

## INITIATING COVERAGE REPORT

Temple University Investment Association  
The Fox Fund  
December 5<sup>th</sup>, 2018

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# Northrop Grumman Corp.

Exchange: NYSE | Ticker: NOC | Target Price: ~\$301

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## COMPANY OVERVIEW

Northrop Grumman (NOC) is a leading defense company that specializes in information technology, aircraft, space technology, and systems integration services. The company reports in three operating segments: Aerospace Systems (42.6% of FY'17 Revenue), Mission Systems (40.5% of FY'17 Revenue) and Technology Systems (16.9% of FY'17 Revenue). The recent acquisition of Orbital ATK (OA) in June 2018 added a fourth operating segment to the company, which has been renamed Innovation Systems. The Aerospace Systems segment is primarily responsible for supporting the Department of Defense (DoD) and other U.S. government agencies. The Innovation Systems segment is responsible for launching vehicles and missile products, defense electronics and precision weapons. NOC reports Q4 FY'18 earnings on January 25, 2019.

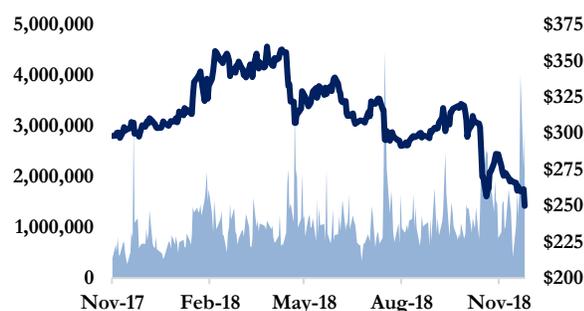
## INVESTMENT THESIS

NOC is currently trading a 1-year NTM EV/EBITDA multiple of 11.78x representing a discount of ~21% from its median multiple of 15.18x. The undervaluation case for NOC began when NOC management announced during the Q1'18 earnings call that the company did not bid on two key contracts, sparking a ~14% selloff of the stock. The story continues into the mid and later part of this year surrounding the potential denuclearization of North Korea, the loss of the JSTARS contract with the Air Force, potential sanctions on Saudi Arabia and market volatility. The punishment to NOC stock is unjustified, as North Korea hasn't denuclearized after agreeing to do so, since there is no official agreement. Also, a decrease in spending from Saudi Arabia will be negligible to NOC, as the company doesn't derive revenue from that region. Additionally, rising geopolitical tensions between world superpowers Russia and China have led to an increased demand for NOC's programs within Aerospace and Missile defense. Cited threats from hypersonic missiles in China have increased spending towards missile defense, which NOC stands to benefit from. Investors are ignoring the company's future growth potential from its acquisition of OA and NOC's pipeline of current and future contracts within its main operating segments. OA will expand NOC's portfolio within rocket propulsion, missiles, munitions, and space technology, all of which will drive future growth. The company's presence in Aerospace and international expansion on current contracts will bring the company back to fair value of ~\$301, representing a return of ~21%.

### Key Statistics (in M, except per share data)

Share Price	\$249.84	52-Week Low	\$249.84
Exp. Return	~21%	52-Week High	\$360.88
Shares O/S	173.6	Div. Yield	1.90%
Market Cap	\$45.40	Enterprise Value	\$140,119

### One-Year Price Graph:



### Earnings (Adj.) / Revenue Surprise History

Quarters	EPS	Revenue	Price
4Q17	3.5%	3.1%	3.7%
1Q18	7.8%	0.5%	(0.6%)
2Q18	2.1%	0.1%	(6.5%)
3Q18	49.6%	1.1%	(6.0%)

### Earnings Projections (Adj.)

	Q1	Q2	Q3	Q4	FY
2016A	\$3.03	\$2.85	\$3.35	\$2.96	\$12.19
2017A	3.63	3.15	3.68	2.82	13.28
2018E	4.21	3.93	6.54	4.36	19.04
2019E	4.43	4.45	4.54	4.60	18.05

Source: Bloomberg, FactSet, CapIQ

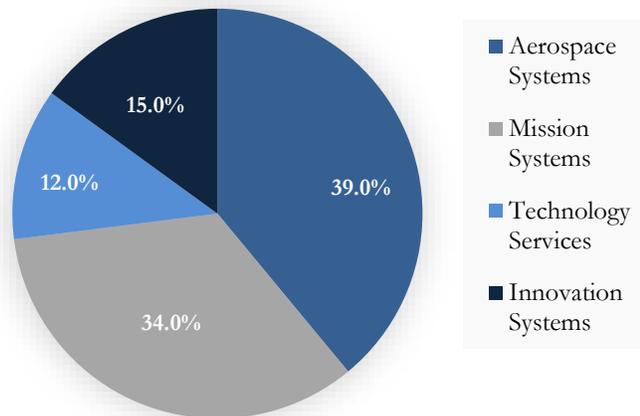
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**SEGMENT OVERVIEW**

**Aerospace Systems (39% of projected FY'19 Revenue)**

This segment works to design, develop, integrate and produce manned aircrafts, autonomous systems, spacecrafts, high-energy laser systems, microelectronics and other systems and subsystems. The U.S. government, and more specifically the DoD, acts as the main end market for this business segment as these organizations use these products and services in projects and missions related to intelligence, surveillance and reconnaissance (ISR), strike operations, communications, and space science and exploration. NOC further breaks this operating segment into three additional business areas: Autonomous Systems, Manned Aircraft, and Space Systems. Autonomous Systems focuses on autonomous aircraft systems for tactical and strategic ISR missions and includes specific programs such as High-Altitude Long-Endurance (HALE) systems and Vertical Take Off and Landing (VTOL) systems. The Manned Aircraft area centers around airborne C4ISR systems, long-range strike aircraft systems, tactical aircraft systems and directed energy systems with key programs such as E-2D Advanced Hawkeyes and Joint Surveillance Target Attack Radar Systems (JSTAR). Finally, the Space Systems business area deals with primarily scientific missions and includes programs exploring earth's origin, space communications, and space-missile defense.

**NOC Revenue Breakdown**



**Mission Systems (34% of projected FY'19 Revenue)**

The Missions Systems is the world leader in advanced full-circle mission solutions and multifunction systems for the DoD as well as international and commercial customers. Major products and services in this sector include C4ISR systems, radar, electro-optical/infrared and acoustic sensors, electronic warfare systems, air and missile defense (AMD) integration, navigation, and shipboard missile launch systems. This segment also subdivides into three further business areas: Sensors and Processing, Cyber and ISR, and Advanced Capabilities. Sensors and Processing is most responsible for the performance of this segment due to NOC's production and sales of F-35 sensors and electro-optical/infrared programs that saw higher sales volumes in FY'17. The Missions Systems segment suffered from lower volumes of sales in the Cyber and ISR business area due to restricted programs that the company had utilized in past or expected to use in the present and future. Overall, NOC saw a 4.2% YoY increase in FY'17 when compared to FY'16.

