Systems[1]	**99**	75	17
Mission Systems	**189**	172	89
Space Systems[1]	**63**	73	154
Eliminations	**(14)**	(14)	(13)
Net EAC adjustments	**$ 480**	$ 577	$ 360

[1] Amounts reflect EAC adjustments after the percent complete on legacy Innovation Systems contracts was reset to zero as of the Merger date.

For purposes of the discussion in the remainder of this Segment Operating Results section, references to operating income and operating margin rate reflect segment operating income and segment operating margin rate, respectively.

AERONAUTICS SYSTEMS

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Sales	**$ 11,116**	$ 10,293	$ 9,040	**8%**	14%
Operating income	**1,170**	1,107	848	**6%**	31%
Operating margin rate	***10.5%***	*10.8%*	*9.4%*		

Sales
2019 sales increased $823 million, or 8 percent, as compared with 2018, due in large part to higher volume on restricted programs. In addition, Manned Aircraft sales reflect a $188 million increase due to a full year of sales on legacy Innovation Systems Aerospace Structures programs, as well as a higher rate of F-35 production activity and higher volume on the E-2 program. Autonomous Systems sales include higher Global Hawk volume and lower NATO AGS volume as that program nears completion.

2018 sales increased $1.3 billion, or 14 percent, as compared with 2017, due to higher volume in both business areas, principally on Manned Aircraft programs. Manned Aircraft sales were driven by higher restricted and F-35 volume, as well as $274 million of sales on legacy Innovation Systems Aerospace Structures programs subsequent to the Merger date. Autonomous Systems sales reflect higher volume on several programs, including Triton, partially offset by lower Global Hawk volume.

Operating Income
2019 operating income increased $63 million, or 6 percent, as compared with 2018, due to higher sales. 2019 operating margin rate decreased to 10.5 percent from 10.8 percent principally due to lower net favorable EAC adjustments.

2018 operating income increased $259 million, or 31 percent, as compared with 2017, primarily due to higher sales and a higher operating margin rate. Operating margin rate increased to 10.8 percent from 9.4 percent principally due to improved performance, including $69 million of favorable EAC adjustments on multiple restricted programs.

DEFENSE SYSTEMS

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Sales	**$ 7,495**	$ 6,612	5,479	**13%**	21%
Operating income	**781**	690	534	**13%**	29%
Operating margin rate	***10.4%***	*10.4%*	*9.7%*		

Sales
2019 sales increased $883 million, or 13 percent, as compared with 2018, due to higher Battle Management & Missile Systems sales, partially offset by lower volume on Mission Readiness programs. Battle Management & Missile Systems sales reflect a $1.1 billion increase due to a full year of sales on legacy Innovation Systems Weapon Systems programs. Mission Readiness sales declined principally due to the 2018 completions of a state and local services contract and the JRDC program.

2018 sales increased $1.1 billion, or 21 percent, as compared with 2017, due to higher Battle Management & Missile Systems sales, partially offset by lower volume on Mission Readiness programs. Battle Management & Missile Systems sales include $1.4 billion of sales on legacy Innovation Systems Weapon Systems programs subsequent to the Merger date and higher volume on the Integrated Air and Missile Defense Battle Command System program. Mission Readiness sales decreased primarily due to the completions of several large programs, including KC-10 and JRDC, partially offset by higher volume on the Special Electronic Mission Aircraft program.

Operating Income
2019 operating income increased $91 million, or 13 percent, as compared with 2018, due to higher sales. Operating margin rate was comparable to the prior year and reflects a favorable adjustment on a logistics and modernization sustainment program, offset by lower performance on information solutions and services programs.

2018 operating income increased $156 million, or 29 percent, as compared with 2017, due to higher sales and a higher operating margin rate. Operating margin rate increased to 10.4 percent from 9.7 percent primarily due to the close-out of a state and local services contract.

MISSION SYSTEMS

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Sales	**$ 9,410**	$ 8,949	$ 8,460	**5%**	6%
Operating income	**1,382**	1,215	1,157	**14%**	5%
Operating margin rate	***14.7%***	*13.6%*	*13.7%*		

Sales
2019 sales increased $461 million, or 5 percent, as compared with 2018, principally due to higher volume on Airborne Sensors & Networks and Maritime/Land Systems & Sensors programs. Airborne Sensors & Networks sales increased principally due to higher volume on airborne radar, F-35 and restricted programs, partially offset by lower volume on communications programs. Maritime/Land Systems & Sensors sales increased principally due to higher volume on marine systems and international programs.

2018 sales increased $489 million, or 6 percent, as compared with 2017, principally due to higher volume on Airborne Sensors & Networks and Navigation, Targeting & Survivability programs. Airborne Sensors & Networks sales increased principally due to higher volume on restricted, airborne electronic warfare and F-35 programs. Navigation, Targeting & Survivability sales increased principally due to higher volume on self-protection and infrared countermeasures programs.

Operating Income
2019 operating income increased $167 million, or 14 percent, as compared with 2018, due to a higher operating margin rate and higher sales. Operating margin rate increased to 14.7 percent from 13.6 percent primarily due to improved performance on Maritime/Land Systems & Sensors and Airborne Sensors & Networks programs.

2018 operating income increased $58 million, or 5 percent, as compared with 2017, due to higher sales. Operating margin rate was comparable with the prior year period.

SPACE SYSTEMS

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Sales	**$ 7,425**	$ 5,845	$ 4,719	**27%**	24%
Operating income	**781**	635	578	**23%**	10%
Operating margin rate	***10.5%***	*10.9%*	*12.2%*		

Sales
2019 sales increased $1.6 billion, or 27 percent, as compared with 2018, including a $1.4 billion increase due to a full year of sales on legacy Innovation Systems programs. In addition, Space sales reflect higher volume on Next Generation Overhead Persistent Infrared (Next Gen OPIR) programs and the James Webb Space Telescope (JWST).

2018 sales increased $1.1 billion or 24 percent, as compared with 2017, primarily due to $1.5 billion of sales on legacy Innovation Systems programs subsequent to the Merger date and higher Ground Based Strategic Deterrent Technology Maturation Risk Reduction volume. Space sales reflect ramp-down on a restricted ISR program and lower JWST volume.

Operating Income
2019 operating income increased $146 million, or 23 percent, as compared with 2018, due to higher sales. Operating margin rate decreased to 10.5 percent from 10.9 percent primarily due to lower net favorable EAC adjustments.

2018 operating income increased $57 million, or 10 percent, as compared with 2017, due to higher sales. Operating margin rate decreased to 10.9 percent from 12.2 percent primarily due to a $56 million favorable EAC adjustment recorded on a restricted program in 2017.

NORTHROP GRUMMAN CORPORATION

PRODUCT AND SERVICE ANALYSIS

The following table presents product and service sales and operating costs and expenses by segment:

	Year Ended December 31					
$ in millions	**2019**		2018		2017	
Segment Information:	**Sales**	**Operating Costs and Expenses**	Sales	Operating Costs and Expenses	Sales	Operating Costs and Expenses
Aeronautics Systems						
Product	**$ 9,387**	**$ 8,444**	$ 8,665	$ 7,749	$ 7,388	$ 6,715
Service	**1,626**	**1,409**	1,555	1,372	1,606	1,436
Intersegment eliminations	**103**	**93**	73	65	46	41
Total Aeronautics Systems	**11,116**	**9,946**	10,293	9,186	9,040	8,192
Defense Systems						
Product	**2,784**	**2,577**	1,703	1,523	370	323
Service	**4,020**	**3,520**	4,159	3,723	4,135	3,745
Intersegment eliminations	**691**	**617**	750	676	974	877
Total Defense Systems	**7,495**	**6,714**	6,612	5,922	5,479	4,945
Mission Systems						
Product	**6,022**	**5,091**	5,790	5,013	5,388	4,642
Service	**2,660**	**2,322**	2,441	2,118	2,434	2,129
Intersegment eliminations	**728**	**615**	718	603	638	532
Total Mission Systems	**9,410**	**8,028**	8,949	7,734	8,460	7,303
Space Systems						
Product	**5,659**	**5,031**	4,311	3,805	3,218	2,784
Service	**1,683**	**1,538**	1,471	1,345	1,465	1,327
Intersegment eliminations	**83**	**75**	63	60	36	30
Total Space Systems	**7,425**	**6,644**	5,845	5,210	4,719	4,141
Segment Totals						
Total Product	**$ 23,852**	**$ 21,143**	$ 20,469	$ 18,090	$ 16,364	$ 14,464
Total Service	**9,989**	**8,789**	9,626	8,558	9,640	8,637
Total Segment[1]	**$ 33,841**	**$ 29,932**	$ 30,095	$ 26,648	$ 26,004	$ 23,101

[1] A reconciliation of segment operating income to total operating income is included in “Segment Operating Results.”

Product Sales and Costs

2019 product sales increased $3.4 billion, or 17 percent, as compared with 2018, and reflects a $2.4 billion increase due to a full year of product sales on legacy Innovation Systems programs. In addition, Aeronautics Systems product sales reflect higher volume on restricted and F-35 programs and Space Systems product sales reflect higher volume on Next Gen OPIR.

2019 product costs increased $3.1 billion, or 17 percent, as compared with 2018, consistent with the higher product sales described above.

2018 product sales increased $4.1 billion, or 25 percent, as compared with 2017, primarily due to the addition of $2.8 billion of product sales subsequent to the Merger date on legacy Innovation Systems programs and higher restricted and F-35 volume at Aeronautics Systems.

2018 product costs increased $3.6 billion, or 25 percent, as compared with 2017, consistent with the higher product sales described above.

Service Sales and Costs

2019 service sales increased $363 million, or 4 percent, as compared with 2018, and reflects a $265 million increase due to a full year of service sales on legacy Innovation Systems programs and higher service sales at Mission Systems, partially offset by lower service sales at Defense Systems principally due to program completions.

2019 service costs increased $231 million, or 3 percent, as compared to 2018, consistent with the higher service sales described above and reflects improved margin rates at Defense Systems and Aeronautics Systems.

2018 service sales were comparable with 2017. Lower service sales at Space Systems and Defense Systems principally due to the completion of several programs, were offset by the addition of $374 million of service sales subsequent to the Merger date on legacy Innovation Systems programs.

2018 service costs were comparable with 2017, consistent with service sales described above.

BACKLOG

Backlog represents the future sales we expect to recognize on firm orders received by the company and is equivalent to the company's remaining performance obligations at the end of each period. It comprises both funded backlog (firm orders for which funding is authorized and appropriated) and unfunded backlog. Unexercised contract options and indefinite delivery indefinite quantity (IDIQ) contracts are not included in backlog until the time the option or IDIQ task order is exercised or awarded. Backlog is converted into sales as costs are incurred or deliveries are made.

Backlog consisted of the following at December 31, 2019 and 2018:

	2019			2018	
$ in millions	**Funded**	**Unfunded**	**Total Backlog**	Total Backlog	% Change in 2019
Aeronautics Systems	**$ 10,454**	**$ 15,567**	**$ 26,021**	$ 20,991	**24%**
Defense Systems	**6,443**	**2,038**	**8,481**	7,181	**18%**
Mission Systems	**9,032**	**5,194**	**14,226**	12,069	**18%**
Space Systems	**4,348**	**11,764**	**16,112**	13,259	**22%**
Total backlog	**$ 30,277**	**$ 34,563**	**$ 64,840**	$ 53,500	**21%**

LIQUIDITY AND CAPITAL RESOURCES

We endeavor to ensure the most efficient conversion of operating income into cash for deployment in our business and to maximize shareholder value through cash deployment activities. In addition to our cash position, we use various financial measures to assist in capital deployment decision-making, including cash provided by operating activities and free cash flow, a non-GAAP measure described in more detail below.

As of December 31, 2019, we had cash and cash equivalents of $2.2 billion; approximately $269 million was held outside of the U.S. by foreign subsidiaries. Cash and cash equivalents and cash generated from operating activities, supplemented by borrowings under credit facilities, commercial paper and/or in the capital markets, if needed, are expected to be sufficient to fund our operations for at least the next 12 months. Capital expenditure commitments were $790 million at December 31, 2019, and are expected to be paid with cash on hand.

Operating Cash Flow

The table below summarizes key components of cash flow provided by operating activities:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Net earnings	**$ 2,248**	$ 3,229	$ 2,869
Non-cash items[1]	**2,683**	1,775	1,018
Changes in assets and liabilities:			
Trade working capital	**128**	(65)	(285)
Retiree benefits, excluding MTM (expense) benefit	**(703)**	(1,083)	(946)
Other, net	**(59)**	(29)	(43)
Net cash provided by operating activities	**$ 4,297**	$ 3,827	$ 2,613

[1] Includes depreciation and amortization, MTM (expense) benefit, non-cash lease expense, stock based compensation expense and deferred income taxes.

2019 cash provided by operating activities increased $470 million, as compared with 2018, principally due to improved trade working capital and lower pension contributions.

2018 cash provided by operating activities increased $1.2 billion, as compared with 2017, principally due to higher net earnings, including the addition of legacy Innovation Systems businesses, and improved trade working capital performance.

Free Cash Flow
Free cash flow, as reconciled in the table below, is a non-GAAP measure defined as net cash provided by operating activities less capital expenditures, and may not be defined and calculated by other companies in the same manner. We use free cash flow as a key factor in our planning for, and consideration of, acquisitions, the payment of dividends and share repurchases. This non-GAAP measure may be useful to investors and other users of our financial statements as a supplemental measure of our cash performance, but should not be considered in isolation, as a measure of residual cash flow available for discretionary purposes, or as an alternative to operating cash flows presented in accordance with GAAP.

The table below reconciles net cash provided by operating activities to free cash flow:

	Year Ended December 31			% Change in	
$ in millions	**2019**	2018	2017	**2019**	2018
Net cash provided by operating activities	**$ 4,297**	$ 3,827	$ 2,613	**12%**	46%
Less: capital expenditures	**(1,264)**	(1,249)	(928)	**1%**	35%
Free cash flow	**$ 3,033**	$ 2,578	$ 1,685	**18%**	53%

2019 free cash flow increased $455 million, as compared with 2018, principally driven by an increase in net cash provided by operating activities.

2018 free cash flow increased $893 million, as compared with 2017, principally driven by the increase in net cash provided by operating activities described above, partially offset by the inclusion of capital expenditures from legacy Innovation Systems and higher capital expenditures at Aeronautics Systems and Space Systems.

Investing Cash Flow
2019 net cash used in investing activities decreased to $1.2 billion from $8.9 billion principally due to $7.7 billion paid in 2018 for the acquisition of Orbital ATK, net of cash acquired.

Financing Cash Flow
2019 net cash used in financing activities decreased to $2.4 billion from $4.6 billion principally due to lower debt and credit facility repayments of $2.1 billion and lower share repurchases, partially offset by net repayments of commercial paper in 2019 as compared to net borrowings in 2018.

Share Repurchases – See Note 3 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information on our share repurchase programs.

Commercial Paper, Credit Facilities and Unsecured Senior Notes – See Note 10 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information on our commercial paper, credit facilities and unsecured senior notes.

Financial Arrangements – See Note 12 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K for further information on our use of standby letters of credit and guarantees.

Other Sources of Capital – We believe we can obtain additional capital, if necessary for long-term liquidity, from such sources as the public or private capital markets, the sale of assets, sale and leaseback of operating assets, and leasing rather than purchasing new assets. We have an effective shelf registration statement on file with the SEC, which allows us to access capital in a timely manner.

Contractual Obligations

At December 31, 2019, we had contractual commitments to repay debt with interest, make payments under operating leases, settle obligations related to agreements to purchase goods and services and make payments on various other liabilities. Payments due under these obligations and commitments, and the estimated timing of those payments, are as follows:

$ in millions	Total	2020	2021- 2022	2023- 2024	2025 and beyond
Long-term debt	$ 13,945	$ 1,110	$ 2,247	$ 1,056	$ 9,532
Interest payments on long-term debt	6,632	524	956	830	4,322
Operating leases	1,992	300	486	331	875
Purchase obligations[1]	15,126	8,089	2,839	2,213	1,985
Other long-term liabilities[2]	1,516	490	341	176	509
Total contractual obligations	$ 39,211	$ 10,513	$ 6,869	$ 4,606	$ 17,223

[1] A "purchase obligation" is defined as an agreement to purchase goods or services that is enforceable and legally binding on us and that specifies all significant terms, including: fixed or minimum quantities to be purchased; fixed, minimum, or variable price provisions; and the approximate timing of the transaction. These amounts are primarily comprised of open purchase order commitments to suppliers and subcontractors pertaining to funded contracts.

[2] Other long-term liabilities, including their current portions, primarily consist of total accrued environmental reserves, deferred compensation, and other miscellaneous liabilities. It excludes obligations for uncertain tax positions of $1.2 billion as we are not able to reasonably estimate the timing of future cash flows related to such positions.

The table above excludes estimated minimum funding requirements for the company's pension and OPB plans, as set forth by the Employee Retirement Income Security Act, as amended. For further information about future minimum contributions for these plans, see Note 13 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K. Further details regarding long-term debt and operating leases can be found in Notes 10 and 15, respectively, to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

CRITICAL ACCOUNTING POLICIES, ESTIMATES AND JUDGMENTS

Our consolidated financial statements are based on GAAP, which requires us to make estimates and assumptions about future events that affect the amounts reported in our consolidated financial statements. We employ judgment in making our estimates in consideration of historical experience, currently available information and various other assumptions that we believe to be reasonable under the circumstances. Actual results could differ from our estimates and assumptions, and any such differences could be material to our consolidated financial statements. We believe the following accounting policies are critical to the understanding of our consolidated financial statements and require the use of significant management judgment in their application. For a summary of our significant accounting policies, see Note 1 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

Revenue Recognition

Due to the long-term nature of our contracts, we generally recognize revenue over time using the cost-to-cost method, which requires us to make reasonably dependable estimates regarding the revenue and cost associated with the design, manufacture and delivery of our products and services.

Contract sales may include estimates of variable consideration, including cost or performance incentives (such as award and incentive fees), contract claims and requests for equitable adjustment (REAs). Variable consideration is included in total estimated sales to the extent it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. We estimate variable consideration as the most likely amount to which we expect to be entitled.