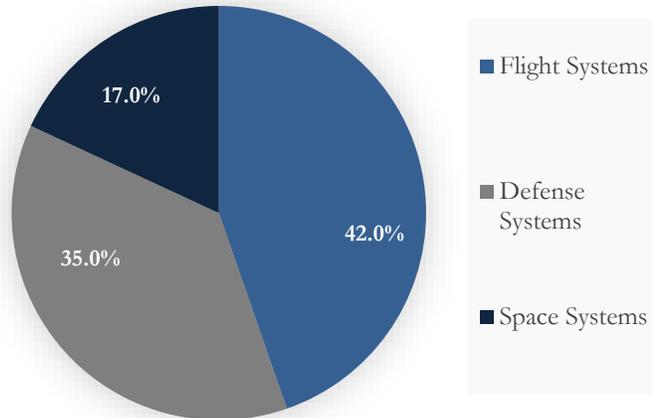
**Technology Services (12% of projected FY'19 Revenue)**

The Technology Services segment is concerned with logistic solutions supporting the full life cycle of platforms and systems and delivering innovative, technology-driven solutions and services for DoD, global defense and federal-civil customers. Similar to the prior segments, this segment is comprised of three business areas: Global Logistics and Modernization, Advanced Defense Services, and System Modernization and Services. This segment has historically been the smallest segment in terms of revenue generation, and has also been the least volatile. In FY'17, revenue for this segment decreased by 1.6% YoY from FY'16. The main reason for this slight decrease was the completion of programs during FY'16 and FY'17 in the Systems Modernization and Services business areas. Losses were offset by sales increases in Global Logistics and Modernization due to intercompany increased volumes and increased sales on UKAWACS and Hunter programs.

**Innovation Systems (15% of projected FY'19 Revenue)**

On September 8, 2017 NOC announced the acquisition of Orbital ATK for \$7.8B in cash plus the assumption of \$1.4B in debt. NOC paid \$134.50 per Orbital ATK share, a 22% premium to OA's previous end of day close of \$110.04. The acquisition of OA added a fourth business segment to NOC, which has been renamed Innovation Systems. The acquisition did not reach shareholder and regulatory approval until June 6, 2018, and therefore did not contribute to NOC's revenue until 2Q'18. In 3Q'18, Innovations Systems revenue made up 17.5% of total revenue generated that quarter. This business segment also encompasses three business areas: Flight Systems, Defense Systems, and Space Systems. These three areas work to launch vehicles and related propulsion systems, missile products, defense electronics, precision weapons, ammunition, satellites, and associated space components and services.

**OA Revenue Breakdown**



Flight Systems Group (34% of Projected FY'19 Revenue)

The Flight Systems Group is responsible for developing launch vehicles that are used as small and medium-class space launch vehicles to place satellites into earth orbit and escape trajectories, interceptor and target vehicles for missile defense systems and suborbital launch vehicles that place payloads into a variety of high-altitude trajectories. The group also develops and produces medium and large-class rocket propulsion systems for human and cargo launch vehicles, strategic missiles, missile defense interceptors and target vehicles. Additionally, Flight Systems Group operates in the military and commercial aircraft and launch structures markets. The Flight Systems Group is broken up into three specific sub segments; Launch Vehicles Division, Propulsion Systems Division, Aerospace Structures Division.

Defense Systems Group (39% of projected FY'19 Revenue)

The Defense Systems Group is Orbital ATK's largest segment and is responsible for developing and producing small, medium, and large-caliber ammunition, precision weapons and munitions, high-performance gun systems, and propellant and energetic materials. The Defense group serves a variety of domestic and international customers in the defense and security markets in a prime contractor, partner or supplier role. Defense Systems Group also provides propulsion control systems that support U.S. Missile Defense Agency and NASA programs; airborne missile warning systems, advanced fuzes and defense electronics. The group produces the U.S. Navy's Advanced Anti-Radiation Guided Missile and has developed advanced air-breathing propulsion systems and special-mission aircraft for defense applications. The Defense Systems Group is broken up into four subdivisions; Missile Products, Armament Systems, Defense Electronics, and Small Caliber Systems.

Space Systems Group (26% of Projected FY'19 Revenue)

The Space Systems Group offers a wide range of products for commercial, military, scientific and international customers. The segment develops and produces small- and medium- class satellites that are used to enable global and regional communications and broadcasting, conduct space-related scientific research and perform activities related to national security. In addition, the Space Systems Group develops and produces human-rated space systems for earth orbit and deep-space exploration, including delivering cargo to the International Space Station. This group is also a provider of spacecraft components and subsystems as well as specialized engineering and operations services to U.S. Government agencies. The Space Systems Group is broken up into four subdivisions; Satellite Systems, Advanced Programs, Space Components, and Technical Services.

**INDUSTRY OVERVIEW**

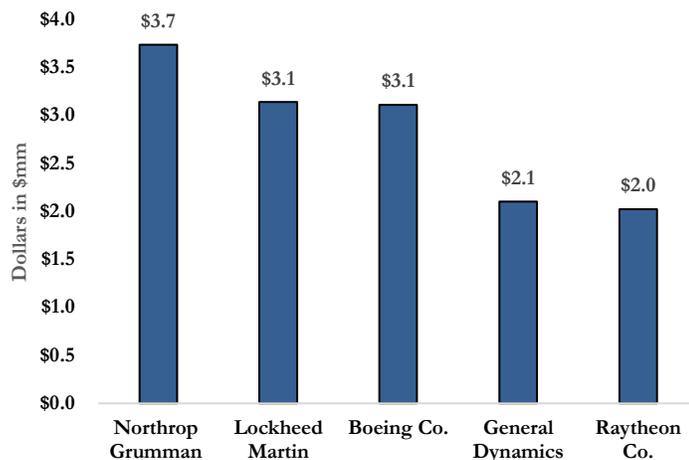
**Political Lobbying and Contract Formation**

Unlike the majority of sectors and industries, firms in the defense industry rely primarily on political lobbying in the formation of defense contracts rather than competing solely on the price or quality of products and services. The primary goal of an American defense company is to position itself favorably with federal, state and local governments so when the opportunity to bid on a new defense contract with the DoD or United States Armed Forces arises, the politicians drafting the deal will think of the company as the best option. To increase the volume and quality of contracts, defense lobbyists also focus on increasing the yearly U.S. defense budget issued by the Pentagon. To obtain the most profitable contracts, successful defense firms spend a significant amount of funds on lobbyists in Washington and contributions to pro-defense PACs. In FY'17, defense firms spent a total of \$125mm and employed over 700 lobbyists to influence defense contract formation. Since 1990, 57% of defense lobbying funds have gone towards Republican candidates and office holders, meaning defense firms have more influence to help draft accommodating legislation and DoD contracts with a conservative administration. NOC currently ranks first amongst all aerospace and defense companies in total contributions to American elections in FY'18, making it a likely candidate for new contracts moving forward.

**Defense Spending and Regulations**

In March 2017, President Trump authorized a \$639B budget for FY'18 defense spending, a \$30B increase YoY. President Trump later emphasized increasing the missile defense budget specifically, citing threats from North Korean nuclear and aerospace developments. In the 2018-midterm elections, the Democrats took control of the House of Representatives. This takeover creates a mixed Congress with the Republican-controlled Senate, leading to expectations of increased legislative gridlock and a threat to the development of large defense contracts, with most of the concern stemming from the Budget Control Act. The Budget Control Act of 2011 included a steep cut to defense spending known as the sequester, but Congress has used three temporary bills to soften its impact, and one more bill passed by January 2020 will see the DoD through the sequesters expiration. Experts believe that despite new congressional gridlock, a bill will be passed to force the-sequester into expiration. After signs of healthy budget growth under the Trump presidency, the Pentagon drafted an O50 budget, which includes funding for both the DoD and Department of Energy's nuclear division, of \$719B for FY'19 and \$733B for FY'20. After White House revisions, annual defense spending FY'20 is expected to decrease to \$700B, a 2% drop from FY'19 expectations. NOC's improved position in Washington will allow the company to take advantage of defense budget changes, achieving more contacts and gaining increasingly equitable positions in budget allocations.

**Lobbying Contributions**



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**Geopolitical Tension and Defense Contracting: A New Cold War Heating Up**

Saudi Arabia

Saudi Arabia, the third-largest defense market in the world after the U.S. and China, created over \$110B in potential deals in defense contracts with American aerospace and defense contractors in FY'17. Following an investigation into the murder of journalist Jamal Khashoggi at the Saudi Arabian consulate in Istanbul in October 2018, many government officials in the U.S. and abroad have called for increased sanctions against the kingdom. As of late November 2018, the Trump administration has imposed 17 sanctions against specific Saudi officials and citizens. Many Republicans suspicious of the Saudi government's involvement in Khashoggi's murder have called for further action against the kingdom. Increased sanctions against Saudi Arabia poses a threat to the existing and future American defense contracts

within the region with the potential to close off deals within the region for the foreseeable future. On the other hand, many defense experts believe that previously developed contracts between American defense companies and Saudi Arabia will be able to withstand external pressures generated from the Khashoggi controversy and any future sanctions on the kingdom will not affect American A&D success in Saudi Arabia, as past contracts have survived through long-held disputes between the countries. NOC currently has no exposure to current Saudi defense deals and is unlikely to see any developments within the region in the foreseeable future.

#### China

In addition to a long and contentious history, U.S./China tensions have developed into one of the largest global rivalries of modern day due to controversy involving trade, cyber security, and military encroachments, among other transgressions. The Trump administration has created over \$200B in tariffs on Chinese goods, and China has responded by adding over \$100B of tariffs on U.S. imports. Chinese officials have accused Washington of starting a new Cold War, citing aggressive American warships in the South China Sea and the FBI arresting and extraditing a senior Chinese intelligence official in Belgium as the most recent of a series of inflammatory actions against the republic. The Chinese government recently ended a 2015 cyber ceasefire with the U.S., opening up American institutions to new threats of espionage and cyber terrorism. On the other side, President Trump has often voiced his unequivocal opposition to China, accusing Chinese intelligence of attempting to oust him from office through interference in U.S. elections. In August 2018, Chinese aerospace scientists successfully tested the Starry Sky 2 Aircraft, a hypersonic missile with the capability to render today's missile defense systems obsolete. Recent U.S. intelligence reports have stated that Chinese hypersonic missiles could be operational as early as 2020. The combination of a rising rivalry with China and the hypersonic threat has the potential to drive a new arms race that would continue to increase American defense spending and profitability for A&D firms. OA, an A&D company recently acquired by NOC, has recently signed a contract to study potential integration of turbine and hypersonic engine technologies that may prove crucial for the U.S. to defend from any Chinese attack should the new Cold War heat up.

#### North Korea

Since the end of the Korean War in the 1950's, constant disputes and controversies have fueled tensions between the U.S. and North Korea. Contributing to the arms race and Cold War originating in East Asia, North Korea has engaged in a buildup of nuclear weapons and ballistic missiles that threatens U.S. security. North Korean leader Kim Jong-un refuses to abandon his country's nuclear development programs, despite diplomatic developments between North Korea, the U.S., and the rest of the world. The country continues to construct nuclear weapons, test missiles, and increase missile fuel production while refusing to surrender any of its nuclear arsenals. In April 2018, Lt. Gen. Samuel Greaves, the director of the U.S. Missile Defense Agency, said that it is "extremely likely" that North Korea and Iran will possess hypersonic missile technology in the near future, adding, "the hypersonic threat is something that [the U.S.] needs to address expediently". In order to address this threat, US agencies will become increasingly reliant and the research of defense firms such as NOC.

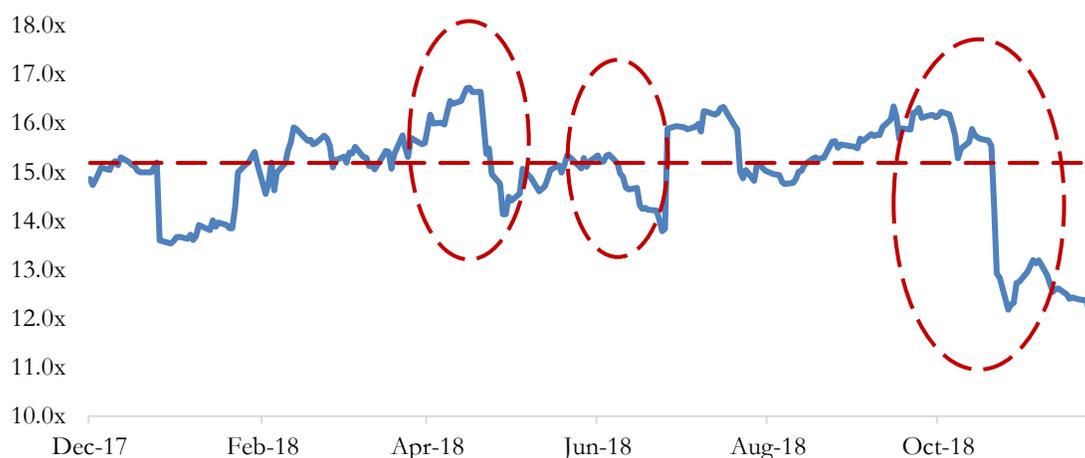
#### Russia

Amidst the controversy surrounding Russian interference in American elections, US/Russia relations have experienced a major setback, setting up for a dispute emulating the original Cold War. In response to the poisoning of a Russian double-agent in Britain, President Trump removed 60 Russian diplomats from embassies in the states, surpassing the 55 diplomats removed by President Reagan during the height of the Cold War. Similar to the way Russian intelligence officials used propaganda to destabilize the US in the 1980's, Russia is now using hacking and social media to infiltrate American institutions and disrupt processes from the inside. Russia is once again focusing on a military buildup of Cold War proportions, with many American officials believing that the Russian government has breached the 1987 Intermediate-Range Nuclear Forces agreement for its continued development of medium-range missiles and nuclear attack technology. Days after a meeting between Russian leader Vladimir Putin and Donald Trump, the Kremlin Ministry of defense released videos of hypersonic missile tests. Putin later added that the country has built an "invisible" Kinzhal hypersonic cruise missile that can travel 10 times faster than the speed of sound. On November 25th, Russian forces opened fire on and seized three Ukrainian navy ships and their crews, creating a crisis that triggered the deployment of thousands of troops, artillery, and missile systems on both sides. As Ukraine's most important ally during the 2014 annexation of Crimea, Ukrainians will once again look to the US to respond to continued Russian aggressions.