Our cost estimation process is based on the professional knowledge of our engineering, program management and financial professionals, and draws on their significant experience and judgment. We prepare EACs for our contracts and calculate an estimated contract profit based on total estimated contract sales and cost. Since our contracts typically span a period of several years, estimation of revenue, cost, and progress toward completion requires the use of judgment. Factors considered in these estimates include our historical performance, the availability, productivity and cost of labor, the nature and complexity of work to be performed, the effect of change orders, availability and cost of materials, components and subcontracts, the effect of any delays in performance and the level of indirect cost allocations.

We generally review and reassess our sales, cost and profit estimates for each significant contract at least annually or more frequently as determined by the occurrence of events, changes in circumstances and evaluations of contract performance to reflect the latest reliable information available. The company performs on a broad portfolio of long-term contracts, including the development of complex and customized military platforms and systems, as well as advanced electronic equipment and software, that often include technology at the forefront of science. Cost estimates on fixed-price development contracts are inherently more uncertain as to future events than production contracts, and, as a result, there is typically more variability in those estimates, as well as financial risk associated with unanticipated cost growth. Changes in estimates occur for a variety of reasons, including changes in contract scope, the resolution of risk at lower or higher cost than anticipated, unanticipated performance and other risks affecting contract costs, performance issues with subcontractors or suppliers, changes in indirect cost allocations, such as overhead and G&A costs, and changes in estimated award and incentive fees. Identified risks typically include technical, schedule and/or performance risk based on our evaluation of the contract effort. Similarly, the changes in estimates may include changes in, or resolution of, identified opportunities for operating margin improvement.

For the impacts of changes in estimates on our consolidated statements of earnings and comprehensive income, see “Segment Operating Results” and Note 1 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

Retirement Benefits

Overview – The determination of projected benefit obligations, the fair value of plan assets, and pension and OPB expense for our retirement benefit plans requires the use of estimates and actuarial assumptions. We perform an annual review of our actuarial assumptions in consultation with our actuaries. As we determine changes in the assumptions are warranted, or as a result of plan amendments, future pension and OPB expense and our projected benefit obligation could increase or decrease. The principal estimates and assumptions that have a significant effect on our consolidated financial position and annual results of operations are the discount rate, cash balance crediting rate, expected long-term rate of return on plan assets, estimated fair market value of plan assets, and the mortality rate of those covered by our pension and OPB plans. The effects of actual results differing from our assumptions and the effects of changing assumptions (i.e. actuarial gains or losses) are recognized immediately through earnings upon annual remeasurement in the fourth quarter, or on an interim basis as triggering events warrant remeasurement.

Discount Rate – The discount rate represents the interest rate used to determine the present value of future cash flows currently expected to be required to settle our pension and OPB obligations. The discount rate is generally based on the yield of high-quality corporate fixed-income investments. At the end of each year, we determine the discount rate using a theoretical bond portfolio model of bonds rated AA or better to match the notional cash outflows related to projected benefit payments for each of our significant benefit plans. Taking into consideration the factors noted above, our weighted-average composite pension discount rate was 3.39 percent at December 31, 2019, and 4.31 percent at December 31, 2018.

The effects of a hypothetical change in the discount rate may be nonlinear and asymmetrical for future years as the discount rate changes. Holding all other assumptions constant, an increase or decrease of 25 basis points in the December 31, 2019 discount rate assumption would have the following estimated effects on 2019 pension and OPB obligations, which would be reflected in the 2019 MTM expense (benefit), and 2020 expected pension and OPB expense:

$ in millions	25 Basis Point Decrease in Rate	25 Basis Point Increase in Rate
2020 pension and OPB (benefit) expense	$ (34)	$ 31
2019 pension and OPB obligation and MTM expense (benefit)	1,297	(1,230)

Cash Balance Crediting Rate – A portion of the company's pension obligation and resulting pension expense is based on a cash balance formula, where participants' hypothetical account balances are accumulated over time with pay-based credits and interest. Interest is credited monthly using the current 30-Year Treasury bond rate. The interest crediting rate is part of the cash balance formula and independent of actual pension investment earnings. The cash balance crediting rate tends to move in concert with the discount rate but has an offsetting effect on pension benefit obligations and the related MTM expense (benefit). The minimum cash balance crediting rate allowed under the plan is 2.25 percent. The cash balance crediting rate assumption has been set to its current level of 2.39 percent as of December 31, 2019, growing to 2.64 percent by 2025. Holding all other assumptions constant, an increase or decrease of 25 basis points in the December 31, 2019 cash balance crediting rate assumption would have the following estimated effects on the 2019 pension benefit obligation, which would be reflected in the 2019 MTM expense (benefit), and 2020 expected pension expense:

$ in millions	25 Basis Point Decrease in Rate	25 Basis Point Increase in Rate
2020 pension (benefit) expense	$ (11)	$ 12
2019 pension obligation and MTM expense (benefit)	(136)	151

Expected Long-Term Rate of Return on Plan Assets – The expected long-term rate of return on plan assets (EROA) assumption reflects the average rate of net earnings we expect on current and future benefit plan investments. EROA is a long-term assumption, which we review annually and adjust to reflect changes in our long-term view of expected market returns and/or significant changes in our plan asset investment policy. Due to the inherent uncertainty of this assumption, we consider multiple data points at the measurement date including the plan's target asset allocation, historical asset returns and third party projection models of expected long-term returns for each of the plans' strategic asset classes. In addition to the data points themselves, we consider trends in the data points, including changes from the prior measurement date. The EROA assumptions we use for pension benefits are consistent with those used for OPB plans; however, we reduce the EROA for OPB plans to allow for the impact of tax on investment earnings, as certain Voluntary Employee Beneficiary Association trusts are taxable.

During 2019, the Investment Committee of the company's benefit plans reviewed and approved the plans' major asset class allocations. The current asset allocation is approximately 40% public equities, 30% fixed-income and 30% alternatives, which reflects a shift of approximately 5% from public equities to alternatives. At this time, the Investment Committee is not contemplating any significant changes to that mix. For further information on plan asset investments, see Note 13 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

While historical market returns are not necessarily predictive of future market returns, given our long history of plan performance supported by the stability in our investment mix, investment managers, and active asset management, we believe our actual historical performance is a reasonable metric to consider when developing our EROA. Our average annual rate of return from 1976 to 2019 was approximately 11.1 percent and our 20-year and 30-year rolling average rates of return were approximately 7.1 percent and 9.7 percent, respectively, each determined on an arithmetic basis and net of expenses. Our 2019 actual net plan asset returns were approximately 19.1 percent.

Consistent with our past practice, we obtained long-term capital market forecasting models from several third parties and, using our target asset allocation, developed an expected rate of return on plan assets from each model. We considered not only the specific returns projected by those third party models, but also changes in the models year-to-year when developing our EROA.

For determining 2019 FAS expense, we assumed an expected long-term rate of return on pension plan assets of 8.0 percent and an expected long-term rate of return on OPB plan assets of 7.67 percent. For 2020 FAS expense, we have assumed an expected long-term rate of return on pension plan assets of 8.0 percent and 7.66 percent on OPB plans. Holding all other assumptions constant, an increase or decrease of 25 basis points in our December 31, 2019 EROA assumption would have the following estimated effects on 2020 expected pension and OPB expense:

$ in millions	25 Basis Point Decrease	25 Basis Point Increase
2020 pension and OPB expense (benefit)	$ 78	$ (78)

In addition, holding all other assumptions constant, an increase or decrease of 100 basis points in actual versus expected return on plan assets would have the following estimated effects on our 2020 MTM expense (benefit):

$ in millions	100 Basis Point Decrease	100 Basis Point Increase
2020 MTM expense (benefit)	$ 312	$ (312)

Estimated Fair Market Value of Plan Assets – For certain plan assets where the fair market value is not readily determinable, such as real estate, private equity, hedge funds and opportunistic investments, we develop estimates of fair value using the best information available. Estimated fair values on these plan assets are based on redemption values and net asset values, as well as valuation methodologies that include third party appraisals, comparable transactions, discounted cash flow valuation models and public market data.

Mortality Rate – Mortality assumptions are used to estimate life expectancies of plan participants. In October 2014, the Society of Actuaries (SOA) issued updated mortality tables and a mortality improvement scale, which reflected longer life expectancies than previously projected. In October 2019, the SOA issued an updated mortality base table (the Private Retirement Plans Mortality table for 2012 (Pri-2012)) as well as an updated mortality improvement scale (MP-2019). The updated model is based on a comprehensive study, which shifted the blue/white collar mix in prior tables more toward blue collar in the Pri-2012 table. Considering our employee population, we performed a study of our recent actual pension plan mortality experience to determine whether the Pri-2012 table's shift toward blue collar was appropriate for our company. After considering the additional information released by the SOA in October 2019, and after reviewing our own historical mortality experience, we adopted the Pri-2012 White Collar table along with their projection scale, but with a long-term improvement rate of 0.75% versus 1.0% assumed by the SOA. Accordingly, we updated the mortality assumptions used in calculating our pension and OPB obligations recognized at December 31, 2019, and the amounts estimated for our 2020 pension and OPB expense.

For further information regarding our pension and OPB plans, see "Risk Factors" in Part I, Item 1A of the 2019 Form 10-K and Notes 1 and 13 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

Litigation, Commitments and Contingencies

We are subject to a range of claims, disputes, enforcement actions, investigations, lawsuits, overhead cost claims, environmental matters, income tax matters and administrative proceedings that arise in the ordinary course of business. Estimating liabilities and costs associated with these matters requires judgment based upon the professional knowledge and experience of management. We determine whether to record a reserve and, if so, what amount based on consideration of the facts and circumstances of each matter as then known to us. Determinations regarding whether to record a reserve and, if so, of what amount, reflect management's assessment regarding what is likely to occur; they do not necessarily reflect what management believes should occur. The ultimate resolution of any such exposure to us may vary materially from earlier estimates as further facts and circumstances develop or become known to us.

Environmental Matters – We are subject to environmental laws and regulations in the jurisdictions in which we do or have done business. Factors that could result in changes to the assessment of probability, range of reasonably estimated costs and environmental accruals include: modification of planned remedial actions; changes in the estimated time required to conduct remedial actions; discovery of more or less extensive (or different) contamination than anticipated; information regarding the potential causes and effects of contamination; results of efforts to involve other responsible parties; financial capabilities of other responsible parties; changes in laws and regulations, their interpretation or application; contractual obligations affecting remediation or responsibilities; and improvements in remediation technology. As we expect to be able to recover a portion of environmental remediation liabilities through overhead charges on government contracts, such amounts are deferred in prepaid expenses and other current assets (current portion) and other non-current assets until charged to contracts. We use judgment to evaluate the recoverability of our environmental remediation costs, assessing, among other things, U.S. government regulations, our U.S. government contract mix and past practices. Portions of the company's environmental liabilities we do not expect to be recoverable have been expensed.

Income Tax Matters – The evaluation of tax positions taken in a filed tax return, or planned to be taken in a future tax return or claim, requires the use of judgment. We establish reserves for uncertain tax positions when, despite the belief that our tax positions are supportable, there remains uncertainty in a tax position taken in our filed tax returns or planned to be taken in a future tax return or claim. The company follows a recognition and measurement approach, considering the facts, circumstances, and information available at the reporting date. Judgment is

exercised by the company in determining the level of evidence necessary and appropriate to support its assessment using all available information. The technical merits of its position are derived from sources of authority in the tax law and their applicability to the facts and circumstances of the tax position. In measuring the tax position, the company considers the amounts and probabilities of the outcomes that could be realized upon settlement. When it is more likely than not that a tax position will be sustained, we record the largest amount of tax benefit with a greater than 50 percent likelihood of being realized upon ultimate settlement with a taxing authority. To the extent we prevail in matters for which reserves have been established or are required to pay amounts in excess of reserves, there could be a significant impact on our consolidated financial position and annual results of operations. During 2019, we increased our unrecognized tax benefits by approximately $319 million related to our methods of accounting associated with the timing of revenue recognition and related costs, and the 2017 Tax Act.

For further information on litigation, commitments and contingencies, see “Risk Factors” in Part I, Item 1A of the 2019 Form 10-K and Note 1, Note 7, Note 11 and Note 12 to the consolidated financial statements in Part II, Item 8 of Exhibit 99.4 of this Form 8-K.

Goodwill and Other Purchased Intangible Assets

Overview – We allocate the purchase price of acquired businesses to the underlying tangible and intangible assets acquired and liabilities assumed based upon their respective fair values, with the excess recorded as goodwill. Such fair value assessments require judgments and estimates that can be affected by contract performance and other factors over time, which may cause final amounts to differ materially from original estimates. Adjustments to the fair value of purchased assets and liabilities after the initial measurement period are recognized in net earnings.

We recognize purchased intangible assets in connection with our business acquisitions at fair value on the acquisition date. The most significant purchased intangible assets recognized from our acquisitions are generally customer-related intangible assets, including customer contracts and commercial customer relationships. We determine the fair value of those customer-related intangible assets based on estimates and judgments, including the amount and timing of expected future cash flows, long-term growth rates and discount rates. In some cases, we use discounted cash flow analyses, which are based on estimates of future sales, earnings and cash flows after considering such factors as general market conditions, customer budgets, existing firm and future orders, changes in working capital, long term business plans and recent operating performance.

Impairment Testing – We test for impairment of goodwill annually at each of our reporting units, which comprise our operating segments. The results of our annual goodwill impairment tests as of December 31, 2019 and 2018, respectively, indicated that the estimated fair value of each reporting unit exceeded its respective carrying value. There were no impairment charges recorded in the years ended December 31, 2019, 2018 and 2017.

In addition to performing an annual goodwill impairment test, we may perform an interim impairment test if events occur or circumstances change that suggest goodwill in any of our reporting units may be impaired. Such indicators may include, but are not limited to, the loss of significant business, significant reductions in federal government appropriations or other significant adverse changes in industry or market conditions.

When testing goodwill for impairment, we compare the fair values of each of our reporting units to their respective carrying values. To determine the fair value of our reporting units, we primarily use the income approach based on the cash flows that the reporting unit expects to generate in the future, consistent with our operating plans. This income valuation method requires management to project sales, operating expenses, working capital, capital spending and cash flows for the reporting units over a multi-year period, as well as to determine the weighted-average cost of capital (WACC) used as a discount rate and terminal value assumptions. The WACC takes into account the relative weights of each component of our consolidated capital structure (equity and debt) and represents the expected cost of new capital adjusted as appropriate to consider lower risk profiles associated with longer-term contracts and barriers to market entry. The terminal value assumptions are applied to the final year of the discounted cash flow model. We use industry multiples (including relevant control premiums) of operating earnings to corroborate the fair values of our reporting units determined under the market valuation method of the income approach.

We test for impairment of our purchased intangible assets when events or changes in circumstances indicate that the carrying amount of these assets may not be recoverable. Our assessment is based on our projection of the undiscounted future operating cash flows of the related asset group. If such projections indicate that future undiscounted cash flows are not sufficient to recover the carrying amount, we recognize a non-cash impairment charge to reduce the carrying amount to fair value. There were no impairment charges recorded in the years ended December 31, 2019, 2018 and 2017.

Impairment assessment inherently involves management judgments as to assumptions about expected future cash flows and the impact of market conditions on those assumptions. Due to the many variables inherent in the estimation of a business' fair value and the relative size of our recorded goodwill and other purchased intangible assets, differences in assumptions may have a material effect on the results of our impairment analysis.

OTHER MATTERS

Off-Balance Sheet Arrangements

As of December 31, 2019, we had no significant off-balance sheet arrangements.

EXHIBIT 99.4

PART II

Item 8. Financial Statements and Supplementary Data

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Shareholders of
Northrop Grumman Corporation
Falls Church, Virginia

Opinion on the Financial Statements

We have audited the accompanying consolidated statements of financial position of Northrop Grumman Corporation and subsidiaries (the “Company”) as of December 31, 2019 and 2018, and the related consolidated statements of earnings and comprehensive income, changes in shareholders’ equity, and cash flows for each of the three years in the period ended December 31, 2019, and the related notes (collectively referred to as the “financial statements”). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company’s internal control over financial reporting as of December 31, 2019, based on the criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated January 29, 2020, not presented herein, expressed an unqualified opinion on the Company’s internal control over financial reporting.

Change in Accounting Principle

As discussed in Note 1 to the financial statements, the Company has changed its method of accounting for leases in 2019 due to the adoption of ASC 842, *Leases*.

Basis for Opinion

These financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on the Company’s financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current-period audit of the financial statements that were communicated or required to be communicated to the audit committee and that (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Revenue Recognition - Cost and Revenue Estimates for Development Contracts - Refer to Note 1 to the financial statements

Critical Audit Matter Description

As more fully described in Note 1 to the financial statements, the Company recognizes substantially all revenue as control is transferred to the customer on their long-term contracts over time using the cost-to-cost method (cost incurred relative to total cost estimated at completion). Use of the cost-to-cost-method requires the Company to make reasonably dependable estimates regarding the revenue and costs associated with the design, manufacture and delivery of their products or services. The Company estimates profit on these contracts as the difference between total estimated sales and total estimated costs at completion and recognizes that profit as costs are incurred. Cost estimates on contracts requiring development work are inherently more uncertain as to future events than production contracts, and, as a result, there is typically more variability in those estimates. Certain of these contracts are fixed price in nature, which results in greater financial risk associated with unanticipated cost growth. Alternatively, cost-type contracts may have award or incentive fees that are subject to uncertainty and may be earned over extended periods or towards the end of the contract. As a result, the estimation of costs required to complete these contracts and the expected revenues that will be earned is complex and requires significant judgment.

Given the judgment necessary to make reasonably dependable estimates regarding the revenue and costs associated with such contracts, auditing these estimates required extensive audit effort due to the complexity of the underlying programs and a high degree of auditor judgment when performing audit procedures and evaluating the results of those procedures.