**UNDERVALUATION**

NOC is currently trading at a 1-Year NTM EV/EBITDA multiple of 11.78x, representing a discount of ~21% from its median multiple of 15.18x. We believe a 1-year valuation is justified because it represents the uncertainty in the market surrounding future defense spending due to geopolitical tensions, and some key contracts NOC lost out on. The undervaluation for NOC began in April 2018 after the Q1'18 earnings call selloff of ~14%, when management announced the company did not bid on next generation GPS III satellites or the F-35 distributed aperture system. This raised concern among investors as they worried the company would lose out on future revenue opportunities in one of the fastest growing programs within the F-35. Investors didn't realize that the decision to not bid was from a strategic perspective. NOC management sees better opportunities in continuing to be a manufacturer of the F-35's center fuselage, which will be a significant driver of growth into FY'19 and FY'20 for the company's Aerospace segment. The story continues into June 2018 after the United States-North Korea summit as investors viewed it as a threat to NOC's top line and future international growth opportunities, since a proposed denuclearization of the country would delegitimize it as a global military power. This was purely speculation as no formal treaty has been signed and will not be in the foreseeable future. Kim Jung-un's promises have fell short of what American officials demanded, as North Korea has made no progress towards relinquishing its nuclear weapons or missiles. Countries in surrounding nations have future orders with NOC to defend against any potential threat from North Korea. Further into the middle part of this year the Air Force decided to scrap a proposed \$7B upgrade to the Joint Surveillance Target Attack Radar System (JSTARS) project, a major blow to NOC's top line as it was a guaranteed contract. Furthermore, the murder of journalist Jamal Khashoggi in October 2018 in Saudi Arabia sparked the talk of sanctions against Saudi government officials. This caused an industry-wide selloff because of the nearly \$110B in potential deals and future contracts with Saudi Arabia. In the event of any deals with Saudi Arabia being cut, the effect would be negligible to NOC as the company has no exposure and current or future contracts within that region. Along the political spectrum North Korea is not the only country with potential threats to the U.S. China and Russia both pose threats to the safety of the U.S., and China increased its military spending by nearly 10% at the beginning of this year in an attempt to unveil a "world class" military. China continues to boast its artillery as the country has successfully developed and tested hypersonic missiles, which are capable of rendering the U.S.'s current defense system obsolete. As for Russia, President Vladimir Putin has made comments about the country's weapons capabilities and a hypersonic missile, which jeopardizes the security of the U.S. The tension between the two countries has increased due to Russia opening fire on three Ukrainian Navy ships. As a result, the stakes have heightened when President Trump cancelled his meeting with Putin at the most recent G20 Summit meeting. Political tensions among world superpowers will result in increased spending to defend against any potential threats. NOC stands to benefit in the coming years as spending for its programs within Orbital ATK, B-21 Raiders, and F-35's will be in demand to neutralize potential threats. We see these programs driving the top line of NOC bringing the stock back to fair value of ~\$301, returning ~21%.

1-Year NTM EV/EBITDA



## CATALYSTS

### Orbital ATK - More Ammunition to the Firepower

OA, now renamed Innovation Systems, is the largest supplier of ammunition to the Pentagon with 8B rounds of ammunition produced in the last 5 years and has contracts with NASA to launch rockets to the international space station as well as other satellites. With NOC's integration of OA into its product portfolio, the company has opportunities to expand into precision munitions, hypersonic defense, and space. The two companies have no overlapping contracts, which will ease the integration of each other's technologies, including NOC's high end set of solutions with OA's lower cost solutions. OA's focus on missiles, interceptors and propulsion, combined with NOC's strength in command and control equates to a combined space business of \$6B, with a \$1.5B contribution from OA. Revenue synergies with Innovation Systems have been generated at a faster rate than expected given the complementary natures of NOC's and OA's portfolio. Missile defense synergies will be the biggest opportunity for NOC in the future as the global rocket and missile market is expected to grow at a CAGR of roughly 5% through 2022, to reach a total value of \$70B. OA is a primary supplier of long-range missile defense interceptors and target systems with more than 300 vehicles already built or under contract. These projects reflect NOC's opportunity with OA such as the Ground-Based Strategic Deterrent (GBSD) replacement and many others. OA's contract portfolio will bring \$2.5B annually to NOC's existing portfolio of \$11.5B, better positioning it as a contender for the most lucrative government contracts. While OA bolsters NOC's presence in areas such as munitions, defense, and space, the partnership of the two companies in the newly developed Innovation Systems segment opens the door for NOC to secure contracts among multiple reporting segments. The implementation of OA has been firing out of the gate in Q3'18. Innovation systems segment is expected to near \$3B by end of FY'18 and increase 72% YoY to \$5.5B in FY'19. To coincide with the revenue synergies, margin expansion in the segment will increase 11% in FY'18 to 13% in FY'19.

### Future Opportunities with Innovation System's Expertise

#### Flight Systems - The Pegasus Program

Carried by a NOC L-1011 Stargazer carrier aircraft, the Pegasus XL rocket is an air-launched rocket propulsion system capable of sending small to medium-sized payloads to low Earth orbit or to rendezvous with the International Space Station. The Pegasus XL rocket is the only air-launched orbital rocket in the world, creating unique opportunities for NOC to utilize the Pegasus for a wide array of customers. With commercial, military, and scientific applications, the distinctive project positions NOC's Innovation Systems segment to capitalize on recent positive trends within the market for small satellites. NOC is a builder of satellites and related subsystems, with more than 225 space systems and 800 space components delivered or in production. Additionally, the global market for small satellites is expected to grow at a CAGR of 17.1% through FY'23, and the expected number of small satellites to be launched over that span exceeds 500. Among contractors within the space, defense companies are the dominant driver for demand, and American companies hold a 32% market share of launches. Given Pegasus' flawless track record of 43 successful tests, it remains the industry benchmark for affordable options within small payload propulsion.

#### Defense Systems - Competing for Ground Based Strategic Deterrent (GBSD)

NOC will be able to leverage OA's cost solutions to compete with competitor Boeing (BA) for the \$85B GBSD contract to replace the aging Minuteman III Intercontinental Ballistic Missile (ICBM) system. It also includes a \$21.7B Research and Development (R&D) position. In August 2017, BA and NOC were each awarded contracts valued at \$349mm and \$328mm to begin development work for the design of the rockets. The full contract will be awarded to either BA or NOC in September 2020 as funding for the proposal is expected to increase in the coming years (see exhibit III). The GBSD competition involves a replacement of missiles rather than an aircraft platform. There are only two engine suppliers in the United States that are able to produce the large rocket motors necessary for the propulsion applications, which are NOC Innovation Systems and Aerojet Rocketdyne. NOC's acquisition and implementation of OA will provide the company with an advantage as it now has expertise in rocket propulsion, avionics, vehicle integration and composite structures. Current projections from the Air Force estimate that the procurement of 650 missiles for the program would be valued at \$49B, roughly \$75mm per missile. The most likely scenario from Air Force is that there would be an average buy of 64 missiles/yr, making total procurement roughly ~\$5B/yr. Propulsion makes up about 15% of the total cost of the rocket or ~\$700mm/yr. If the propulsion is split evenly between BA and NOC it could be a \$300-\$350mm/yr. revenue opportunity, generating close to \$1B for NOC over the next two years.

## The B-21 Raider - A Program for Future Growth

The B-21 Raider (formerly referred to as the LRS-B) is a long-range, nuclear-capable stealth bomber aircraft that can withstand the most hostile and advanced battlegrounds. The B-21 project came to existence following the publishing of the 2006 Quadrennial Defense Review, a comprehensive Department of Defense report outlining the U.S. military's top objectives. In the report, the DoD recommended expedited development of a next-generation bomber that would be able to deliver long-range attack capabilities. In October 2015, NOC was chosen as the primary contractor for the B-21 project, beating out a joint effort by Lockheed Martin and Boeing. The project is within the United States Air Force's top three priorities for procurement, as before the call for the new bomber was requested, the Air Force had no plans to invest in superior bomber technologies to replace the current B-1, B-2, and B-52 iterations of the aircraft class until 2037.