How the Critical Audit Matter Was Addressed in the Audit

Our auditing procedures related to the cost and revenue estimates for these development contracts included the following, among others:

- We tested the effectiveness of controls over the estimates of total costs and revenues on such contracts, including development costs and any related award or incentive fee estimates for the relevant performance obligations.
- We selected certain long-term contracts for testing and performed the following procedures:
  - Evaluated whether the recognition of revenue over time on such contracts was appropriate based on the terms and conditions of each contract, including whether continuous transfer of control to the customer occurred as progress was made toward fulfilling the performance obligation.
  - Tested management’s identification of distinct performance obligations by evaluating whether the underlying goods and services were highly interdependent and interrelated.
  - Tested management’s determination of the transaction price, including any award or incentive fees, based on the consideration expected to be received in accordance with the rights and obligations established under the contracts and any contractual modifications.
  - Evaluated the estimates of total cost and revenue for the performance obligation by:
    - Conducting site visits to the relevant program locations and directly observing the contract status, as well as making inquiries regarding any challenges related to the program.
    - Comparing costs incurred to date to the costs management estimated to be incurred to date.
    - Evaluating management’s ability to achieve the estimates of total cost and revenue by performing corroborating inquiries with the Company’s program and business management, and testing management’s process used to develop the estimates based on their work plans, engineering specifications, program labor, and supplier contracts.
    - Comparing management’s estimates for the selected contracts to costs and revenues of similar performance obligations, when applicable.
  - Tested the mathematical accuracy of management’s calculation of revenue recognized during the period for the performance obligations.

Income Taxes - Uncertain Tax Positions - Refer to Notes 1 and 7 to the financial statements

Critical Audit Matter Description

The Company files income tax returns in the U.S. federal jurisdiction and in various state and foreign jurisdictions. Uncertain tax positions reflect the Company's expected treatment of tax positions taken in a filed tax return, or planned to be taken in a future tax return or claim, which have not been reflected in measuring income tax expense or taxes payable for financial reporting purposes. Until these positions are sustained by the taxing authorities or the statute of limitations concerning such issues lapses, the Company does not generally recognize the tax benefits resulting from such positions and reports the tax effects as a liability for uncertain tax positions in its consolidated statements of financial position. The Company has recognized increased uncertain tax positions in recent years principally related to the methods of accounting associated with the timing of revenue recognition and related costs, and the 2017 Tax Act. Until the matters are resolved, the outcome is inherently uncertain and the Company discloses a summary of changes in their uncertain tax positions within the notes to their financial statements.

Auditing the assumptions associated with the Company's uncertain tax positions involved especially challenging judgments given the complexity and inherent subjectivity involved in evaluating the potential outcomes of these matters.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures related to the assumptions used in determining uncertain tax positions included the following, among others:

- We tested the effectiveness of internal controls relating to the identification and completeness of, and recognition for, uncertain tax positions, including management's controls over the underlying key assumptions and inputs used to derive the estimates.
- With the assistance of our income tax specialists, we selected specific uncertain tax positions for testing and performed the following procedures:
  - Performed inquiries of the Company's tax department, financial reporting department, and other personnel directly involved in the development of the estimates.
  - Obtained supporting documentation and evaluated how the Company supported the position, including the assumptions and estimates used for measurement, and how the taxing authorities have historically challenged the tax position, if applicable.
  - Obtained and read opinions provided by external counsel, as applicable, regarding the tax position taken by the Company.
  - Evaluated whether the uncertain tax position met the "more likely than not" recognition threshold.
  - Evaluated the appropriateness and consistency of the methodologies and assumptions used by management when developing these estimates.
- We tested the mathematical accuracy of management's calculations.

/s/ Deloitte & Touche LLP
McLean, Virginia
January 29, 2020
(April 28, 2020 as to the reclassification of segment information as described in Notes 1, 2, 8 and 16)
We have served as the Company's auditor since 1975.

CONSOLIDATED STATEMENTS OF EARNINGS AND COMPREHENSIVE INCOME

	Year Ended December 31		
$ in millions, except per share amounts	**2019**	2018	2017
Sales			
Product	**$ 23,852**	$ 20,469	$ 16,364
Service	**9,989**	9,626	9,640
Total sales	**33,841**	30,095	26,004
Operating costs and expenses			
Product	**18,675**	15,785	12,527
Service	**7,907**	7,519	7,547
General and administrative expenses	**3,290**	3,011	2,712
Operating income	**3,969**	3,780	3,218
Other (expense) income			
Interest expense	**(528)**	(562)	(360)
FAS (non-service) pension benefit	**800**	1,049	699
Mark-to-market pension and OPB (expense) benefit	**(1,800)**	(655)	536
Other, net	**107**	130	136
Earnings before income taxes	**2,548**	3,742	4,229
Federal and foreign income tax expense	**300**	513	1,360
Net earnings	**$ 2,248**	$ 3,229	$ 2,869
Basic earnings per share	**$ 13.28**	$ 18.59	$ 16.45
Weighted-average common shares outstanding, in millions	**169.3**	173.7	174.4
Diluted earnings per share	**$ 13.22**	$ 18.49	$ 16.34
Weighted-average diluted shares outstanding, in millions	**170.0**	174.6	175.6
Net earnings (from above)	**$ 2,248**	$ 3,229	$ 2,869
Other comprehensive loss			
Change in unamortized prior service credit, net of tax expense of $15 in 2019, $19 in 2018 and $35 in 2017	**(47)**	(60)	(44)
Change in cumulative translation adjustment and other, net	**2**	(14)	(2)
Other comprehensive loss, net of tax	**(45)**	(74)	(46)
Comprehensive income	**$ 2,203**	$ 3,155	$ 2,823

The accompanying notes are an integral part of these consolidated financial statements.

CONSOLIDATED STATEMENTS OF FINANCIAL POSITION

	December 31	
$ in millions, except par value	**2019**	2018
Assets		
Cash and cash equivalents	**$ 2,245**	$ 1,579
Accounts receivable, net	**1,326**	1,448
Unbilled receivables, net	**5,334**	5,026
Inventoried costs, net	**783**	654
Prepaid expenses and other current assets	**997**	973
Total current assets	**10,685**	9,680
Property, plant and equipment, net of accumulated depreciation of $5,850 for 2019 and $5,369 for 2018	**6,912**	6,372
Operating lease right-of-use assets	**1,511**	—
Goodwill	**18,708**	18,672
Intangible assets, net	**1,040**	1,372
Deferred tax assets	**508**	94
Other non-current assets	**1,725**	1,463
Total assets	**$ 41,089**	$ 37,653
Liabilities		
Trade accounts payable	**$ 2,226**	$ 2,182
Accrued employee compensation	**1,865**	1,676
Advance payments and billings in excess of costs incurred	**2,237**	1,917
Other current liabilities	**3,106**	2,499
Total current liabilities	**9,434**	8,274
Long-term debt, net of current portion of $1,109 for 2019 and $517 for 2018	**12,770**	13,883
Pension and other postretirement benefit plan liabilities	**6,979**	5,755
Operating lease liabilities	**1,308**	—
Deferred tax liabilities	**—**	108
Other non-current liabilities	**1,779**	1,446
Total liabilities	**32,270**	29,466
Commitments and contingencies (Note 12)		
Shareholders' equity		
Preferred stock, $1 par value; 10,000,000 shares authorized; no shares issued and outstanding	**—**	—
Common stock, $1 par value; 800,000,000 shares authorized; issued and outstanding: 2019—167,848,424 and 2018—170,607,336	**168**	171
Paid-in capital	**—**	—
Retained earnings	**8,748**	8,068
Accumulated other comprehensive loss	**(97)**	(52)
Total shareholders' equity	**8,819**	8,187
Total liabilities and shareholders' equity	**$ 41,089**	$ 37,653

The accompanying notes are an integral part of these consolidated financial statements.

CONSOLIDATED STATEMENTS OF CASH FLOWS

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Operating activities			
Net earnings	**$ 2,248**	$ 3,229	$ 2,869
Adjustments to reconcile to net cash provided by operating activities:			
Depreciation and amortization	**1,018**	800	475
Mark-to-market pension and OPB expense (benefit)	**1,800**	655	(536)
Non-cash lease expense	**247**	—	—
Stock-based compensation	**127**	86	94
Deferred income taxes	**(509)**	234	985
Changes in assets and liabilities:			
Accounts receivable, net	**122**	202	(209)
Unbilled receivables, net	**(335)**	(297)	(422)
Inventoried costs, net	**(135)**	(37)	25
Prepaid expenses and other assets	**(78)**	(56)	(92)
Accounts payable and other liabilities	**617**	381	570
Income taxes payable, net	**(63)**	(258)	(157)
Retiree benefits	**(703)**	(1,083)	(946)
Other, net	**(59)**	(29)	(43)
Net cash provided by operating activities	**4,297**	3,827	2,613
Investing activities			
Acquisition of Orbital ATK, net of cash acquired	**—**	(7,657)	—
Capital expenditures	**(1,264)**	(1,249)	(928)
Other, net	**57**	28	39
Net cash used in investing activities	**(1,207)**	(8,878)	(889)
Financing activities			
Payments of long-term debt	**(500)**	(2,276)	—
Net proceeds from issuance of long-term debt	**—**	—	8,245
Payments to credit facilities	**(31)**	(320)	(13)
Net (repayments of) borrowings on commercial paper	**(198)**	198	—
Common stock repurchases	**(744)**	(1,263)	(393)
Cash dividends paid	**(880)**	(821)	(689)
Payments of employee taxes withheld from share-based awards	**(65)**	(85)	(92)
Other, net	**(6)**	(28)	(98)
Net cash (used in) provided by financing activities	**(2,424)**	(4,595)	6,960
Increase (decrease) in cash and cash equivalents	**666**	(9,646)	8,684
Cash and cash equivalents, beginning of year	**1,579**	11,225	2,541
Cash and cash equivalents, end of year	**$ 2,245**	$ 1,579	$ 11,225

The accompanying notes are an integral part of these consolidated financial statements.

CONSOLIDATED STATEMENTS OF CHANGES IN SHAREHOLDERS' EQUITY

	Year Ended December 31		
$ in millions, except per share amounts	**2019**	2018	2017
Common stock			
Beginning of year	**$ 171**	$ 174	$ 175
Common stock repurchased	**(3)**	(4)	(2)
Shares issued for employee stock awards and options	**—**	1	1
End of year	**168**	171	174
Paid-in capital			
Beginning of year	**—**	44	—
Common stock repurchased	**—**	(34)	—
Stock compensation	**—**	(10)	44
End of year	**—**	—	44
Retained earnings			
Beginning of year	**8,068**	6,913	5,141
Impact from adoption of ASU 2018-02 and ASU 2016-01	**—**	(21)	—
Common stock repurchased	**(751)**	(1,225)	(371)
Net earnings	**2,248**	3,229	2,869
Dividends declared	**(880)**	(822)	(687)
Stock compensation	**63**	(6)	(39)
End of year	**8,748**	8,068	6,913
Accumulated other comprehensive (loss) income			
Beginning of year	**(52)**	1	47
Impact from adoption of ASU 2018-02 and ASU 2016-01	**—**	21	—
Other comprehensive income (loss), net of tax	**(45)**	(74)	(46)
End of year	**(97)**	(52)	1
Total shareholders' equity	**$ 8,819**	$ 8,187	$ 7,132
Cash dividends declared per share	**$ 5.16**	$ 4.70	$ 3.90

The accompanying notes are an integral part of these consolidated financial statements.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations
Northrop Grumman Corporation (herein referred to as “Northrop Grumman,” the “company,” “we,” “us,” or “our”) is a leading global security company. We offer a broad portfolio of capabilities and technologies that enable us to deliver innovative platforms, systems and solutions for applications that range from undersea to outer space and into cyberspace. We provide capabilities in autonomous systems; cyber; command, control, communications and computers, intelligence, surveillance and reconnaissance (C4ISR); space; strike; and logistics and modernization. We participate in many high-priority defense and government programs in the United States (U.S.) and abroad. We conduct most of our business with the U.S. government, principally the Department of Defense (DoD) and intelligence community. We also conduct business with foreign, state and local governments, as well as commercial customers.

At December 31, 2019, the company was aligned in four operating sectors: Aerospace Systems, Innovation Systems, Mission Systems and Technology Services. Effective January 1, 2020, the company reorganized its sectors to better align the company’s broad portfolio to serve its customers’ needs. The four new sectors are: Aeronautics Systems, Defense Systems, Mission Systems and Space Systems. This realignment is reflected in the accompanying financial information.

On June 6, 2018 (the “Merger date”), the company completed its previously announced acquisition of Orbital ATK, Inc. (“Orbital ATK”) (the “Merger”). On the Merger date, Orbital ATK became a wholly-owned subsidiary of the company and its name was changed to Northrop Grumman Innovation Systems, Inc., which we established as a new, fourth business sector (“Innovation Systems”). The operating results of legacy Innovation Systems subsequent to the Merger date have been included in the company’s consolidated results of operations and are reflected in the Space Systems, Defense Systems and Aeronautics Systems sectors. See Note 2 for further information regarding the Merger.

Principles of Consolidation
The consolidated financial statements include the accounts of Northrop Grumman and its subsidiaries and joint ventures or other investments for which we consolidate the financial results. Intercompany accounts, transactions and profits are eliminated in consolidation. Investments in equity securities and joint ventures where the company has significant influence, but not control, are accounted for using the equity method.

Basis of Presentation
Effective January 1, 2019, we adopted Accounting Standards Codification (ASC) Topic 842, *Leases*, using the optional transition method to apply the standard through a cumulative effect adjustment in the period of adoption. The adoption of this standard is reflected in the amounts and disclosures set forth in this Form 10-K.

Accounting Estimates
The company’s consolidated financial statements are prepared in conformity with accounting principles generally accepted in the United States of America (“GAAP” or “FAS”). The preparation thereof requires management to make estimates and judgments that affect the reported amounts of assets and liabilities and the disclosure of contingencies at the date of the financial statements, as well as the reported amounts of sales and expenses during the reporting period. Estimates have been prepared using the most current and best available information; however, actual results could differ materially from those estimates.

Revenue Recognition
The majority of our sales are derived from long-term contracts with the U.S. government for the production of goods, the provision of services, or a combination of both. The company classifies sales as product or service based on the predominant attributes of each performance obligation.

The company recognizes revenue for each separately identifiable performance obligation in a contract representing a promise to transfer a distinct good or service to a customer. In most cases, goods and services provided under the company’s contracts are accounted for as single performance obligations due to the complex and integrated nature of our products and services. These contracts generally require significant integration of a group of goods and/or services to deliver a combined output. In some contracts, the company provides multiple distinct goods or services to a customer, most commonly when a contract covers multiple phases of the product life cycle (e.g., development, production, sustainment, etc.). In those cases, the company accounts for the distinct contract deliverables as separate performance obligations and allocates the transaction price to each performance obligation based on its relative standalone selling price, which is generally estimated using cost plus a reasonable margin. Warranties are provided

on certain contracts, but do not typically provide for services beyond standard assurances and are therefore not considered to be separate performance obligations. Assets recognized from the costs to obtain or fulfill a contract are not material.

Contracts are often modified for changes in contract specifications or requirements, which may result in scope and/or price changes. Most of the company's contract modifications are for goods or services that are not distinct in the context of the contract and are therefore accounted for as part of the original performance obligation through a cumulative estimate-at-completion (EAC) adjustment.

The company recognizes revenue as control is transferred to the customer, either over time or at a point in time. In general, our U.S. government contracts contain termination for convenience and/or other clauses that generally provide the customer rights to goods produced and/or in-process. Similarly, our non-U.S. government contracts generally contain contractual termination clauses or entitle the company to payment for work performed to date for goods and services that do not have an alternative use. As control is effectively transferred while we perform on our contracts, we generally recognize revenue over time using the cost-to-cost method (cost incurred relative to total cost estimated at completion) as the company believes this represents the most appropriate measurement towards satisfaction of its performance obligations. Revenue for contracts in which the control of goods produced does not transfer until delivery to the customer is recognized at a point in time (i.e., typically upon delivery).

Contract Estimates

Use of the cost-to-cost method requires us to make reasonably dependable estimates regarding the revenue and cost associated with the design, manufacture and delivery of our products and services. The company estimates profit on these contracts as the difference between total estimated sales and total estimated cost at completion and recognizes that profit as costs are incurred. Significant judgment is used to estimate total sales and cost at completion.

Contract sales may include estimates of variable consideration, including cost or performance incentives (such as award and incentive fees), contract claims and requests for equitable adjustment (REAs). Variable consideration is included in total estimated sales to the extent it is probable that a significant reversal in the amount of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is subsequently resolved. We estimate variable consideration as the most likely amount to which we expect to be entitled.

We recognize changes in estimated contract sales or costs and the resulting changes in contract profit on a cumulative basis. Cumulative EAC adjustments represent the cumulative effect of the changes on current and prior periods; sales and operating margins in future periods are recognized as if the revised estimates had been used since contract inception. If it is determined that a loss is expected to result on an individual performance obligation, the entire amount of the estimable future loss, including an allocation of general and administrative (G&A) costs, is charged against income in the period the loss is identified.

The following table presents the effect of aggregate net EAC adjustments:

	Year Ended December 31		
$ in millions, except per share data	**2019**	2018	2017
Revenue	**$ 538**	$ 631	$ 374
Operating income	**480**	577	360
Net earnings[1]	**379**	456	234
Diluted earnings per share[1]	**2.23**	2.61	1.33

[1] Based on a 21% federal statutory tax rate for the years ended December 31, 2019 and 2018 and a 35% federal statutory tax rate for the year ended December 31, 2017.

EAC adjustments on a single performance obligation can have a material effect on the company's financial statements. When such adjustments occur, we generally disclose the nature, underlying conditions and financial impact of the adjustments. No such adjustments were material to the financial statements during the year ended December 31, 2019. During the second quarter of 2018, the company recognized $69 million of favorable EAC adjustments on multiple restricted programs at Aeronautics Systems. During the third quarter of 2017, the company recorded a $56 million favorable EAC adjustment on a restricted program at Space Systems.

Backlog

Backlog represents the future sales we expect to recognize on firm orders received by the company and is equivalent to the company's remaining performance obligations at the end of each period. It comprises both funded backlog (firm orders for which funding is authorized and appropriated) and unfunded backlog. Unexercised contract options

and indefinite delivery indefinite quantity (IDIQ) contracts are not included in backlog until the time an option or IDIQ task order is exercised or awarded.

Company backlog as of December 31, 2019 was $64.8 billion. We expect to recognize approximately 45 percent and 70 percent of our December 31, 2019 backlog as revenue over the next 12 and 24 months, respectively, with the remainder to be recognized thereafter.

Contract Assets and Liabilities
For each of the company's contracts, the timing of revenue recognition, customer billings, and cash collections results in a net contract asset or liability at the end of each reporting period. Fixed-price contracts are typically billed to the customer either using progress payments, whereby amounts are billed monthly as costs are incurred or work is completed, or performance based payments, which are based upon the achievement of specific, measurable events or accomplishments defined and valued at contract inception. Cost-type contracts are typically billed to the customer on a monthly or semi-monthly basis.

Contract assets are equivalent to and reflected as Unbilled receivables in the consolidated statements of financial position and are primarily related to long-term contracts where revenue recognized under the cost-to-cost method exceeds amounts billed to customers. Unbilled receivables are classified as current assets and, in accordance with industry practice, include amounts that may be billed and collected beyond one year due to the long-cycle nature of many of our contracts. Accumulated contract costs in unbilled receivables include costs such as direct production costs, factory and engineering overhead, production tooling costs, and allowable G&A. Unbilled receivables also include certain estimates of variable consideration described above. These contract assets are not considered a significant financing component of the company's contracts as the payment terms are intended to protect the customer in the event the company does not perform on its obligations under the contract.

Contract liabilities are equivalent to and reflected as Advance payments and billings in excess of costs incurred in the consolidated statements of financial position. Certain customers make advance payments prior to the company's satisfaction of its obligations on the contract. These amounts are recorded as contract liabilities until such obligations are satisfied, either over time as costs are incurred or at a point in time when deliveries are made. Contract liabilities are not a significant financing component as they are generally utilized to pay for contract costs within a one-year period or are used to ensure the customer meets contractual requirements.

Net contract assets are as follows:

$ in millions	**December 31, 2019**	December 31, 2018	$ Change	% Change
Unbilled receivables, net	**$ 5,334**	$ 5,026	$ 308	6 %
Advance payments and amounts in excess of costs incurred	**(2,237)**	(1,917)	(320)	17 %
Net contract assets	**$ 3,097**	$ 3,109	$ (12)	— %

The change in the balances of the company's contract assets and liabilities primarily results from timing differences between revenue recognition and customer billings and/or payments. Net contract assets as of December 31, 2019 are consistent with the prior year and reflect an increase in Advance payments and amounts in excess of costs incurred at all four sectors as well as an increase in Unbilled receivables, net at Mission Systems and Defense Systems.

The amount of revenue recognized for the years ended December 31, 2019, 2018 and 2017 that was included in the contract liability balance at the beginning of each year was $1.3 billion, $1.3 billion and $1.2 billion, respectively.

Disaggregation of Revenue
See Note 16 for information regarding the company's sales by customer type, contract type and geographic region for each of our segments. We believe those categories best depict how the nature, amount, timing and uncertainty of our revenue and cash flows are affected by economic factors.

General and Administrative Expenses
In accordance with the regulations that govern cost accounting requirements for government contracts, most general management and corporate expenses incurred at the segment and corporate locations are considered allowable and allocable costs. Allowable and allocable G&A costs, including independent research and development (IR&D) and bid and proposal (B&P) costs, are allocated on a systematic basis to contracts in progress and are included as a component of total estimated contract costs.

Research and Development
Company-sponsored research and development activities primarily include efforts related to government programs. Company-sponsored IR&D expenses totaled $953 million, $764 million and $639 million in 2019, 2018 and 2017, respectively, which represented 2.8 percent, 2.5 percent and 2.5 percent of total sales, respectively. Customer-funded research and development activities are charged directly to the related contracts.

Income Taxes
Provisions for federal and foreign income taxes are calculated on reported earnings before income taxes based on current tax law and include the cumulative effect of any changes in tax rates from those used previously in determining deferred tax assets and liabilities. Such provisions differ from the amounts currently payable because certain items of income and expense are recognized in different periods for financial reporting purposes than for income tax purposes. The company recognizes federal and foreign interest accrued related to unrecognized tax benefits in income tax expense. Federal tax penalties are recognized as a component of income tax expense.

In accordance with the regulations that govern cost accounting requirements for government contracts, current state and local income and franchise taxes are generally considered allowable and allocable costs and, consistent with industry practice, are recorded in operating costs and expenses. The company generally recognizes changes in deferred state taxes and unrecognized state tax benefits in unallocated corporate expenses.

Uncertain tax positions reflect the company’s expected treatment of tax positions taken in a filed tax return, or planned to be taken in a future tax return or claim, which have not been reflected in measuring income tax expense or taxes payable for financial reporting purposes. Until these positions are sustained by the taxing authorities or the statute of limitations concerning such issues lapses, the company does not generally recognize the tax benefits resulting from such positions and reports the tax effects as a liability for uncertain tax positions in its consolidated statements of financial position.

Cash and Cash Equivalents
Cash and cash equivalents are comprised of cash in banks and highly liquid instruments with original maturities of three months or less, primarily consisting of bank time deposits and investments in institutional money market funds. Cash in bank accounts often exceeds federally insured limits.

Fair Value of Financial Instruments
The company measures the fair value of its financial instruments using observable and unobservable inputs. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect internal market assumptions.

These two types of inputs create the following fair value hierarchy:

Level 1 - Quoted prices for identical instruments in active markets.

Level 2 - Quoted prices for similar instruments in active markets; quoted prices for identical or similar instruments in markets that are not active; and model-derived valuations whose inputs are observable or whose significant value drivers are observable.

Level 3 - Significant inputs to the valuation model are unobservable.

The company holds a portfolio of marketable securities consisting of securities to partially fund non-qualified employee benefit plans. A portion of these securities are held in common/collective trust funds and are measured at fair value using net asset value (NAV) per share as a practical expedient. Marketable securities accounted for as trading are recorded at fair value on a recurring basis and are included in Other non-current assets in the consolidated statements of financial position. Changes in unrealized gains and losses on trading securities are included in Other, net in the consolidated statements of earnings and comprehensive income. Investments in held-to-maturity instruments with original maturities greater than three months are recorded at amortized cost.

Derivative financial instruments are recognized as assets or liabilities in the financial statements and measured at fair value on a recurring basis. Changes in the fair value of derivative financial instruments that are designated as fair value hedges are recorded in net earnings, while the changes in the fair value of derivative financial instruments that are designated as cash flow hedges are recorded as a component of other comprehensive income until settlement. For derivative financial instruments not designated as hedging instruments, gains or losses resulting from changes in the fair value are reported in Other, net in the consolidated statements of earnings and comprehensive income.

The company uses derivative financial instruments to manage its exposure to foreign currency exchange risk related to receipts from customers and payments to suppliers denominated in foreign currencies (i.e., foreign currency

forward contracts). For foreign currency forward contracts, where model-derived valuations are appropriate, the company utilizes the income approach to determine the fair value and uses the applicable London Interbank Offered Rate (LIBOR) swap rates.

The company does not use derivative financial instruments for trading or speculative purposes, nor does it use leveraged financial instruments. Credit risk related to derivative financial instruments is considered minimal and is managed through the use of multiple counterparties with high credit standards and periodic settlements of positions, as well as by entering into master netting agreements with most of our counterparties.

Inventoried Costs

Inventoried costs generally comprise costs associated with unsatisfied performance obligations on contracts accounted for using point in time revenue recognition, costs incurred in excess of existing contract requirements or funding that are probable of recovery and other accrued contract costs that are expected to be recoverable when allocated to specific contracts. Product inventory primarily consists of raw materials and is stated at the lower of cost or net realizable value, generally using the average cost method.

Accumulated contract costs in inventoried costs include costs such as direct production costs, factory and engineering overhead, production tooling costs, and allowable G&A. Inventoried costs are classified as current assets and, in accordance with industry practice, include amounts related to contracts having production cycles longer than one year.

Cash Surrender Value of Life Insurance Policies

The company maintains whole life insurance policies on a group of executives, which are recorded at their cash surrender value as determined by the insurance carrier. The company also has split-dollar life insurance policies on former officers and executives from acquired businesses, which are recorded at the lesser of their cash surrender value or premiums paid. These policies are utilized as a partial funding source for deferred compensation and other non-qualified employee retirement plans. As of December 31, 2019 and 2018, the carrying values associated with these policies were $380 million and $316 million, respectively, and are recorded in Other non-current assets in the consolidated statements of financial position.

Property, Plant and Equipment

Property, plant and equipment are depreciated over the estimated useful lives of individual assets. Most assets are depreciated using declining-balance methods, with the remainder using the straight-line method. Depreciation expense is generally recorded in the same segment where the related assets are held. However, the additional depreciation expense related to the step-up in fair value of property, plant and equipment acquired through business combinations is recorded in unallocated corporate expense within operating income as such depreciation is not considered part of management's evaluation of segment operating performance. Major classes of property, plant and equipment and their useful lives are as follows:

		December 31	
Useful life in years, $ in millions	Useful Life	**2019**	2018
Land and land improvements	Up to 40[1]	**$ 619**	$ 636
Buildings and improvements	Up to 45	**2,575**	2,139
Machinery and other equipment	Up to 20	**6,997**	6,618
Capitalized software costs	3-5	**606**	603
Leasehold improvements	Length of Lease[2]	**1,965**	1,745
Property, plant and equipment, at cost		**12,762**	11,741
Accumulated depreciation		**(5,850)**	(5,369)
Property, plant and equipment, net		**$ 6,912**	$ 6,372

[1] Land is not a depreciable asset.

[2] Leasehold improvements are depreciated over the shorter of the useful life of the asset or the length of the lease.

Goodwill and Other Purchased Intangible Assets

The company tests goodwill for impairment at least annually as of December 31, or when an indicator of potential impairment exists. When performing the goodwill impairment test, the company uses a discounted cash flow approach corroborated by comparative market multiples, where appropriate, to determine the fair value of its reporting units.

Goodwill and other purchased intangible asset balances are included in the identifiable assets of their assigned business segment. However, the company includes the amortization of other purchased intangible assets in unallocated corporate expense within operating income as such amortization is not considered part of management’s evaluation of segment operating performance. The company’s customer-related intangible assets are generally amortized over their respective useful lives based on the pattern in which the future economic benefits of the intangible assets are expected to be consumed. Other intangible assets are generally amortized on a straight-line basis over their estimated useful lives.

Leases

The company leases certain buildings, land and equipment. Under ASC 842, at contract inception we determine whether a contract is or contains a lease and whether the lease should be classified as an operating or finance lease. Operating lease balances are included in Operating lease right-of-use assets, Other current liabilities, and Operating lease liabilities in our consolidated statements of financial position.

The company recognizes operating lease right-of-use assets and operating lease liabilities based on the present value of the future minimum lease payments over the lease term at commencement date. We use our incremental borrowing rate based on the information available at commencement date to determine the present value of future payments and the appropriate lease classification. Many of our leases include renewal options aligned with our contract terms. We define the initial lease term to include renewal options determined to be reasonably certain. In our adoption of ASC 842, we elected not to recognize a right-of-use asset and a lease liability for leases with an initial term of 12 months or less; we recognize lease expense for these leases on a straight-line basis over the lease term. We elected the practical expedient to not separate lease components from nonlease components and applied that practical expedient to all material classes of leased assets.

Many of the company’s real property lease agreements contain incentives for tenant improvements, rent holidays or rent escalation clauses. For tenant improvement incentives, if the incentive is determined to be a leasehold improvement owned by the lessee, the company generally records a deferred rent liability and amortizes the deferred rent over the term of the lease as a reduction to rent expense. For rent holidays and rent escalation clauses during the lease term, the company records rental expense on a straight-line basis over the term of the lease. For these lease incentives, the company uses the date of initial possession as the commencement date, which is generally when the company is given the right of access to the space and begins to make improvements in preparation for intended use.

Finance leases are not material to our consolidated financial statements and the company is not a lessor in any material arrangements. We do not have any material restrictions or covenants in our lease agreements, sale-leaseback transactions, land easements or residual value guarantees.

Litigation, Commitments and Contingencies

We accrue for litigation, commitments and contingencies when management, after considering the facts and circumstances of each matter as then known to management, has determined it is probable a liability will be found to have been incurred and the amount of the loss can be reasonably estimated. When only a range of amounts is reasonably estimable and no amount within the range is more likely than another, the low end of the range is recorded. Legal fees are expensed as incurred. Due to the inherent uncertainties surrounding gain contingencies, we generally do not recognize potential gains until realized.

Environmental Costs

We accrue for environmental liabilities when management determines that, based on the facts and circumstances known to the company, it is probable the company will incur costs to address environmental impacts and the costs are reasonably estimable. When only a range of amounts is reasonably estimable and no amount within the range is more probable than another, we record the low end of the range. The company typically projects environmental costs for up to 30 years, records environmental liabilities on an undiscounted basis, and excludes asset retirement obligations and certain legal costs. At sites involving multiple parties, we accrue environmental liabilities based upon our expected share of liability, taking into account the financial viability of other liable parties.

Retirement Benefits

The company sponsors various defined benefit pension plans and defined contribution retirement plans covering substantially all of its employees. In most cases, our defined contribution plans provide for a company match of employee contributions. The company also provides postretirement benefits other than pensions to eligible retirees and qualifying dependents, consisting principally of health care and life insurance benefits.

The liabilities, unamortized prior service credits and annual income or expense of the company's defined benefit pension and other postretirement benefit plans (OPB) are determined using methodologies that involve several actuarial assumptions.

Because U.S. government regulations provide for the costs of pension and OPB plans to be charged to our contracts in accordance with the Federal Acquisition Regulation (FAR) and the related U.S. Government Cost Accounting Standards (CAS) that govern such plans, we calculate retiree benefit plan costs under both FAS and CAS methods. While both FAS and CAS recognize a normal service cost component in measuring periodic pension cost, there are differences in the way the components of annual pension costs are calculated under each method. Measuring plan obligations under FAS and CAS includes different assumptions and models, such as in estimating returns on plan assets, calculating interest expense and the periods over which gains/losses related to pension assets and actuarial changes are recognized. As a result, annual retiree benefit plan expense amounts for FAS are different from the amounts for CAS in any given reporting period even though the ultimate cost of providing benefits over the life of the plans is the same under either method. CAS retiree benefit plan costs are charged to contracts and are included in segment operating income, and the difference between the service cost component of FAS expense and total CAS expense is recorded in operating income at the consolidated company level. Not all net periodic pension expense is recognized in net earnings in the year incurred because it is allocated as production costs and a portion remains in inventory at the end of a reporting period.

Actuarial gains and losses are immediately recognized in net periodic benefit cost for FAS through Mark-to-market pension and OPB ("MTM") (expense) benefit upon annual remeasurement in the fourth quarter, or on an interim basis as triggering events warrant remeasurement. Prior service credits are recognized as a component of Accumulated other comprehensive loss and amortized into earnings in future periods.

Stock Compensation

The company's stock compensation plans are classified as equity plans and compensation expense is generally recognized over the vesting period of stock awards (typically three years), net of estimated forfeitures. The company issues stock awards in the form of restricted performance stock rights and restricted stock rights. The fair value of stock awards is determined based on the closing market price of the company's common stock on the grant date. At each reporting date, the number of shares used to calculate compensation expense and diluted earnings per share is adjusted to reflect the number ultimately expected to vest.

Accumulated Other Comprehensive Loss

The components of accumulated other comprehensive loss are as follows:

	December 31	
$ in millions	**2019**	2018
Unamortized prior service credit, net of tax expense of $17 for 2019 and $32 for 2018	**$ 51**	$ 98
Cumulative translation adjustment	**(147)**	(144)
Other, net	**(1)**	(6)
Total accumulated other comprehensive loss	**$ (97)**	$ (52)

Related Party Transactions

For all periods presented, the company had no material related party transactions.

Accounting Standards Updates

On February 25, 2016, the FASB issued ASU No. 2016-02, *Leases (Topic 842)*. ASC Topic 842 supersedes existing lease guidance, including ASC 840 - *Leases*. Among other things, ASU 2016-02 requires recognition of a right-of-use asset and liability for future lease payments for contracts that meet the definition of a lease and requires disclosure of certain information about leasing arrangements. On July 30, 2018, the FASB issued ASU No. 2018-11, *Leases (Topic 842): Targeted Improvements*, which, among other things, allows companies to elect an optional transition method to apply the new lease standard through a cumulative-effect adjustment in the period of adoption.

We adopted the standard on January 1, 2019 using the optional transition method and, as a result, did not recast prior period consolidated financial statements. All prior period amounts and disclosures are presented under ASC 840. We elected the package of practical expedients, which, among other things, allows us to carry forward our prior lease classifications under ASC 840. We did not elect to adopt the hindsight practical expedient and are therefore maintaining the lease terms we previously determined under ASC 840. Adoption of the new standard resulted in the

recording of additional lease assets and lease liabilities on the consolidated statements of financial position with no cumulative impact to retained earnings and did not have a material impact on our results of operations or cash flows.

Other accounting standards updates adopted and/or issued, but not effective until after December 31, 2019, are not expected to have a material effect on the company's consolidated financial position, annual results of operations and/or cash flows.

2. ACQUISITION OF ORBITAL ATK

On June 6, 2018, the company completed its previously announced acquisition of Orbital ATK, by acquiring all of the outstanding shares of Orbital ATK for a purchase price of $7.7 billion in cash. On the Merger date, Orbital ATK became a wholly-owned subsidiary of the company and its name was changed to Northrop Grumman Innovation Systems, Inc. We established Innovation Systems as a new, fourth business sector. Its main products include precision munitions and armaments; tactical missiles and subsystems; ammunition; launch vehicles; space and strategic propulsion systems; aerospace structures; space exploration products; and national security and commercial satellite systems and related components/services. The acquisition was financed with proceeds from the company's debt financing completed in October 2017 and cash on hand. We believe this acquisition has enabled us to broaden our capabilities and offerings, provide additional innovative solutions to meet our customers' emerging requirements, create value for shareholders and provide expanded opportunities for our combined employees.