### Why the Demand?

To protect against theft of certain design elements by foreign governments, the U.S. has kept many specific features of the B-21 highly classified. However, with the currently available information it is the widely held belief that the B-21 Raider is the most technologically advanced aircraft the world has ever seen. With extensive payload limits and improved efficiency, the aircraft brings numerous battlefield advantages to the table. The minimum service ceiling for the stealth bomber is a best-in-class 60,000 feet, which minimizes the potential of enemy radar systems establishing a weapons lock on the American aircraft. Additionally, the B-21 offers advanced battlefield communications capabilities, as it is able to identify hostile aircraft or ground-based attacks and transmit data to ally aircraft or satellites while deep behind enemy lines. This ability will enhance the communications network operated by U.S. military devices and vehicles, in turn creating a more holistic understanding of immediately posed threats. Target engagement and elimination is another specialty of the B-21 Raider. The bomber possesses the ability to lock onto a missile fired from another American aircraft, and remotely guides it to its target. The B-21 further positions itself as an invaluable asset to the United States military from its unique unmanned capabilities. The aircraft is the only one in the world that can be operated remotely, and remote operation allows it to eliminate the risk posed to American lives, while engaging certain targets that were previously deemed too dangerous.

### How B-21s Fit the Budget

Funding for the B-21/LRS-B project began in 2011 with \$199mm in contributions. Since then, contributions have grown at a 39% CAGR, up to \$2B through FY'18. The upward trend is expected to continue through FY'20, surpassing \$3B for the project. Due to the numerous advancements the B-21 Raider provides, the U.S. Air Force has outlined a plan to purchase a minimum of 100 of the next generation aircraft. However, due to the necessary equipment upgrade for the current serviceable B-1 (63 aircraft) and B-2 (20 aircraft) bombers, the fleet size for dispatched B-21s could surpass 180. Additionally, multiple recommendations from the Air Force Deputy Chief of Staff and high ranking Air Force officials stated the fact that the order for 100 B-21 aircraft is too small, and the DoD must acquire 200. Furthermore, due to the looming threat of rising geopolitical tensions with global superpowers such as China and Russia, coupled with an aging fleet of bombers, the Air Force's order for B-21s could easily double, exceeding 250 of the aircraft. While numerous developments carry the potential for increased demand for the B-21 Raider, we believe that the Air Force will dedicate an additional 50 bombers to the project over its lifespan, as to ease pressure from a possible large-scale foreign engagement, and simultaneously offer an upgrade to the currently utilized, aging stealth bomber aircraft. With a price tag of \$564mm per bomber, the B-21 falls within the Air Force's procurement cost limit of \$606mm. This cost advantage is one that previous generations of bombers could not contribute, as models of the B-2 bomber carried procurement costs of \$1.5B. Given its manageable price and high demand from the Air Force, the B-21 will be able to establish economies of scale and perfect its manufacturing procedure. Furthermore, the reduced unit cost will help to retain demand from the military for future procurement in the coming decades. Given our estimate, NOC is poised to realize revenue of at least \$84.6B from the B-21 project over the next two decades. The B-21 could account for as much as 7% of annual revenue by 2020, while increased production into the 2020s will foster a rise to 10% of annual revenue later in the decade. Comparatively, competitor Lockheed Martin's F-35 fighter jet program accounts for 25% of annual revenue. The B-21 Raider is NOC's fastest growing project and will remain a consistent revenue driver for decades to come, posting average annual revenue of \$4.2B to the top line.

## Domestic and International Expansion

Within the global military landscape, evolving technologies and weapons systems pose a constant threat to world superpowers. The constant search for the next generation of weapons-grade technology is a high priority for military and defense objectives, especially in the United States. China and Russia have rapidly modernized their militaries, with some estimates showing China now has a defense budget almost equal to the U.S. In past years during the Obama administration the U.S. operated with an aging military fleet and declining budget. But now as the Trump Administration has increased defense budgets to replace older fleets within air, ground, and space operations, the U.S. will be more prepared for any potential threats. NOC is poised to capture growth from the FY'19 DoD spending budget of \$716B as NOC is aligned well within modernizations across space, sea, air superiority and restricted spending. Grumman's three largest customers are the Navy (19% of sales), the Air Force (19% of sales), and Restricted (28% of sales), which aligns well with the budget priorities. The biggest drivers of top line growth will be the aerospace and mission systems. We have outlined below the company's biggest projects in the future, some of which the company has been awarded contracts for.

### F-35 Program

The F-35 Lightning II is a stealth-capable, supersonic strike fighter aircraft being procured for use by the United States Air Force, Marine Corps, Navy, and allied defense programs. Contracted primarily to LMT and supplied supplemental by NOC, the F-35 project is the DoD's largest weapons procurement operation in history by total procurement cost. There are 3 variations of the fighter, each of which with different takeoff and landing capabilities and tactical advantages relative to previous generation fighters. For example, of its variations, the F-35A retains conventional takeoff and landing procedures (CTOL). Furthermore, the F-35B variant has short takeoff and vertical landing capabilities (STOVL), and the F-35C has vertical takeoff and landing (VTOL) abilities. The F-35 is a cost-efficient alternative to other fifth-generation aircraft with a design that allows manufacturers to produce similar models for the different tactical needs of the Air Force, Marines, and Navy without incurring the additional expenses of manufacturing separate models.

### *International Implications*

International demand for the F-35 has heated up, with interested customers in every major geographic end market. Most notably, the Asia/Pacific region is drawing demand from allies such as Australia and Japan, and total demand from other regions equates to 204 aircraft still currently on backorder. Australia has announced an order for 72 F-35A fighters, primarily in an effort to replace the aging fleet of Boeing FA-18A/B fighters. Additionally, Japan announced an order for 100 F-35s, including 40 STOVL F-35Bs. Japan's announcement sent shockwaves throughout the Asia/Pacific region, as their increased military presence and enhanced aerial capabilities from sea-going vessels better positions the Japanese military as a formidable threat to China following a rise in tensions between the nations.

### *Sustained Domestic Demand*

The United States Department of Defense plans to acquire a total of 2,456 F-35s over the useful life of the program (see exhibit V), while demand from the Air Force, Marine Corps, and Navy is consistently on the rise. NOC estimates that total sales of aircraft to foreign and domestic military applications will exceed 4,000. The current FY'19 budget proposal for F-35 program requests \$10.7B in funding for procurement, with an additional \$1.3B for R&D. It would include 48 F-35A variations for the Air Force, 20 F-35B variations for the Marine Corps, and an additional 9 F-35C variations for the U.S. Navy. Production of the F-35 is expected to increase 40% next year, as LMT expects to deliver 91 F-35s during 2018. Furthermore, the company predicts production of 130 aircraft in 2019, representing a 42.9% increase YoY.

### *Northrop Grumman's Supplier Role*

As a critical supplier of parts and systems to the F-35, NOC is responsible for one-third of the parts and systems components that comprise the jets. NOC realizes revenue from the F-35 Lightning II fighter in two segments. First, the Manned Aircraft sub-segment within Aerospace Systems saw revenue of \$1.3B in FY'17, and is expected to grow at a CAGR of 16.2% through FY'19, resulting in sub-segment project revenue of \$1.8B. Additionally, the Sensors and Processing sub-segment of Mission Systems saw F-35 revenue of \$715mm in FY'17, which is forecasted to grow at a CAGR of 30.1% through FY'19 producing revenue of \$1.2B. Overall, the F-35 Lightning II program will account for \$3.0B of NOC's FY'19 revenue, or 8.8% of the total top line.