The operating results of legacy Innovation Systems subsequent to the Merger date are included in the company's consolidated results of operations and reflected in the Space Systems, Defense Systems and Aeronautics Systems sectors. We recognized customer sales of $3.1 billion, operating income of $342 million and net earnings of $273 million related to legacy Innovation Systems businesses for the period from the Merger date to December 31, 2018.

The company recognized $29 million of acquisition-related costs that were expensed as incurred during the year ended December 31, 2018. These costs are included in Product and Service cost in the consolidated statements of earnings and comprehensive income.

Purchase Price Allocation

The acquisition was accounted for as a purchase business combination. As such, the company recorded the assets acquired and liabilities assumed at fair value, with the excess of the purchase price over the fair value of assets acquired and liabilities assumed recorded as goodwill. Determining the fair value of assets acquired and liabilities assumed requires significant judgment, including the amount and timing of expected future cash flows, long-term growth rates and discount rates. In some cases, the company used discounted cash flow analyses, which were based on our best estimate of future sales, earnings and cash flows after considering such factors as general market conditions, customer budgets, existing firm and future orders, changes in working capital, long term business plans and recent operating performance. Use of different estimates and judgments could yield materially different results.

During the second quarter of 2019, the company finalized its determination of the fair values of the assets acquired and liabilities assumed as of the Merger date. Based on additional information obtained during the measurement period, the company refined its initial assessment of fair value and recognized the following significant adjustments to our preliminary purchase price allocation: Intangible assets increased $220 million, Other current liabilities increased $114 million, Pension and OPB plan liabilities increased $56 million, Other non-current liabilities increased $53 million, Other current assets increased $44 million and Goodwill decreased $36 million. These adjustments did not result in a material impact on the financial results of prior periods.

The Merger date fair value of the consideration transferred totaled $7.7 billion in cash, which was comprised of the following:

$ in millions, except per share amounts		**Purchase price**
Shares of Orbital ATK common stock outstanding as of the Merger date		57,562,152
Cash consideration per share of Orbital ATK common stock	$	134.50
Total purchase price	$	7,742

The following purchase price allocation table presents the company's final determination of the fair values of assets acquired and liabilities assumed at the Merger date:

$ in millions		As of June 6, 2018
Cash and cash equivalents	$	85
Accounts receivable		596
Unbilled receivables		1,237
Inventoried costs		220
Other current assets		237
Property, plant and equipment		1,509
Goodwill		6,259
Intangible assets		1,525
Other non-current assets		151
Total assets acquired		11,819
Trade accounts payable		(397)
Accrued employee compensation		(158)
Advance payments and billings in excess of costs incurred		(222)
Below market contracts[1]		(151)
Other current liabilities		(412)
Long-term debt		(1,687)
Pension and OPB plan liabilities		(613)
Deferred tax liabilities		(248)
Other non-current liabilities		(189)
Total liabilities assumed		(4,077)
Total purchase price	$	7,742

[1] Included in Other current liabilities in the consolidated statements of financial position.

The following table presents a summary of purchased intangible assets and their related estimated useful lives:

		Fair Value (in millions)	Estimated Useful Life in Years
Customer contracts	$	1,245	9
Commercial customer relationships		280	13
Total customer-related intangible assets	$	1,525	

The purchase price allocation resulted in the recognition of $6.3 billion of goodwill, which was allocated to the Space Systems, Defense Systems and Aeronautics Systems sectors (refer to Note 8). The goodwill recognized is attributable to expected revenue synergies generated by the integration of Northrop Grumman products and technologies with those of legacy Orbital ATK, synergies resulting from the consolidation or elimination of certain costs, and intangible assets that do not qualify for separate recognition, such as the assembled workforce of Orbital ATK. None of the goodwill is expected to be deductible for tax purposes.

Unaudited Supplemental Pro Forma Information
The following table presents unaudited pro forma financial information prepared in accordance with Article 11 of Regulation S-X and computed as if Orbital ATK had been included in our results as of January 1, 2017:

	Year Ended December 31	
$ in millions, except per share amounts	**2018**	2017
Sales	**$ 32,319**	$ 30,634
Net earnings	**3,417**	2,938
Diluted earnings per share	**19.57**	16.73

The unaudited supplemental pro forma financial data has been calculated after applying our accounting policies and adjusting the historical results of Orbital ATK with pro forma adjustments, net of tax, that assume the acquisition occurred on January 1, 2017. Significant pro forma adjustments include the following:

1. The impact of the adoption of ASC Topic 606 on Orbital ATK's historical sales of $21 million and cost of sales of $21 million, for the year ended December 31, 2017.
2. The elimination of intercompany sales and costs of sales between the company and Orbital ATK of $80 million and $155 million for the years ended December 31, 2018 and 2017, respectively.
3. The elimination of nonrecurring transaction costs incurred by the company and Orbital ATK in connection with the Merger of $71 million and $57 million for the years ended December 31, 2018 and 2017, respectively.
4. The recognition of additional depreciation expense, net of removal of historical depreciation expense, of $8 million and $40 million for the years ended December 31, 2018 and 2017, respectively, related to the step-up in fair value of acquired property, plant and equipment.
5. Additional interest expense related to the debt issued to finance the Merger, including amortization of the debt issuance costs associated with the newly issued debt, of $208 million for the year ended December 31, 2017. Interest expense and amortization of debt issuance costs have been included in the company's historical financial statements since the date of issuance (October 12, 2017).
6. The recognition of additional amortization expense, net of removal of historical amortization expense, of $90 million and $290 million for the years ended December 31, 2018 and 2017, respectively, related to the fair value of acquired intangible assets.
7. The elimination of Orbital ATK's historical amortization of net actuarial losses and prior service credits and impact of the revised pension and OPB net periodic benefit cost as determined under the company's plan assumptions of $51 million and $110 million for the years ended December 31, 2018 and 2017, respectively.
8. The income tax effect on the pro forma adjustments, which was calculated using the federal statutory tax rate in effect in each respective period, of $(5) million and $130 million for the years ended December 31, 2018 and 2017, respectively.

The unaudited pro forma financial information does not reflect the potential realization of revenue synergies or cost savings, nor does it reflect other costs relating to the integration of the two companies. This unaudited pro forma financial information should not be considered indicative of the results that would have actually occurred if the acquisition had been consummated on January 1, 2017, nor are they indicative of future results.

3. EARNINGS PER SHARE, SHARE REPURCHASES AND DIVIDENDS ON COMMON STOCK

Basic Earnings Per Share
We calculate basic earnings per share by dividing net earnings by the weighted-average number of shares of common stock outstanding during each period.

Diluted Earnings Per Share
Diluted earnings per share include the dilutive effect of awards granted to employees under stock-based compensation plans. The dilutive effect of these securities totaled 0.7 million, 0.9 million and 1.2 million shares for the years ended December 31, 2019, 2018 and 2017, respectively.

Share Repurchases

On September 16, 2015, the company's board of directors authorized a share repurchase program of up to $4.0 billion of the company's common stock (the "2015 Repurchase Program"). Repurchases under the 2015 Repurchase Program commenced in March 2016.

On December 4, 2018, the company's board of directors authorized a new share repurchase program of up to an additional $3.0 billion in share repurchases of the company's common stock (the "2018 Repurchase Program"). By its terms, repurchases under the 2018 Repurchase Program will commence upon completion of the 2015 Repurchase Program and will expire when we have used all authorized funds for repurchases.

During the fourth quarter of 2018, the company entered into an accelerated share repurchase (ASR) agreement with Goldman Sachs & Co. LLC (Goldman Sachs) to repurchase $1.0 billion of the company's common stock under the 2015 Repurchase Program. Under the agreement, we made a payment of $1.0 billion to Goldman Sachs and received an initial delivery of 3.0 million shares valued at $800 million that were immediately canceled by the company. The remaining balance was settled on January 4, 2019 with a final delivery of 0.9 million shares from Goldman Sachs. The final average purchase price was $260.32 per share.

As of December 31, 2019, repurchases under the 2015 Repurchase Program totaled $3.7 billion; $0.3 billion remained under this share repurchase authorization. By its terms, the 2015 Repurchase Program is set to expire when we have used all authorized funds for repurchases.

Share repurchases take place from time to time, subject to market conditions and management's discretion, in the open market or in privately negotiated transactions. The company retires its common stock upon repurchase and, in the periods presented, has not made any purchases of common stock other than in connection with these publicly announced repurchase programs.

The table below summarizes the company's share repurchases to date under the authorizations described above:

Repurchase Program Authorization Date	Amount Authorized (in millions)	Total Shares Retired (in millions)	Average Price Per Share[1]	Date Completed	Shares Repurchased (in millions) Year Ended December 31 **2019**	2018	2017
September 16, 2015	$ 4,000	14.5	$ 255.04		**3.2**	3.8	1.6
December 4, 2018	$ 3,000	—	$ —		**—**	—	—
					3.2	3.8	1.6

[1] Includes commissions paid.

Dividends on Common Stock

In May 2019, the company increased the quarterly common stock dividend 10 percent to $1.32 per share from the previous amount of $1.20 per share.

In May 2018, the company increased the quarterly common stock dividend 9 percent to $1.20 per share from the previous amount of $1.10 per share.

In January 2018, the company increased the quarterly common stock dividend 10 percent to $1.10 per share from the previous amount of $1.00 per share.

In May 2017, the company increased the quarterly common stock dividend 11 percent to $1.00 per share from the previous amount of $0.90 per share.

4. ACCOUNTS RECEIVABLE, NET

Accounts receivable, net represent amounts billed and due from customers. Substantially all accounts receivable at December 31, 2019 are expected to be collected in 2020. The company does not believe it has significant exposure to credit risk as the majority of our accounts receivable are due from the U.S. government either as the ultimate customer or in connection with foreign military sales.

Accounts receivable consisted of the following:

	December 31	
$ in millions	**2019**	2018
Due from U.S. government [1]	$ 1,030	$ 1,164
Due from international and other customers	329	318
Accounts receivable, gross	1,359	1,482
Allowance for doubtful accounts	(33)	(34)
Accounts receivable, net	$ 1,326	$ 1,448

[1] Includes receivables due from the U.S. government associated with foreign military sales (FMS). For FMS, we contract with and are paid by the U.S. government.

5. UNBILLED RECEIVABLES, NET

Unbilled receivables, net represent revenue recognized under the cost-to-cost method that exceeds amounts billed to customers. Substantially all unbilled receivables at December 31, 2019 are expected to be billed and collected in 2020. Progress and performance-based payments are reflected as an offset to the related unbilled receivable balances.

Unbilled receivables consisted of the following:

	December 31	
$ in millions	**2019**	2018
Due from U.S. government [1]		
Unbilled receivables	$ 17,347	$ 16,823
Progress and performance-based payments received	(12,838)	(12,539)
Total due from U.S. government	4,509	4,284
Due from international and other customers		
Unbilled receivables	4,063	3,811
Progress and performance-based payments received	(3,193)	(3,030)
Total due from international and other customers	870	781
Unbilled receivables, net of progress and performance-based payments received	5,379	5,065
Allowance for doubtful accounts	(45)	(39)
Unbilled receivables, net	$ 5,334	$ 5,026

[1] Includes unbilled receivables due from the U.S. government associated with FMS sales. For FMS, we contract with and are paid by the U.S. government.

6. INVENTORIED COSTS, NET

Inventoried costs are primarily associated with contracts where the U.S. government is the primary customer, therefore the company does not believe it has significant exposure to recoverability risk related to these amounts.

Inventoried costs, net consisted of the following:

	December 31	
$ in millions	**2019**	2018
Production costs of contracts in process	**$ 476**	$ 402
G&A expenses	**31**	16
	507	418
Progress and performance-based payments received	**(41)**	(41)
	466	377
Product inventory and raw material	**317**	277
Inventoried costs, net	**$ 783**	$ 654

7. INCOME TAXES

The 2017 Tax Act was enacted in December 2017 and included a number of changes to previous U.S. tax laws that impacted the company, most notably a reduction of the U.S. corporate income tax rate from 35 percent to 21 percent for tax years beginning after December 31, 2017. In accordance with Staff Accounting Bulletin No.118, the company recognized provisional tax expense of $285 million for the year ended December 31, 2017 and additional tax expense of $5 million for the year ended December 31, 2018 related to the 2017 Tax Act.

Federal and foreign income tax expense consisted of the following:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Federal income tax expense:			
Current	**$ 758**	$ 292	$ 449
Deferred	**(474)**	213	907
Total federal income tax expense	**284**	505	1,356
Foreign income tax expense:			
Current	**10**	7	8
Deferred	**6**	1	(4)
Total foreign income tax expense	**16**	8	4
Total federal and foreign income tax expense	**$ 300**	$ 513	$ 1,360

Earnings from foreign operations before income taxes are not material for all periods presented.

Income tax expense differs from the amount computed by multiplying earnings before income taxes by the statutory federal income tax rate due to the following:

	Year Ended December 31					
$ in millions	**2019**		2018		2017	
Income tax expense at statutory rate	**$ 535**	**21.0 %**	$ 786	21.0 %	$ 1,480	35.0 %
Stock compensation - excess tax benefits	**(14)**	**(0.5)**	(27)	(0.7)	(48)	(1.1)
Research credit	**(216)**	**(8.5)**	(186)	(5.0)	(130)	(3.1)
Foreign derived intangible income	**(28)**	**(1.1)**	(16)	(0.4)	—	—
Manufacturing deduction	**—**	**—**	—	—	(97)	(2.3)
Settlements with taxing authorities	**—**	**—**	—	—	(42)	(1.0)
Impacts related to the 2017 Tax Act	**—**	**—**	(84)	(2.2)	285	6.8
MTM benefit tax rate differential[1]	**—**	**—**	—	—	(72)	(1.7)
Other, net	**23**	**0.9**	40	1.0	(16)	(0.4)
Total federal and foreign income taxes	**$ 300**	**11.8 %**	$ 513	13.7 %	$ 1,360	32.2 %

[1] Impact of applying the 2017 Tax Act enacted statutory tax rate of 21 percent versus 35 percent.

The year to date 2019 effective tax rate decreased to 11.8 percent from 13.7 percent in the same period of 2018. MTM expense reduced the 2019 effective tax rate by 3.7 percentage points and the 2018 effective tax rate by 1.1 percentage points. In addition, the company's effective tax rate for 2019 reflects an increase in benefits for research credits and foreign derived intangible income of $30 million and $12 million, respectively, and the absence of an $84 million benefit associated with the 2017 Tax Act realized in 2018.

The year to date 2018 effective tax rate decreased to 13.7 percent from 32.2 percent in the same period of 2017 principally due to the reduction of the U.S. corporate income tax rate from 35 percent to 21 percent as a result of the 2017 Tax Act and a $56 million increase in research credits. In addition, the company's effective tax rate for 2017 includes $285 million of tax expense recorded in connection with the 2017 Tax Act, largely due to the write-down of net deferred tax assets, offset by $97 million of tax benefits associated with manufacturing deductions and a $72 million tax benefit from the impact of applying the 2017 Tax Act enacted statutory tax rate of 21 percent versus 35 percent to the 2017 MTM benefit.

Income tax payments, net of refunds received, were $324 million, $270 million and $517 million for the years ended December 31, 2019, 2018 and 2017, respectively.

Uncertain Tax Positions

We file income tax returns in the U.S. federal jurisdiction and in various state and foreign jurisdictions. The Northrop Grumman 2014-2017 federal tax returns and refund claims related to its 2007-2016 federal tax returns are currently under IRS examination. In addition, legacy Orbital ATK federal tax returns for the year ended March 31, 2015, the nine-month transition period ended December 31, 2015 and calendar years 2016-2017 are currently under IRS examination.

Tax returns for open tax years related to state and foreign jurisdictions remain subject to examination. As state income taxes are generally considered allowable and allocable costs, any individual or aggregate state examination impacts are not expected to have a material impact on our financial results. Amounts currently subject to examination related to foreign jurisdictions are not material.

The change in unrecognized tax benefits during 2019, 2018 and 2017, excluding interest, is as follows:

	December 31		
$ in millions	**2019**	2018	2017
Unrecognized tax benefits at beginning of the year	**$ 748**	$ 283	$ 135
Additions based on tax positions related to the current year	**158**	293	102
Additions for tax positions of prior years	**400**	207	110
Reductions for tax positions of prior years	**(65)**	(23)	(44)
Settlements with taxing authorities	**(15)**	(7)	(20)
Other, net	**(3)**	(5)	—
Net change in unrecognized tax benefits	**475**	465	148
Unrecognized tax benefits at end of the year	**$ 1,223**	$ 748	$ 283

During 2019, we increased our unrecognized tax benefits by approximately $319 million related to our methods of accounting associated with the timing of revenue recognition and related costs, and the 2017 Tax Act. It is reasonably possible that within the next twelve months our unrecognized tax benefits may decrease by up to $60 million. Since enactment of the 2017 Tax Act, the IRS and U.S. Treasury Department have issued and are expected to further issue interpretive guidance that impacts taxpayers. We will continue to evaluate such guidance as it is issued.

These liabilities, along with $56 million of accrued interest and penalties, are included in other current and non-current liabilities in the consolidated statements of financial position. If the income tax benefits from these tax positions are ultimately realized, $570 million of federal and foreign tax benefits would reduce the company's effective tax rate.

Net interest expense within the company's federal, foreign and state income tax provisions was not material for all years presented.

Deferred Income Taxes

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and tax purposes. Net deferred tax assets and liabilities are classified as non-current in the consolidated statements of financial position.

The tax effects of significant temporary differences and carryforwards that gave rise to year-end deferred federal, state and foreign tax balances, as presented in the consolidated statements of financial position, are as follows:

	December 31	
$ in millions	**2019**	2018
Deferred Tax Assets		
Retiree benefits	**$ 1,827**	$ 1,541
Accrued employee compensation	**336**	308
Provisions for accrued liabilities	**166**	139
Inventory	**684**	650
Stock-based compensation	**38**	42
Operating lease liabilities	**411**	—
Tax credits	**166**	174
Other	**73**	59
Gross deferred tax assets	**3,701**	2,913
Less valuation allowance	**(160)**	(142)
Net deferred tax assets	**3,541**	2,771
Deferred Tax Liabilities		
Goodwill	**515**	511
Purchased intangibles	**262**	346
Property, plant and equipment, net	**584**	518
Operating lease right-of-use assets	**404**	—
Contract accounting differences	**1,225**	1,381
Other	**43**	29
Deferred tax liabilities	**3,033**	2,785
Total net deferred tax assets (liabilities)	**$ 508**	$ (14)

Realization of deferred tax assets is primarily dependent on generating sufficient taxable income in future periods. The company believes it is more-likely-than-not our net deferred tax assets will be realized.

At December 31, 2019, the company has available tax credits and unused net operating losses of $324 million and $310 million, respectively, that may be applied against future taxable income. The majority of tax credits and net operating losses expire in 2020 through 2040, however, some may be carried forward indefinitely. Due to the uncertainty of the realization of the tax credits and net operating losses, the company has recorded valuation allowances of $121 million and $32 million as of December 31, 2019, respectively.

Undistributed Foreign Earnings

As of December 31, 2019, the company has accumulated undistributed earnings generated by our foreign subsidiaries and most have been taxed in the U.S. as a result of the 2017 Tax Act. The 2017 Tax Act allows for a dividend received deduction for repatriation of earnings. We intend to indefinitely reinvest these earnings, as well as future earnings from our foreign subsidiaries, to fund our international operations and foreign credit facility. In addition, we expect future U.S. cash generation will be sufficient to meet future U.S. cash needs.

8. GOODWILL AND OTHER PURCHASED INTANGIBLE ASSETS

Goodwill

As discussed in Note 2, the Merger resulted in the recognition of $6.3 billion of goodwill, which was allocated to the Space Systems, Defense Systems and Aeronautics Systems sectors.

Changes in the carrying amounts of goodwill for the years ended December 31, 2018 and 2019, were as follows:

$ in millions	Aeronautics Systems	Defense Systems	Mission Systems	Space Systems	Total
Balance as of December 31, 2017	$ 2,969	$ 2,259	$ 6,062	$ 1,165	$ 12,455
Acquisition of Orbital ATK	498	2,123	—	3,601	6,222
Other[1]	—	(5)	—	—	(5)
Balance as of December 31, 2018	$ 3,467	$ 4,377	$ 6,062	$ 4,766	$ 18,672
Acquisition of Orbital ATK	**—**	**—**	**—**	**37**	**37**
Other[1]	**—**	**(1)**	**—**	**—**	**(1)**
Balance as of December 31, 2019	**$ 3,467**	**$ 4,376**	**$ 6,062**	**$ 4,803**	**$ 18,708**

[1] Other consists primarily of adjustments for foreign currency translation.

At December 31, 2019 and 2018, accumulated goodwill impairment losses totaled $417 million and $153 million at Aeronautics Systems and Space Systems, respectively.

Other Purchased Intangible Assets

Net customer-related and other intangible assets are as follows:

	December 31	
$ in millions	**2019**	2018
Gross customer-related and other intangible assets	**$ 3,356**	$ 3,356
Less accumulated amortization	**(2,316)**	(1,984)
Net customer-related and other intangible assets	**$ 1,040**	$ 1,372

Amortization expense for 2019, 2018 and 2017, was $332 million, $203 million and $14 million, respectively. As of December 31, 2019, the expected future amortization of purchased intangibles for each of the next five years is as follows:

$ in millions	
2020	$ 262
2021	204
2022	197
2023	78
2024	55

9. FAIR VALUE OF FINANCIAL INSTRUMENTS

The following table presents the financial assets and liabilities the company records at fair value on a recurring basis identified by the level of inputs used to determine fair value. See Note 1 for the definitions of these levels and for further information on our financial instruments.

	December 31, 2019			December 31, 2018		
$ in millions	**Level 1**	**Level 2**	**Total**	Level 1	Level 2	Total
Financial Assets (Liabilities)						
Marketable securities	**$ 364**	**$ 1**	**$ 365**	$ 319	$ 1	$ 320
Marketable securities valued using NAV			**17**			15
Total marketable securities	**364**	**1**	**382**	319	1	335
Derivatives	**—**	**(3)**	**(3)**	—	(10)	(10)

The notional value of the company’s foreign currency forward contracts at December 31, 2019 and 2018 was $98 million and $114 million, respectively. The portion of notional value designated as a cash flow hedge at

December 31, 2019 was $7 million. At December 31, 2018, no portion of the notional value was designated as a cash flow hedge.

The derivative fair values and related unrealized gains/losses at December 31, 2019 and 2018 were not material.

There were no transfers of financial instruments between the three levels of the fair value hierarchy during the years ended December 31, 2019 and 2018.

The carrying value of cash and cash equivalents and commercial paper approximates fair value.

10. DEBT

Commercial Paper

The company maintains a commercial paper program that serves as a source of short-term financing with capacity to issue unsecured commercial paper notes up to $2.0 billion. At December 31, 2019, there were no commercial paper borrowings outstanding. At December 31, 2018, there were $198 million of outstanding short-term commercial paper borrowings at a weighted-average interest rate of 2.77 percent that had original maturities of three months or less from the date of issuance. The outstanding balance of commercial paper borrowings is recorded in Other current liabilities in the consolidated statements of financial position.

Credit Facilities

In August 2018, the company entered into a five-year senior unsecured credit facility in an aggregate principal amount of $2.0 billion (the “2018 Credit Agreement”). The revolving credit facility established under the 2018 Credit Agreement is intended to support the company’s commercial paper program and other general corporate purposes. At December 31, 2019, there was no balance outstanding under this facility. Commercial paper borrowings reduce the amount available for borrowing under the 2018 Credit Agreement. In October 2019, the company amended the 2018 Credit Agreement to extend its maturity date by one year from August 2023 to August 2024.

In December 2016, a subsidiary of the company entered into a two-year credit facility, with two additional one-year option periods, in an aggregate principal amount of £120 million (the equivalent of approximately $155 million as of December 31, 2019) (the “2016 Credit Agreement”). The company exercised the second option to extend the maturity to December 2020. The 2016 Credit Agreement is guaranteed by the company. At December 31, 2019, there was £60 million (the equivalent of approximately $78 million as of December 31, 2019) outstanding under this facility, which bears interest at a rate of LIBOR plus 1.10 percent. All of the borrowings outstanding under this facility are recorded in Other current liabilities in the consolidated statements of financial position.

Our credit agreements contain generally customary terms and conditions, including covenants restricting the company’s ability to sell all or substantially all of its assets, merge or consolidate with another entity or undertake other fundamental changes and incur liens. The company also cannot permit the ratio of its debt to capitalization (as set forth in the credit agreements) to exceed 65 percent. At December 31, 2019, the company was in compliance with all covenants under its credit agreements.

Unsecured Senior Notes

Long-term debt consists of the following:

$ in millions	Interest rate	December 31 2019	2018
Fixed-rate notes and debentures, maturing in			
2019	5.05%	**$ —**	$ 500
2020	2.08%	**1,000**	1,000
2021	3.50%	**700**	700
2022	2.55%	**1,500**	1,500
2023	3.25%	**1,050**	1,050
2025	2.93%	**1,500**	1,500
2026	7.75% - 7.88%	**527**	527
2027	3.20%	**750**	750
2028	3.25%	**2,000**	2,000
2031	7.75%	**466**	466
2040	5.05%	**300**	300
2043	4.75%	**950**	950
2045	3.85%	**600**	600
2047	4.03%	**2,250**	2,250
Credit facilities	1.89%	**78**	108
Other	Various	**272**	272
Debt issuance costs		**(64)**	(73)
Total long-term debt		**13,879**	14,400
Less: current portion[1]		**1,109**	517
Long-term debt, net of current portion		**$ 12,770**	$ 13,883

[1] The current portion of long-term debt is recorded in Other current liabilities in the consolidated statements of financial position.

The estimated fair value of long-term debt was $15.1 billion and $14.3 billion as of December 31, 2019 and 2018, respectively. We calculated the fair value of long-term debt using Level 2 inputs, based on interest rates available for debt with terms and maturities similar to the company’s existing debt arrangements.

Indentures underlying long-term debt issued by the company or its subsidiaries contain various restrictions with respect to the issuer, including one or more restrictions relating to limitations on liens, sale-leaseback arrangements and funded debt of subsidiaries. The majority of these fixed rate notes and debentures are subject to redemption at the company’s discretion at any time prior to maturity in whole or in part at the principal amount plus any make-whole premium and accrued and unpaid interest. Interest on these fixed rate notes and debentures are payable semi-annually in arrears.

Total interest payments, net of interest received, were $521 million, $456 million and $273 million for the years ended December 31, 2019, 2018 and 2017, respectively.

Maturities of long-term debt as of December 31, 2019, are as follows:

$ in millions	
Year Ending December 31	
2020	$ 1,110
2021	742
2022	1,505
2023	1,053
2024	3
Thereafter	9,532
Total principal payments	13,945
Unamortized premium on long-term debt, net of discount	(2)
Debt issuance costs	(64)
Total long-term debt	$ 13,879

11. INVESTIGATIONS, CLAIMS AND LITIGATION

On May 4, 2012, the company commenced an action, *Northrop Grumman Systems Corp. v. United States*, in the U.S. Court of Federal Claims. This lawsuit relates to an approximately $875 million firm fixed-price contract awarded to the company in 2007 by the U.S. Postal Service (USPS) for the construction and delivery of flats sequencing systems (FSS) as part of the postal automation program. The FSS have been delivered. The company's lawsuit is based on various theories of liability. The complaint seeks approximately $63 million for unpaid portions of the contract price, and approximately $115 million based on the company's assertions that, through various acts and omissions over the life of the contract, the USPS adversely affected the cost and schedule of performance and materially altered the company's obligations under the contract. The United States responded to the company's complaint with an answer, denying most of the company's claims, and counterclaims seeking approximately $410 million, less certain amounts outstanding under the contract. The principal counterclaim alleges that the company delayed its performance and caused damages to the USPS because USPS did not realize certain costs savings as early as it had expected. On April 2, 2013, the U.S. Department of Justice informed the company of a False Claims Act complaint relating to the FSS contract that was filed under seal by a relator in June 2011 in the U.S. District Court for the Eastern District of Virginia. On June 3, 2013, the United States filed a Notice informing the Court that the United States had decided not to intervene in this case. The relator alleged that the company violated the False Claims Act in a number of ways with respect to the FSS contract, alleged damage to the USPS in an amount of at least approximately $179 million annually, alleged that he was improperly discharged in retaliation, and sought an unspecified partial refund of the contract purchase price, penalties, attorney's fees and other costs of suit. The relator later voluntarily dismissed his retaliation claim and reasserted it in a separate arbitration, which he also ultimately voluntarily dismissed. On September 5, 2014, the court granted the company's motion for summary judgment and ordered the relator's False Claims Act case be dismissed with prejudice. On February 16, 2018, both the company and the United States filed motions to dismiss many of the claims and counterclaims referenced above, in whole or in part. The United States also filed a motion seeking to amend its answer and counterclaim, including to reduce its counterclaim to approximately $193 million, which the court granted on June 11, 2018. On October 17, 2018, the court granted in part and denied in part the parties' motions to dismiss. After a mediation that did not resolve the dispute, the court has set trial to commence on February 3, 2020, running through March or early April. Although the ultimate outcome of these matters ("the FSS matters," collectively), including any possible loss, cannot be predicted or reasonably estimated at this time, the company intends vigorously to pursue and defend the FSS matters.

On August 8, 2013, the company received a court-appointed expert's report in litigation pending in the Second Federal Court of the Federal District in Brazil brought by the Brazilian Post and Telegraph Corporation (ECT), a Brazilian state-owned entity, against Solystic SAS (Solystic), a French subsidiary of the company, and two of its consortium partners. In this suit, commenced on December 17, 2004, and relatively inactive for some period of time, ECT alleges the consortium breached its contract with ECT and seeks damages of approximately R$111 million (the equivalent of approximately $27 million as of December 31, 2019), plus interest, inflation adjustments and attorneys' fees, as authorized by Brazilian law, which amounts could be significant over time. The original suit sought R$89 million (the equivalent of approximately $22 million as of December 31, 2019) in damages. In October 2013, ECT asserted an additional damage claim of R$22 million (the equivalent of approximately $5 million as of December 31, 2019). In its counterclaim, Solystic alleges ECT breached the contract by wrongfully refusing to accept the equipment Solystic had designed and built and seeks damages of approximately €31 million (the

equivalent of approximately $35 million as of December 31, 2019), plus interest, inflation adjustments and attorneys' fees, as authorized by Brazilian law. The Brazilian court retained an expert to consider certain issues pending before it. On August 8, 2013 and September 10, 2014, the company received reports from the expert, which contain some recommended findings relating to liability and the damages calculations put forth by ECT. Some of the expert's recommended findings were favorable to the company and others were favorable to ECT. In November 2014, the parties submitted comments on the expert's most recent report. On June 16, 2015, the court published a decision denying the parties' request to present oral testimony. In a decision dated November 13, 2018, the trial court ruled in ECT's favor on one of its claims against Solystic, and awarded damages of R$41 million (the equivalent of approximately $10 million as of December 31, 2019) against Solystic and its consortium partners, with that amount to be adjusted for inflation and interest from November 2004 through any appeal, in accordance with the Manual of Calculations of the Federal Justice, as well as attorneys' fees. On March 22, 2019, ECT appealed the trial court's decision to the intermediate court of appeals. Solystic filed its appeal on April 11, 2019. The parties are assessing whether there is a possible path for a negotiated resolution of the dispute.

We are engaged in remediation activities relating to environmental conditions allegedly resulting from historic operations at the former United States Navy and Grumman facilities in Bethpage, New York. For over 20 years, we have worked closely with the United States Navy, the United States Environmental Protection Agency, the New York State Department of Environmental Conservation, the New York State Department of Health and other federal, state and local governmental authorities, to address legacy environmental conditions in Bethpage. We have incurred, and expect to continue to incur, as included in Note 12, substantial remediation costs related to these environmental conditions. The remediation standards or requirements to which we are subject are being reconsidered and may change and costs may increase materially. As discussed in Note 12, the State of New York issued a Feasibility Study and an Amended Record of Decision, seeking to impose additional remedial requirements. The company is engaged in discussions with the State of New York and certain other potentially responsible parties. The State of New York has said that, among other things, it is also evaluating potential natural resource damages. In addition, we are a party to various, and expect to become a party to additional, legal proceedings and disputes related to remediation, costs, allowability and/or alleged environmental impacts in Bethpage, including with federal and state entities, the Navy, local municipalities and water districts, and insurance carriers, as well as class action and individual plaintiffs alleging personal injury and property damage and seeking both monetary and non-monetary relief. These Bethpage matters could result in additional costs, fines, penalties, sanctions, compensatory or other damages (including natural resource damages), determinations on allocation, allowability and coverage, and non-monetary relief. We cannot at this time predict or reasonably estimate the potential cumulative outcomes or ranges of possible liability of these aggregate Bethpage matters.

On August 12, 2016, plaintiffs filed a putative class action complaint in the United States District Court for the Eastern District of Virginia against Orbital ATK and certain individuals, captioned Steven Knurr, et al. v. Orbital ATK, Inc., No. 16-cv-01031 (TSE-MSN). As later amended, the complaint asserted claims on behalf of Orbital ATK shareholders for violations of Sections 10(b) and 20(a) of the Exchange Act and Rule 10b-5, and Section 14(a) of the Exchange Act allegedly arising out of false and misleading statements and the failure to disclose that: (i) Orbital ATK lacked effective control over financial reporting; and (ii) as a result, Orbital ATK failed to record an anticipated loss on a long-term contract with the U.S. Army to manufacture and supply small caliber ammunition at the U.S. Army's Lake City Army Ammunition Plant. The complaint sought damages and other relief. On June 7, 2019, the court approved the parties' proposal to resolve the litigation for $108 million, subject to certain terms and conditions. The company continues to pursue recovery of allowable costs and coverage litigation against various of its insurance carriers.

The company is a party to various other investigations, lawsuits, arbitration, claims, enforcement actions and other legal proceedings, including government investigations and claims, that arise in the ordinary course of our business. The nature of legal proceedings is such that we cannot assure the outcome of any particular matter. However, based on information available to the company to date, the company does not believe that the outcome of any of these other matters pending against the company is likely to have a material adverse effect on the company's consolidated financial position as of December 31, 2019, or its annual results of operations and/or cash flows.

12. COMMITMENTS AND CONTINGENCIES

U.S. Government Cost Claims

From time to time, the company is advised of claims by the U.S. government concerning certain potential disallowed costs, plus, at times, penalties and interest. When such findings are presented, the company and U.S. government representatives engage in discussions to enable the company to evaluate the merits of these claims, as well as to assess the amounts being claimed. Where appropriate, provisions are made to reflect the company's

estimated exposure for such potential disallowed costs. Such provisions are reviewed periodically using the most recent information available. The company believes it has adequately reserved for disputed amounts that are probable and reasonably estimable, and that the outcome of any such matters would not have a material adverse effect on its consolidated financial position as of December 31, 2019, or its annual results of operations and/or cash flows.

Environmental Matters

The table below summarizes the amount accrued for environmental remediation costs, management's estimate of the amount of reasonably possible future costs in excess of accrued costs and the deferred costs expected to be recoverable through overhead charges on U.S. government contracts as of December 31, 2019 and 2018:

$ in millions	Accrued Costs[1][2]	Reasonably Possible Future Costs in excess of Accrued Costs[2]	Deferred Costs[3]
December 31, 2019	**$ 531**	**$ 448**	**$ 436**
December 31, 2018	461	374	343

[1] As of December 31, 2019, $148 million is recorded in Other current liabilities and $383 million is recorded in Other non-current liabilities.