E-2D Advanced Hawkeye - Japan

China and Japan have had a long history of military conflict and with China expanding its presence in the Pacific Sea, Japan is beefing up its arms. China is developing its capabilities among advanced fighter jets and anti-ship ballistic missiles, which is why there is currently strong demand from Japan for American military assets. Specifically, Japan is in need to upgrade older E-2C Hawkeyes, which work in early warning and threat detection. This is a vital need for Japan given perceived threats from China, all of which enable NOC to expand its international operations and drive growth.

*What is the Hawkeye and what does it mean for NOC?*

The E-2 Hawkeye is an American all-weather, carrier capable tactical airborne early warning (AEW) aircraft. The latest E-2 version is the E-2D Advanced Hawkeye, which features a new avionics suite, mission computer, integrated satellite communications, flight management systems and much more. The first Japanese E-2D is currently undergoing flight tests, having made its first flight in October 2017 from NOC's Aircraft Integration Center of Excellence in St. Augustine, Florida, with deliveries expected in late 2019. The new capabilities will be implemented onto the U.S. Navy's entire E-2D fleet, will greatly increase the range and endurance of the Advanced Hawkeye. This is key to the program and exemplifies the demand as the U.S. is going to increase focus on the Asia-Pacific region, where the distances over the Pacific are forcing the Navy to look for a way to extend its footprint in its carrier air wings. In September 2018 the U.S. Department of State approved the possible sale of nine E-2D Advanced Hawkeye (AHE) Airborne Early Warning and Control (AE&WC) aircraft to Japan for an estimated cost of \$3.1B. The proposed sale has since been approved because previous Hawkeye sales have had no issues. Also, Japan is a major political and economical power in East Asia and Western Pacific and is a vital partner to the United States. NOC is the prime contractor for this project and there are no offsets in the deal. The program is currently delivering at rate of five per year, with the Japanese order potentially pushing production to five or six units per year. Japan initially planned to purchase five or six Hawkeyes, but at the end of 3Q'18 the order was increased to a total of 13. With the program expected to be completed by 2022 it will be a sustainable driver for growth for NOC's AS segment as manned aircraft sales are expected to increase 13% YoY into FY'19.

**MOATS****Cost Efficiency**

NOC's recent developments allow the company to provide innovative solutions to customers at lower prices than its competitors, giving it an excellent reputation amongst government contractors and a distinct advantage in formulating contract bids. In many of NOC's largest current contracts, such as B-21 Bomber production, the company has used new manufacturing advancements and efficiencies to significantly decrease new generation model production costs and supply models to customers at lower prices while maintaining or improving profit margins.

**RISKS****Single Customer Reliance**

NOC relies heavily on contracts with the US Government as its primary source of revenue; in FY'17, 85% of NOC's sales were derived from the US Government. The US Government also has the ability to delay work under specific contracts for a specified period of time, pushing potential growth drivers outside of an investment window. If NOC is unable to obtain favorable positions in new defense contracts, the company will be unable to grow revenue.

**Pension Fund Contributions**

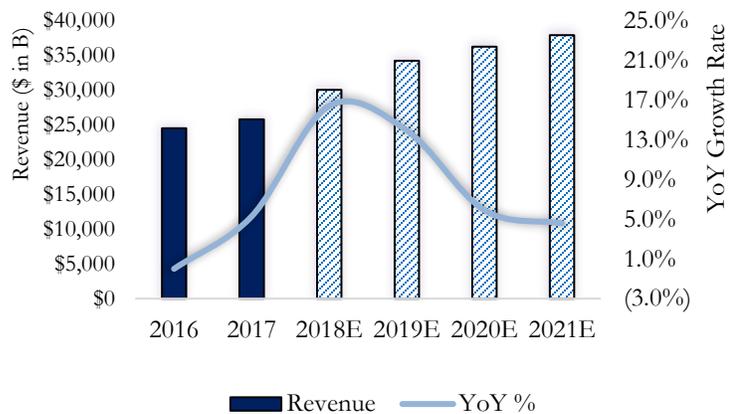
In January of FY'18, NOC announced it would make a \$250mm discretionary pension fund contribution by year end. In June, NOC acquired Orbital ATK for \$7.8B in cash, taking on \$8.3B in debt as of October FY'18. Analysts fear the contribution, in combination with the large decrease in cash stemming from the Orbital acquisition, may restrict NOC's FCF significantly. A weakened cash flow has the potential to weaken NOC's short-term credit ratings and increase default rates while rendering NOC unable to capitalize on economies of scale created from low-cost production methods, decreasing revenue and its reputation amongst potential contract customers.

**FINANCIALS**

**Revenue:**

NOC reports revenue through four segments: Aerospace Systems, Mission Systems, Technology Services, and Innovation Systems. The company reported revenue of \$25.8B in FY'17, representing YoY growth of 5.3% from FY'16. Revenue growth has been driven by strong performance in the Mission and Aerospace segments. The full integration of Innovation systems will begin to see revenue synergies beginning in the 1H of FY'19. As a result it has the opportunity to drive top line revenue in FY'19 to roughly \$34B and \$36B in FY'20 respectively.

**Total Revenue**



Aerospace Systems (39% of projected FY'19 Revenue)

Aerospace Systems segment sales totaled \$11.9B in sales in FY'17, representing a 10.4% increase YoY from \$10.8B in FY'16. This segment is reported in three business areas along with the segment revenue breakdown: Autonomous Systems (25%), Manned Aircraft (53%), and Space Systems (22%). Moving forward revenue for this segment is expected to total \$13B and \$14.1B, respectively in FY'18 and FY'19. The fastest growing sub segment will be manned aircraft sales. This can be attributed to higher sales volumes from the F-35 program, B-21 Bombers, and E-2D Advanced Hawkeyes, which will begin to add significant revenue to NOC beginning in FY'19. The F-35 is expected generate \$1.2B of revenue for the segment, representing 10% of segment sales in FY'19. The B-21 Bombers will be a long term driver of revenue for this segment adding close to \$1B in revenue by FY'20 and it's expected to grow at a CAGR of 38%, adding a consistent revenue stream to the segment. Additionally the current sale of 13 E-2D Advanced Hawkeyes will generate roughly \$4B in revenue for the life of its program. Investors can expect the Aerospace Systems segment to be on the fastest growing and largest segment for NOC moving forward. The B-21 and F-35 programs, specifically within the manned aircraft sub segment, will sustain consistent growth as NOC has secured long term contracts.

Mission Systems (34% of Projected FY'19 Revenue)

Mission Systems segment revenue for FY'17 totaled \$11.4B for FY'17 and is expected to reach \$11.7B by the end of FY'18 and increase 5% YoY to \$12.4B in FY'19. The segment is reported in three business areas along with the segment revenue breakdown: Sensor and Processing (49%), Cyber and ISR, and Advanced Capabilities. A majority of the growth in FY'17 was driven by Sensors and processing volumes, primarily related to restricted programs and the F-35 programs. The most significant growth from Mission Systems in FY'18 was the Sensor and Processing sub-segment. The F-35 program will drive growth as NOC manufactures products for sensors and radars within the F-35. Additionally, CIRM recently achieved Milestone C enabling the program to move into full rate production. Sales within Cyber and ISR are expected to grow at a modest 2% in FY'19 primarily related to restricted programs. The segment faces some headwinds moving into FY'19, as there is a decline in classified ISR program.

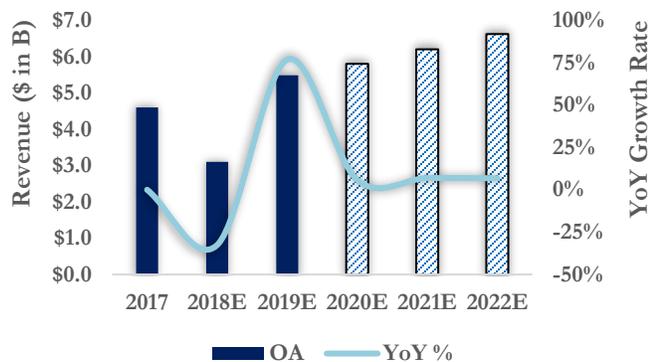
Technology Services (12% of Projected FY'19 Revenue)

The three reportable business areas are: Global Logistics and Modernizations (47% of revenue), Advanced Defense Services (28% of revenue) and System Modernization and Services (25% of revenue). Technology services will continue to be a core asset with 20%-25% of sales supporting positions and programs such as the B-2 and international operations with the F-35 program. The Technology Services segment has seen stagnant growth over the past years. From FY'17 to FY'18 revenue decreased roughly \$400mm or (8.3%) YoY. The reason for the slow growth in revenue can be attributed to the loss of several contracts which total \$500mm or 10% of segment revenues. The contracts loss include the roll off the KC-10 program, an estimated loss of (\$225mm), loss of the Joint National Integration Center Research and Development Contract (JRDC - \$200mm), VITA program completion (\$75 - \$100mm) and the loss of the ENSS network contract (\$50mm).

Innovation Systems (15% of Projected FY'19 Revenue)

Q3'18 was the first full quarter with the implementation of Innovation systems, generating \$1.4B in revenue to account for 17.5% of quarterly revenue. OA's portfolio and current backlog will bring \$1.5B in revenue to the space business. Innovation systems can be broken down as follows: Flight Systems Group (34%), Defense Systems Group (39%) and Space Systems Group (26%). Aerospace sales are driven mostly by manned aircraft sales. Revenue synergies will be generated throughout all sub segments as full integration is beginning. In the long term many of the revenue synergies where OA has exposure to the launch vehicle and space market. Additionally, Innovation Systems will expand NOC into international markets by helping to increase international sales by 23% YoY. With management's disciplined approach to the implementation, possible cost synergies from the acquisition will reach \$200mm by FY'20. Innovation systems helped to drive organic sales by 9% so far throughout FY'19 and are expected to reach roughly 11% in FY'19. Within the space systems segment the largest opportunity will be from the down select of the Omega rocket, a potential \$800mm/yr contract. Also, now that NOC has more exposure to propulsion systems at a low-cost solution with OA's expertise, it makes the company a front-runner for the GBSD contract, worth \$85B.

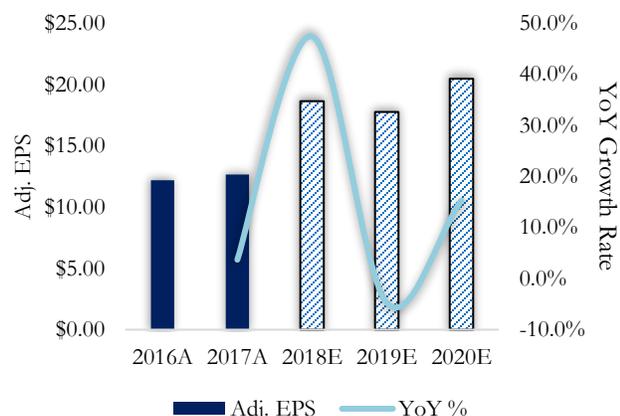
**Innovation Systems Revenue Estimate**



**Earnings**

NOC has beat earnings expectations on all of its last 8 quarterly reports, with an average surprise of 17%. In the company's 2Q'18 earnings call, management raised FY'18 EPS guidance range to \$16.60-\$16.85 after growing confidence in Aerospace and Innovation Systems developments. NOC most recently beat 3Q'18 earnings expectations by 37%, reporting \$6.54 versus \$5.97 expected, an increase of 78% YoY. Additionally, management yet again raised year-end earnings expectations to \$18.75-\$19. On the Q3'18 earnings call management guided for earnings headwinds moving in FY'20, with some analysts lowering earnings expectations between \$17-\$18. NOC's earnings growth stability, proven track record of beating estimates, and growth coming in the next few quarters from Innovation Systems, B-21 and F-35 developments, and international expansion will contribute to more earnings surprises moving into FY'19.

**Adj. EPS Growth**



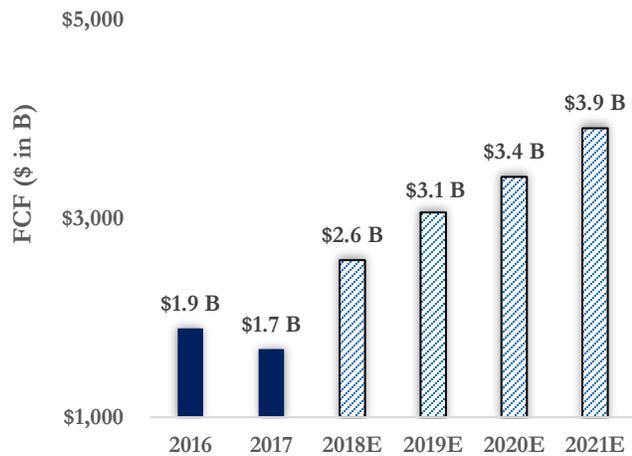
**Debt**

In FY'17, NOC posted total outstanding long-term debt of \$14.4B, along with \$867mm due in the form of short-term debt. The total outstanding debt figure of \$15.3B represents a 115% increase YoY, given the necessary financing to process the acquisition of Orbital ATK. However, of the \$8.25B in senior notes issued for the acquisition, only \$4B is due by 2025, with the rest of payments to spread out over the period ending in 2047. Most immediate payments include \$500mm due in FY'19, and a total of \$2.0B due in FY'20. Standard & Poor's current rating on NOC moving forward is BBB, with a stable outlook. Management's goal is to raise the company's rating to BBB+, and its payment of short-term debt will help to alleviate credit pressures. NOC ended FY'17 with an interest coverage ratio of 9.2x, putting the company in a secure position to pay down its debt over the coming business cycles.

**Free Cash Flow/Capex**

NOC's cash flows from investing totaled (\$889) mm in FY'17, a 10% decrease YoY. This decrease was due to a slight rise in capital expenditures and a drop in income from miscellaneous investing activities. This drop in miscellaneous investing cash inflows forced NOC to engage in a \$250mm discretionary pension fund contribution by year-end. Annual capex through 3Q'18 totaled \$786mm, and 3Q'18 free cash flow was \$693mm before the after-tax pension contribution. Along with using FCF to mitigate pension obligations, NOC has emphasized dividend raises, increasing quarterly common stock dividend by 9% in May of FY'18, the 16th consecutive annual increase. In its 3Q'18 earnings call, NOC management increased its free cash flow guidance to a range of \$2.5B-\$2.7B for the year. NOC also aims to return to a BBB+ credit rating in FY'19, emphasizing debt pay downs in addition to shareholder returns. The company will use a significant amount of FCF to fulfill a \$500m issuance due in the coming year. FY'19 FCF is expected to total \$3.1B. NOC's capex totaled \$928mm in FY'17 and is expected to reach \$1.1B by the end of FY'18. FY'19 capex is projected at \$1.2B.