[2] Estimated remediation costs are not discounted to present value. The range of reasonably possible future costs does not take into consideration amounts expected to be recoverable through overhead charges on U.S. government contracts.

[3] As of December 31, 2019, $119 million is deferred in Prepaid expenses and other current assets and $317 million is deferred in Other non-current assets. These amounts are evaluated for recoverability on a routine basis.

Although management cannot predict whether new information gained as our environmental remediation projects progress, or as changes in facts and circumstances occur, will materially affect the estimated liability accrued, except with respect to Bethpage, we do not anticipate that future remediation expenditures associated with our currently identified projects will have a material adverse effect on the company's consolidated financial position as of December 31, 2019, or its annual results of operations and/or cash flows. With respect to Bethpage, the State of New York issued a Feasibility Study and an Amended Record of Decision, seeking to impose additional remedial requirements. The company is engaged in discussions with the State of New York and other potentially responsible parties. As discussed in Note 11, the remediation standards or requirements to which we are subject are being reconsidered and may change and costs may increase materially.

Financial Arrangements

In the ordinary course of business, the company uses standby letters of credit and guarantees issued by commercial banks and surety bonds issued principally by insurance companies to guarantee the performance on certain obligations. At December 31, 2019, there were $498 million of stand-by letters of credit and guarantees and $182 million of surety bonds outstanding.

Indemnifications

The company has provided indemnifications for certain environmental, income tax and other potential liabilities in connection with certain of its divestitures. The settlement of these liabilities is not expected to have a material adverse effect on the company's consolidated financial position as of December 31, 2019, or its annual results of operations and/or cash flows.

13. RETIREMENT BENEFITS

Plan Descriptions

U.S. Defined Benefit Pension Plans – The company sponsors several defined benefit pension plans in the U.S. Pension benefits for most participants are based on years of service, age and compensation. It is our policy to fund at least the minimum amount required for all qualified plans, using actuarial cost methods and assumptions acceptable under U.S. government regulations, by making payments into benefit trusts separate from the company.

U.S. Defined Contribution Plans – The company also sponsors defined contribution plans covering the majority of its employees, including certain employees covered under collective bargaining agreements. Company contributions vary depending on date of hire, with a majority of employees being eligible for employer matching of employee contributions. Based on date of hire, certain employees are eligible to receive a company non-elective contribution or an enhanced matching contribution in lieu of a defined benefit pension plan benefit. The company's contributions

to these defined contribution plans for the years ended December 31, 2019, 2018 and 2017, were $481 million, $403 million and $344 million, respectively.

Non-U.S. Benefit Plans – The company sponsors several benefit plans for non-U.S. employees. These plans are designed to provide benefits appropriate to local practice and in accordance with local regulations. Some of these plans are funded using benefit trusts separate from the company.

Medical and Life Benefits – The company funds a portion of the costs for certain health care and life insurance benefits for a substantial number of its active and retired employees. In addition to a company and employee cost-sharing feature, the health plans also have provisions for deductibles, co-payments, coinsurance percentages, out-of-pocket limits, conformance to a schedule of reasonable fees, the use of managed care providers and coordination of benefits with other plans. The plans also provide for a Medicare carve-out. The company reserves the right to amend or terminate the plans at any time.

Certain covered employees and dependents are eligible to participate in plans upon retirement if they meet specified age and years of service requirements. The company provides subsidies to reimburse certain retirees for a portion of the cost of individual Medicare-supplemental coverage purchased directly by the retiree through a private insurance exchange. The company has capped the amount of its contributions to substantially all of its remaining postretirement medical and life benefit plans. In addition, after January 1, 2005 (or earlier at some businesses), newly hired employees are not eligible for subsidized postretirement medical and life benefits.

Summary Plan Results

The cost to the company of its retirement benefit plans is shown in the following table:

	Year Ended December 31					
	Pension Benefits			Medical and Life Benefits		
$ in millions	**2019**	2018	2017	**2019**	2018	2017
Components of net periodic benefit cost (benefit)						
Service cost	**$ 367**	$ 404	$ 388	**$ 16**	$ 21	$ 20
Interest cost	**1,360**	1,226	1,250	**80**	76	85
Expected return on plan assets	**(2,101)**	(2,217)	(1,885)	**(92)**	(101)	(89)
Amortization of prior service credit	**(59)**	(58)	(57)	**(3)**	(21)	(22)
Mark-to-market expense (benefit)	**1,783**	699	(445)	**17**	(44)	(91)
Other	**—**	—	(7)	**—**	—	—
Net periodic benefit cost (benefit)	**$ 1,350**	$ 54	$ (756)	**$ 18**	$ (69)	$ (97)

The table below summarizes the components of changes in unamortized prior service credit for the years ended December 31, 2017, 2018 and 2019:

$ in millions	Pension Benefits	Medical and Life Benefits	Total
Changes in unamortized prior service credit			
Amortization of prior service credit	$ 57	$ 22	$ 79
Tax expense	(26)	(9)	(35)
Change in unamortized prior service credit – 2017	31	13	44
Amortization of prior service credit	58	21	79
Tax expense	(14)	(5)	(19)
Change in unamortized prior service credit – 2018	44	16	60
Amortization of prior service credit	**59**	**3**	**62**
Tax expense	**(14)**	**(1)**	**(15)**
Change in unamortized prior service credit – 2019	**$ 45**	**$ 2**	**$ 47**

We expect to recognize $60 million and $(4) million of prior year service credit (cost) related to our pension benefit and medical and life benefit plans, respectively, in net periodic benefit cost in 2020.

The following table sets forth the funded status and amounts recognized in the consolidated statements of financial position for the company's defined benefit retirement plans. Pension benefits data includes the qualified plans, foreign plans and U.S. unfunded non-qualified plans for benefits provided to directors, officers and certain

employees. The company uses a December 31 measurement date for its plans.

	Pension Benefits		Medical and Life Benefits	
$ in millions	**2019**	2018	**2019**	2018
Plan Assets				
Fair value of plan assets at beginning of year	**$ 27,150**	$ 27,226	**$ 1,247**	$ 1,338
Net gain (loss) on plan assets	**5,025**	(1,043)	**234**	(65)
Employer contributions	**221**	370	**42**	38
Participant contributions	**8**	9	**24**	25
Benefits paid	**(1,763)**	(1,685)	**(156)**	(148)
Acquired plan assets	**—**	2,293	**—**	58
Other	**5**	(20)	**1**	1
Fair value of plan assets at end of year	**30,646**	27,150	**1,392**	1,247
Projected Benefit Obligation				
Projected benefit obligation at beginning of year	**32,231**	31,967	**1,930**	2,110
Service cost	**367**	404	**16**	21
Interest cost	**1,360**	1,226	**80**	76
Participant contributions	**8**	9	**24**	25
Actuarial loss (gain)	**4,708**	(2,561)	**159**	(211)
Benefits paid	**(1,763)**	(1,685)	**(156)**	(148)
Acquired benefit obligation	**—**	2,895	**—**	50
Other	**3**	(24)	**(5)**	7
Projected benefit obligation at end of year	**36,914**	32,231	**2,048**	1,930
Funded status	**$ (6,268)**	$ (5,081)	**$ (656)**	$ (683)
Classification of amounts recognized in the consolidated statements of financial position				
Non-current assets	**$ 124**	$ 77	**$ 151**	$ 124
Current liability	**(173)**	(164)	**(47)**	(46)
Non-current liability	**(6,219)**	(4,994)	**(760)**	(761)

The accumulated benefit obligation for all defined benefit pension plans was $36.5 billion and $31.9 billion at December 31, 2019 and 2018, respectively. Amounts for pension plans with accumulated benefit obligations in excess of fair value of plan assets are as follows:

	December 31	
$ in millions	**2019**	2018
Projected benefit obligation	**$ 34,715**	$ 30,259
Accumulated benefit obligation	**34,305**	29,961
Fair value of plan assets	**28,324**	25,101

Plan Assumptions

On a weighted-average basis, the following assumptions were used to determine benefit obligations and net periodic benefit cost:

	Pension Benefits		Medical and Life Benefits	
	2019	2018	**2019**	2018
Assumptions used to determine benefit obligation at December 31				
Discount rate	**3.39%**	4.31%	**3.35%**	4.30%
Initial cash balance crediting rate assumed for the next year	**2.39%**	3.00%		
Rate to which the cash balance crediting rate is assumed to increase (the ultimate rate)	**2.64%**	3.25%		
Year that the cash balance crediting rate reaches the ultimate rate	**2025**	2024		
Rate of compensation increase	**3.00%**	3.00%		
Initial health care cost trend rate assumed for the next year			**5.90%**	6.20%
Rate to which the health care cost trend rate is assumed to decline (the ultimate trend rate)			**5.00%**	5.00%
Year that the health care cost trend rate reaches the ultimate trend rate			**2023**	2023
Assumptions used to determine benefit cost for the year ended December 31				
Discount rate	**4.31%**	3.68%	**4.30%**	3.66%
Initial cash balance crediting rate assumed for the next year	**3.00%**	2.75%		
Rate to which the cash balance crediting rate is assumed to increase (the ultimate rate)	**3.25%**	3.00%		
Year that the cash balance crediting rate reaches the ultimate rate	**2024**	2023		
Expected long-term return on plan assets	**8.00%**	8.00%	**7.67%**	7.65%
Rate of compensation increase	**3.00%**	3.00%		
Initial health care cost trend rate assumed for the next year			**6.20%**	6.50%
Rate to which the health care cost trend rate is assumed to decline (the ultimate trend rate)			**5.00%**	5.00%
Year that the health care cost trend rate reaches the ultimate trend rate			**2023**	2023

Plan Assets and Investment Policy

Plan assets are invested in various asset classes that are expected to produce a sufficient level of diversification and investment return over the long term. Through consultation with our investment management team and outside investment advisers, management develops expected long-term returns for each of the plans' strategic asset classes. In doing so, we consider a number of factors, including our historical investment performance, current market data such as yields/price-earnings ratios, historical market returns over long periods and periodic surveys of investment managers' expectations. Liability studies are conducted on a regular basis to provide guidance in setting investment goals with an objective to balance risk. Risk targets are established and monitored against acceptable ranges.

Our investment policies and procedures are designed to ensure the plans' investments are in compliance with the Employee Retirement Income Security Act (ERISA). Guidelines are established defining permitted investments within each asset class. Derivatives are used for transitioning assets, asset class rebalancing, managing currency risk and for management of fixed-income and alternative investments.

For the majority of the plans' assets, the investment policies require that the asset allocation be maintained within the following ranges as of December 31, 2019:

	Asset Allocation Ranges
Cash and cash equivalents	0% - 12%
Global public equities	30% - 50%
Fixed-income securities	20% - 40%
Alternative investments	18% - 38%

The table below provides the fair values of the company's pension and Voluntary Employee Beneficiary Association (VEBA) trust plan assets at December 31, 2019 and 2018, by asset category. The table also identifies the level of inputs used to determine the fair value of assets in each category. See Note 1 for the definitions of these levels. Certain investments that are measured at fair value using NAV per share (or its equivalent) as a practical expedient are not required to be categorized in the fair value hierarchy table. The total fair value of these investments is included in the table below to permit reconciliation of the fair value hierarchy to amounts presented in the funded status table above. As of December 31, 2019 and 2018, there were no investments expected to be sold at a value materially different than NAV.

	Level 1		Level 2		Level 3		Total	
$ in millions	**2019**	2018	**2019**	2018	**2019**	2018	**2019**	2018
Asset category								
Cash and cash equivalents	**$ 233**	$ 209	**$ 2,572**	$ 2,655			**$ 2,805**	$ 2,864
U.S. equities	**3,341**	2,859					**3,341**	2,859
International equities	**3,271**	2,711			**$ 2**	$ 1	**3,273**	2,712
Fixed-income securities								
U.S. Treasuries	**20**	26	**2,716**	1,501			**2,736**	1,527
U.S. Government Agency			**297**	322			**297**	322
Non-U.S. Government			**194**	206			**194**	206
Corporate debt	**28**	34	**4,513**	4,141			**4,541**	4,175
Asset backed			**892**	297			**892**	297
High yield debt	**30**	11	**104**	153			**134**	164
Bank loans			**33**	20			**33**	20
Other assets	**(9)**	15	**59**	51	**2**	2	**52**	68
Investments valued using NAV as a practical expedient								
U.S. equities							**1,131**	1,170
International equities							**5,636**	4,017
Fixed-income funds							**438**	1,386
Hedge funds							**246**	351
Opportunistic investments							**1,459**	1,367
Private equity funds							**2,454**	2,510
Real estate funds							**2,376**	2,382
Fair value of plan assets at the end of the year	**$ 6,914**	$ 5,865	**$ 11,380**	$ 9,346	**$ 4**	$ 3	**$ 32,038**	$ 28,397

There were no transfers of plan assets between the three levels of the fair value hierarchy during the years ended December 31, 2019 and 2018.

Generally, investments are valued based on information in financial publications of general circulation, statistical and valuation services, records of security exchanges, appraisal by qualified persons, transactions and bona fide offers. Cash and cash equivalents are predominantly held in money market or short-term investment funds. U.S. and international equities consist primarily of common stocks and institutional common trust funds. Investments in certain equity securities, which include domestic and international securities and registered investment companies, and exchange-traded funds with fixed income strategies are valued at the last reported sales or quoted price on the last business day of the reporting period. Fair values for certain fixed-income securities, which are not exchange-traded, are valued using third-party pricing services.

Other assets include derivative assets with a fair value of $49 million and $76 million, derivative liabilities with a fair value of $53 million and $52 million, and net notional amounts of $3.6 billion and $3.2 billion, as of December 31, 2019 and 2018, respectively. Derivative instruments may include exchange traded futures contracts, interest rate swaps, options on futures and swaps, currency contracts, total return swaps and credit default swaps. Notional amounts do not quantify risk or represent assets or liabilities of the pension and VEBA trusts, but are used in the calculation of cash settlement under the contracts. The volume of derivative activity is commensurate with the

amounts disclosed at year-end. Certain derivative financial instruments within the pension trust are subject to master netting agreements with certain counterparties.

Investments in certain equity and fixed-income funds, which include common/collective trust funds, and alternative investments, including hedge funds, opportunistic investments, private equity funds and real estate funds, are valued based on the NAV derived by the investment managers, as a practical expedient, and are described further below.

U.S. and International equities: Generally, redemption periods are daily or monthly with a notice requirement less than 30 days. As of December 31, 2019 and 2018, there were no unfunded commitments.

Fixed-income funds: Redemption periods are daily, monthly or quarterly with various notice requirements but generally are less than 30 days. As of December 31, 2019 and 2018, there were no unfunded commitments.

Hedge funds: Generally, redemption periods are monthly or quarterly with notice requirements from 30 to 95 days. As of December 31, 2019, unfunded commitments were $8 million. There were no unfunded commitments as of December 31, 2018.

Opportunistic investments: Opportunistic investments are primarily held in partnerships with a 5-10 year life. As of December 31, 2019 and 2018, unfunded commitments were $1.3 billion and $1.1 billion, respectively.

Private equity funds: The term of each fund is typically 10 or more years and the fund's investors do not have an option to redeem their interest in the fund. As of December 31, 2019 and 2018, unfunded commitments were $1.9 billion and $1.8 billion, respectively.

Real estate funds: Consists of closed-end real estate funds and infrastructure funds with terms that are typically 10 or more years. This class also contains open-end funds that generally allow investors to redeem their interests in the fund. As of December 31, 2019 and 2018, unfunded commitments were $60 million and $73 million, respectively.

For the years ended December 31, 2019 and 2018, the defined benefit pension and VEBA trusts did not hold any Northrop Grumman common stock.

Benefit Payments

The following table reflects estimated future benefit payments for the next ten years, based upon the same assumptions used to measure the benefit obligation, and includes expected future employee service, as of December 31, 2019:

$ in millions	Pension Plans	Medical and Life Plans	Total
Year Ending December 31			
2020	$ 1,849	$ 151	$ 2,000
2021	1,898	150	2,048
2022	1,947	139	2,086
2023	1,991	138	2,129
2024	2,039	136	2,175
2025 through 2029	10,702	630	11,332

In 2020, the company expects to contribute the required minimum funding of approximately $96 million to its pension plans and approximately $44 million to its medical and life benefit plans. During the year ended December 31, 2019, the company made voluntary pension contributions of $120 million.

14. STOCK COMPENSATION PLANS AND OTHER COMPENSATION ARRANGEMENTS

Stock Compensation Plans

At December 31, 2019, the company had stock-based compensation awards outstanding under the following shareholder-approved plans: the 2011 Long-Term Incentive Stock Plan (2011 Plan), applicable to employees and non-employee directors, and the 1993 Stock Plan for Non-Employee Directors (1993 SPND).

Employee Plans – In May 2015, the company's shareholders approved amendments to the 2011 Plan. These amendments provided that shares issued under the plan would be counted against the aggregate share limit on a one-for-one basis. As amended, 5.1 million shares plus 2.4 million of newly authorized shares were available for issuance under the 2011 Plan; as of December 31, 2019, 5.5 million shares remain available for issuance.

The 2011 Plan provides for the following equity awards: stock options, stock appreciation rights (SARs) and stock awards. Under the 2011 Plan, no SARs have been granted and there are no outstanding stock options. Stock awards include restricted performance stock rights (RPSR) and restricted stock rights (RSR). RPSRs generally vest and are

paid following the completion of a three-year performance period, based primarily on achievement of financial objectives determined by the Board. RSRs generally vest 100% after three years. Each includes dividend equivalents, which are paid concurrently with the RPSR or RSR. The terms of equity awards granted under the 2011 Plan provide for accelerated vesting, and in some instances forfeiture, of all or a portion of an award upon termination of employment.

Non-Employee Director Plans – Awards to non-employee directors are made pursuant to the Northrop Grumman Corporation Equity Grant Program for Non-Employee Directors under the 2011 Plan (the Director Program), which was amended and restated effective January 1, 2016. Under the amended Director Program, each non-employee director is awarded an annual equity grant in the form of Automatic Stock Units, which vest on the one-year anniversary of the grant date. Directors may elect to have all or any portion of their Automatic Stock Units paid on (A) the earlier of (i) the beginning of a specified calendar year after the vesting date or (ii) their separation from service as a member of the Board, or (B) on the vesting date.

Directors also may elect to defer to a later year all or a portion of their remaining cash retainer or committee retainer fees into a stock unit account as Elective Stock Units or in alternative investment options. Elective Stock Units are awarded on a quarterly basis. Directors may elect to have all or a portion of their Elective Stock Units paid on the earlier of (i) the beginning of a specified calendar year or (ii) their separation from service as a member of the Board. Stock units awarded under the Director Program are paid out in an equivalent number of shares of Northrop Grumman common stock. Directors are credited with dividend equivalents in connection with the accumulated stock units until the shares of common stock relating to such stock units are issued.

Compensation Expense

Stock-based compensation expense for the years ended December 31, 2019, 2018 and 2017 was $127 million, $86 million and $94 million, respectively. The related tax benefits for stock-based compensation for the years ended December 31, 2019, 2018 and 2017 were $14 million, $27 million and $48 million, respectively.

At December 31, 2019, there was $101 million of unrecognized compensation expense related to unvested stock awards granted under the company’s stock-based compensation plans. These amounts are expected to be charged to expense over a weighted-average period of 1.3 years.

Stock Awards

Compensation expense for stock awards is measured at the grant date based on the fair value of the award and is recognized over the vesting period (generally three years). The fair value of stock awards and performance stock awards is determined based on the closing market price of the company’s common stock on the grant date. The fair value of market-based stock awards is determined at the grant date using a Monte Carlo simulation model. For purposes of measuring compensation expense for performance awards, the number of shares ultimately expected to vest is estimated at each reporting date based on management’s expectations regarding the relevant performance criteria.

Stock award activity for the years ended December 31, 2017, 2018 and 2019, is presented in the table below. Vested awards do not include any adjustments to reflect the final performance measure for issued shares.

	Stock Awards (in thousands)	Weighted-Average Grant Date Fair Value Per Share	Weighted-Average Remaining Contractual Term (in years)
Outstanding at January 1, 2017	1,148	$ 167	1.3
Granted	397	233	
Vested	(521)	152	
Forfeited	(86)	198	
Outstanding at December 31, 2017	938	$ 192	1.0
Granted	376	321	
Vested	(455)	181	
Forfeited	(63)	250	
Outstanding at December 31, 2018	796	$ 244	0.8
Granted	**339**	**274**	
Vested	**(383)**	**222**	
Forfeited	**(51)**	**280**	
Outstanding at December 31, 2019	**701**	**$ 278**	**0.9**

The majority of our stock awards are granted annually during the first quarter.

The grant date fair value of shares issued in settlement of fully vested stock awards was $119 million, $93 million and $96 million during the years ended December 31, 2019, 2018 and 2017, respectively.

Cash Awards

The company grants certain employees cash units (CUs) and cash performance units (CPUs). Depending on actual performance against financial objectives, recipients of CPUs earn between 0 and 200 percent of the original grant. The following table presents the minimum and maximum aggregate payout amounts related to those cash awards granted for the periods presented:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Minimum aggregate payout amount	**$ 36**	$ 36	$ 38
Maximum aggregate payout amount	**203**	205	201

The majority of our cash awards are granted annually during the first quarter. CUs typically vest and settle in cash on the third anniversary of the grant date, while CPUs generally vest and pay out in cash based primarily on the achievement of financial metrics over a three-year period. At December 31, 2019, there was $133 million of unrecognized compensation expense related to cash awards.

15. LEASES

As described in Note 1, effective January 1, 2019, we adopted ASC 842 using the optional transition method. In accordance with the optional transition method, we did not recast the prior period consolidated financial statements and all prior period amounts and disclosures are presented under ASC 840. Finance leases are not material to our consolidated financial statements and are therefore not included in the following disclosures.

Total Lease Cost

Total lease cost is included in Product and Service costs and G&A expenses in the consolidated statement of earnings and comprehensive income and is recorded net of immaterial sublease income. Total lease cost is comprised of the following:

$ in millions		Year Ended December 31, 2019
Operating lease cost	$	318
Variable lease cost		11
Short-term lease cost		75
Total lease cost	$	404

Supplemental Balance Sheet Information

Supplemental operating lease balance sheet information consists of the following:

$ in millions		December 31, 2019
Operating lease right-of-use assets	$	1,511
Other current liabilities		261
Operating lease liabilities		1,308
Total operating lease liabilities	$	1,569

Other Supplemental Information

Other supplemental operating lease information consists of the following:

$ in millions		Year Ended December 31, 2019
Cash paid for amounts included in the measurement of operating lease liabilities	$	307
Right-of-use assets obtained in exchange for new lease liabilities		462
Weighted average remaining lease term		11.6 years
Weighted average discount rate		3.8%

Maturities of Lease Liabilities

Maturities of operating lease liabilities as of December 31, 2019 are as follows:

$ in millions		
Year Ending December 31		
2020	$	300
2021		262
2022		224
2023		185
2024		146
Thereafter		875
Total lease payments		1,992
Less: imputed interest		(423)
Present value of operating lease liabilities	$	1,569

As of December 31, 2019, we have approximately $125 million in rental commitments for real estate leases that have not yet commenced. These leases are expected to commence in 2020 and 2021 with lease terms of 3 to 11 years.

Rental expense for operating leases classified under ASC 840 for the years ended December 31, 2018 and 2017 were $375 million and $300 million, respectively. These amounts are net of immaterial amounts of sublease income. As of December 31, 2018, future minimum lease payments under long-term non-cancelable operating leases as classified under ASC 840 were as follows:

$ in millions	
Year Ending December 31	
2019	$ 312
2020	270
2021	221
2022	186
2023	152
Thereafter	939
Total minimum lease payments	$ 2,080

16. SEGMENT INFORMATION

The company is aligned in four operating sectors, which also comprise our reportable segments: Aeronautics Systems, Defense Systems, Mission Systems and Space Systems.

The following table presents sales and operating income by segment:

	Year Ended December 31		
$ in millions	**2019**	2018	2017
Sales			
Aeronautics Systems	**$ 11,116**	$ 10,293	$ 9,040
Defense Systems	**7,495**	6,612	5,479
Mission Systems	**9,410**	8,949	8,460
Space Systems	**7,425**	5,845	4,719
Intersegment eliminations	**(1,605)**	(1,604)	(1,694)
Total sales	**33,841**	30,095	26,004
Operating income			
Aeronautics Systems	**1,170**	1,107	848
Defense Systems	**781**	690	534
Mission Systems	**1,382**	1,215	1,157
Space Systems	**781**	635	578
Intersegment eliminations	**(205)**	(200)	(214)
Total segment operating income	**3,909**	3,447	2,903
Net FAS (service)/CAS pension adjustment	**465**	613	638
Unallocated corporate expense	**(405)**	(280)	(323)
Total operating income	**$ 3,969**	$ 3,780	$ 3,218

Net FAS (Service)/CAS Pension Adjustment

For financial statement purposes, we account for our employee pension plans in accordance with FAS. However, the cost of these plans is charged to our contracts in accordance with the FAR and the related CAS. The net FAS (service)/CAS pension adjustment reflects the difference between CAS pension expense included as cost in segment operating income and the service cost component of FAS expense included in total operating income.

Unallocated Corporate Expense

Unallocated corporate expense includes the portion of corporate costs not considered allowable or allocable under applicable CAS or FAR, and therefore not allocated to the segments, such as a portion of management and administration, legal, environmental, compensation, retiree benefits and other corporate unallowable costs. Unallocated corporate expense also includes costs not considered part of management’s evaluation of segment

operating performance, such as amortization of purchased intangible assets and the additional depreciation expense related to the step-up in fair value of property, plant and equipment acquired through business combinations.

Disaggregation of Revenue

Sales by Customer Type	Year Ended December 31					
	2019		2018		2017	
$ in millions	**$**	**%[3]**	$	%[3]	$	%[3]
Aeronautics Systems						
U.S. government [1]	**$ 9,258**	**83%**	$ 8,732	85%	$ 7,817	86%
International [2]	**1,688**	**15%**	1,402	13%	1,107	12%
Other customers	**67**	**1%**	86	1%	70	1%
Intersegment sales	**103**	**1%**	73	1%	46	1%
Aeronautics Systems sales	**11,116**	**100%**	10,293	100%	9,040	100%
Defense Systems						
U.S. government [1]	**4,952**	**66%**	4,132	62%	3,422	62%
International [2]	**1,442**	**19%**	1,249	19%	726	13%
Other customers	**410**	**6%**	481	7%	357	7%
Intersegment sales	**691**	**9%**	750	12%	974	18%
Defense Systems sales	**7,495**	**100%**	6,612	100%	5,479	100%
Mission Systems						
U.S. government [1]	**6,765**	**72%**	6,501	73%	6,186	73%
International [2]	**1,839**	**19%**	1,653	18%	1,565	18%
Other customers	**78**	**1%**	77	1%	71	1%
Intersegment sales	**728**	**8%**	718	8%	638	8%
Mission Systems sales	**9,410**	**100%**	8,949	100%	8,460	100%
Space Systems						
U.S. government [1]	**6,959**	**94%**	5,431	93%	4,544	96%
International [2]	**185**	**2%**	130	2%	54	1%
Other customers	**198**	**3%**	221	4%	85	2%
Intersegment sales	**83**	**1%**	63	1%	36	1%
Space Systems sales	**7,425**	**100%**	5,845	100%	4,719	100%
Total						
U.S. government [1]	**27,934**	**83%**	24,796	82%	21,969	85%
International [2]	**5,154**	**15%**	4,434	15%	3,452	13%
Other customers	**753**	**2%**	865	3%	583	2%
Total Sales	**$ 33,841**	**100%**	$ 30,095	100%	$ 26,004	100%

[1] Sales to the U.S. government include sales from contracts for which we are the prime contractor, as well as those for which we are a subcontractor and the ultimate customer is the U.S. government. Each of the company’s segments derives substantial revenue from the U.S. government.

[2] International sales include sales from contracts for which we are the prime contractor, as well as those for which we are a subcontractor and the ultimate customer is an international customer. These sales include foreign military sales contracted through the U.S. government.

[3] Percentages calculated based on total segment sales.

Sales by Contract Type	Year Ended December 31					
	2019		2018		2017	
$ in millions	**$**	**%[1]**	$	%[1]	$	%[1]
Aeronautics Systems						
Cost-type	**$ 5,299**	**48%**	$ 5,066	50%	$ 4,743	53%
Fixed-price	**5,714**	**52%**	5,154	50%	4,251	47%
Intersegment sales	**103**		73		46	
Aeronautics Systems sales	**11,116**		10,293		9,040	
Defense Systems						
Cost-type	**2,509**	**37%**	2,386	41%	2,354	52%
Fixed-price	**4,295**	**63%**	3,476	59%	2,151	48%
Intersegment sales	**691**		750		974	
Defense Systems sales	**7,495**		6,612		5,479	
Mission Systems						
Cost-type	**3,335**	**38%**	3,099	38%	2,919	37%
Fixed-price	**5,347**	**62%**	5,132	62%	4,903	63%
Intersegment sales	**728**		718		638	
Mission Systems sales	**9,410**		8,949		8,460	
Space Systems						
Cost-type	**5,336**	**73%**	4,453	77%	4,181	89%
Fixed-price	**2,006**	**27%**	1,329	23%	502	11%
Intersegment sales	**83**		63		36	
Space Systems sales	**7,425**		5,845		4,719	
Total						
Cost-type	**16,479**	**49%**	15,004	50%	14,197	55%
Fixed-price	**17,362**	**51%**	15,091	50%	11,807	45%
Total Sales	**$ 33,841**		$ 30,095		$ 26,004	

[1] Percentages calculated based on external customer sales.

Sales by Geographic Region	Year Ended December 31					
	2019		2018		2017	
$ in millions	**$**	**%[2]**	$	%[2]	$	%[2]
Aeronautics Systems						
United States	**$ 9,325**	**85%**	$ 8,818	86%	$ 7,887	88%
Asia/Pacific	**810**	**7%**	677	7%	635	7%
All other [1]	**878**	**8%**	725	7%	472	5%
Intersegment sales	**103**		73		46	
Aeronautics Systems sales	**11,116**		10,293		9,040	
Defense Systems						
United States	**5,362**	**79%**	4,613	79%	3,779	84%
Asia/Pacific	**369**	**5%**	365	6%	194	4%
All other [1]	**1,073**	**16%**	884	15%	532	12%
Intersegment sales	**691**		750		974	
Defense Systems sales	**7,495**		6,612		5,479	
Mission Systems						
United States	**6,843**	**79%**	6,578	80%	6,257	80%
Asia/Pacific	**637**	**7%**	592	7%	617	8%
All other [1]	**1,202**	**14%**	1,061	13%	948	12%
Intersegment sales	**728**		718		638	
Mission Systems sales	**9,410**		8,949		8,460	
Space Systems						
United States	**7,157**	**98%**	5,652	98%	4,629	99%
Asia/Pacific	**20**	**—%**	32	—%	15	—%
All other [1]	**165**	**2%**	98	2%	39	1%
Intersegment sales	**83**		63		36	
Space Systems sales	**7,425**		5,845		4,719	
Total						
United States	**28,687**	**85%**	25,661	85%	22,552	87%
Asia/Pacific	**1,836**	**5%**	1,666	6%	1,461	5%
All other [1]	**3,318**	**10%**	2,768	9%	1,991	8%
Total Sales	**$ 33,841**		$ 30,095		$ 26,004	

[1] All other is principally comprised of Europe and the Middle East.

[2] Percentages calculated based on external customer sales.

Intersegment Sales and Operating Income

Sales between segments are recorded at values that include intercompany operating income for the performing segment based on that segment's estimated average operating margin rate for external sales. Such intercompany operating income is eliminated in consolidation, so that the company's total sales and total operating income reflect only those transactions with external customers. See Note 1 for additional information.

The following table presents intersegment sales and operating income before eliminations:

	Year Ended December 31					
$ in millions	**2019**		2018		2017	
	Sales	**Operating Income**	Sales	Operating Income	Sales	Operating Income
Intersegment sales and operating income						
Aeronautics Systems	**$ 103**	**$ 10**	$ 73	$ 8	$ 46	$ 5
Defense Systems	**691**	**74**	750	74	974	97
Mission Systems	**728**	**113**	718	115	638	106
Space Systems	**83**	**8**	63	3	36	6
Total	**$ 1,605**	**$ 205**	$ 1,604	$ 200	$ 1,694	$ 214

Assets

Substantially all of the company's operating assets are located in the U.S. The following table presents assets by segment:

	December 31	
$ in millions	**2019**	2018
Assets		
Aeronautics Systems	**$ 9,104**	$ 8,396
Defense Systems	**7,420**	7,178
Mission Systems	**9,934**	9,400
Space Systems	**10,595**	9,148
Corporate assets[(1)]	**4,036**	3,531
Total assets	**$ 41,089**	$ 37,653

[(1)] Corporate assets principally consist of cash and cash equivalents, refundable taxes, deferred tax assets, property, plant and equipment and marketable securities.

Capital Expenditures and Depreciation and Amortization

The following table presents capital expenditures and depreciation and amortization by segment:

	Year Ended December 31					
$ in millions	**2019**	2018	2017	**2019**	2018	2017
	Capital Expenditures			Depreciation and Amortization[(1)]		
Aeronautics Systems	**$ 528**	$ 657	$ 574	**$ 224**	$ 190	$ 164
Defense Systems	**71**	66	14	**44**	65	47
Mission Systems	**229**	197	158	**133**	121	117
Space Systems	**352**	226	98	**189**	130	77
Corporate	**84**	103	84	**428**	294	70
Total	**$ 1,264**	$ 1,249	$ 928	**$ 1,018**	$ 800	$ 475

[(1)] Beginning in 2018, corporate amounts include the amortization of purchased intangible assets and the additional depreciation expense related to the step-up in fair value of property, plant and equipment acquired through business combinations as they are not considered part of management's evaluation of segment operating performance.

17. UNAUDITED SELECTED QUARTERLY DATA

Unaudited quarterly financial results are set forth in the following tables and include the operating results of legacy Innovation Systems subsequent to the Merger date. It is the company's long-standing practice to establish actual interim closing dates using a "fiscal" calendar in which we close our books on a Friday near each quarter-end date, in order to normalize the potentially disruptive effects of quarterly closings on business processes. Similarly, legacy Innovation Systems used a "fiscal" calendar by closing its books on a Sunday near these quarter-end dates. Beginning in the second quarter of 2019, legacy Innovation Systems aligned its "fiscal" calendar with legacy Northrop Grumman. This practice is only used at interim periods within a reporting year.

2019

In millions, except per share amounts	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Sales	**$ 8,189**	**$ 8,456**	**$ 8,475**	**$ 8,721**
Operating income	**936**	**946**	**951**	**1,136**
Net earnings (loss)	**863**	**861**	**933**	**(409)**
Basic earnings (loss) per share	**5.08**	**5.07**	**5.52**	**(2.43)**
Diluted earnings (loss) per share[(1)]	**5.06**	**5.06**	**5.49**	**(2.43)**
Weighted-average common shares outstanding	**170.0**	**169.7**	**169.1**	**168.4**
Weighted-average diluted shares outstanding[(1)]	**170.7**	**170.3**	**169.9**	**168.4**

2018

In millions, except per share amounts	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Sales	$ 6,735	$ 7,119	$ 8,085	$ 8,156
Operating income	848	817	1,172	943
Net earnings	840	789	1,244	356
Basic earnings per share	4.82	4.52	7.15	2.07
Diluted earnings per share	4.79	4.50	7.11	2.06
Weighted-average common shares outstanding	174.3	174.5	174.1	171.8
Weighted-average diluted shares outstanding	175.4	175.4	174.9	172.6

(1) Fourth quarter 2019 excludes the dilutive effect of awards granted to employees under stock-based compensation plans as such awards would be antidilutive.