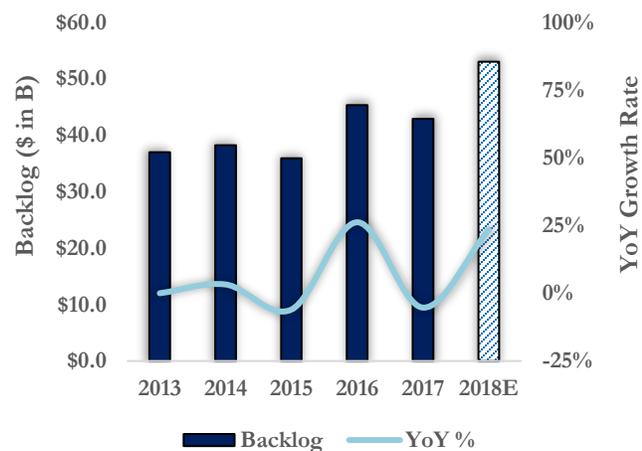
**FCF Growth**



**Backlog**

NOC's current backlog is valued at \$52.6B, indicating a 23% increase from FY'17 year-end. Of the total figure, 62.0%, or \$32.6B is comprised of funded backlog, or the total value of NOC's contracts that have already secured the necessary appropriated funds from Congress. Funded backlog has increased 45.5% since the end of FY'17, mainly due to the legacy contracts that Innovation Systems segment (formerly Orbital ATK) contributes. Furthermore, NOC currently possesses \$20B in unfunded backlog, accountable for 38.0% of total backlog. These contracts are ones that have not yet received funding from Congress, and represent potential future revenue opportunities for the company. Looking forward, NOC is anticipating conversion of 50% of its total backlog in the next year, while the amount rises to 75% in two years. These estimates amount to \$26.3B and \$39.5B in revenue over the next two years for the company, respectively. Positive booking rates moving forward bolster the positive outlook for NOC's backlog conversion rate.

**Backlog**

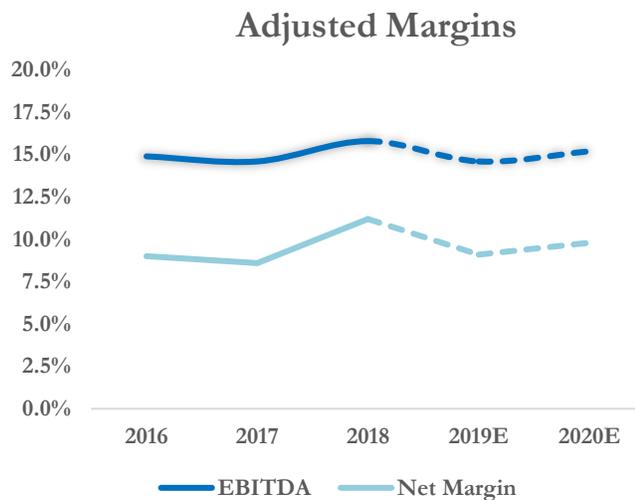


**Book-Bill**

Another key metric to determine the demand and supply of a company's products in the Aerospace & Defense industry is a company's book-to-bill ratio. A ratio above 1.0x indicates that more orders were received than filled, a sign of strong demand, while a ratio below 1.0x is a signal for weak demand. For OA the company's year-end book-to-bill for FY'17 was 1.41x, with a book-to-bill ratio of 1.41x for Q4'17. This shows that OA had and will continue to have an increased demand for the products it is completing. NOC is in the same position as a book-to-bill ratio as of Q3'18 was 1.05.

**Margins**

Beginning in FY'16 NOC began to see an expansion in Net and EBITDA margins as a result of lower operating costs. But as the company has taken on more capital-intensive projects such as the B-21 and the restructuring of the Technology services system, there will be some short-term contraction throughout FY'19. Investors should not be worried by the near term headwinds as strong revenue growth and an increase in cash flow will be realized in the 2H of FY'19. Moving into FY'20 margins will remain robust, as the integration of OA's low cost solution will help to increase the bottom line. The company's most profitable segment is Mission Systems with operating margins of 13.7% as of Q3'18.



EBITDA Margins

EBITDA margins expanded from 14.9% in FY'16 to an estimated 15.8% in FY'18. Margins are expected to contract slightly in FY'19 to 14.6%. This is a result of the consolidation of the Technology Solution segment, as costs will increase moving into FY'19. With the addition of Innovation Systems it has lower than corporate average EBITDA margins, which adds to the contraction expected in FY'19. Also the increase of programs for NOC will cause margins to contract in FY'19 as many projects are capital intensive.

Net Margins

Costs will be higher due to new projects and investments in equipment for the buildout of the new B-21 project. Also the increase in interest expenses for NOC, roughly \$133mm for FY'18 could be a cause for contraction moving forward into FY'19. Total company operating costs will be an estimated \$30.1B in FY'19 as a result of new operations with Innovation systems and the restructuring of Technology Systems. Operating income during the 1H'18 was down \$1.6B, down by 3% from \$1.7B, due to an increase in unallocated corporate expenses, largely related to the costs associated with the OA acquisition. Even though there are some headwinds with margin contraction in FY'19, we believe margins will begin to expand moving into FY'20 after full implementation of OA.

**Shareholder Returns**

Share Repurchases

In FY'13, NOC announced a \$4B share repurchase program that would be completed in FY'15. Following the FY'13 repurchase agreement, the board of directors announced in FY'14 that NOC would undergo another repurchasing program of the company's common stock with a total value of \$3B. Completion of the buybacks was completed in FY'16. Most recently, the company embarked on a new repurchase agreement with a value of \$4B starting in FY'15. As of the end of FY'17, buybacks on the agreement totaled \$1.7B, leaving \$2.3B outstanding under the authorization. In 3Q'18, NOC entered into a \$1B accelerated share repurchase (ASR) agreement with Goldman Sachs & Co. Under the agreement, NOC received 3mm shares, or 80% of remaining shares outstanding. NOC's recent activity in the repurchasing of its shares signal healthy cash flows and emphasize its strong mission of value creation for investors, while adding as much as 2% to management's guided EPS figures.

Dividends

Since FY'15, NOC has raised quarterly dividends on common stock by an average of 12.7% each year. Currently, quarterly dividend returns total \$1.20, or \$4.80 annually. Improved cash flows looking forward allow the company to consider further dividend raises, and management's assertive stance on shareholder returns look to continue as FY'20 estimates for annual dividend returns total \$5.32. NOC's dividend payout ratio is 33.8% as of the end of FY'17, a figure representing the amount returned to shareholders as a percentage of the company's net income. NOC's figure indicates strong shareholder returns relative to its peer group and the S&P 500 index.

**MANAGEMENT**

**Wes Bush - Chairman and Chief Executive Officer (CEO)**

Prior to his time with Northrop Grumman, Bush served as the CEO and President of TRW Inc. Additionally, he served as President and COO before he became CEO of Northrop Grumman in 2010. Bush earned both his bachelor's degree and master's degree in electrical engineering from the Massachusetts Institute of Technology. Bush is expected to step down as CEO at the end of the year but will remain as the chairman through July 2019.



**Kathy J. Warden - President and Chief Operating Officer (COO)**

As President and COO, Warden is responsible for the operational management of the company's four operating sectors. She also leads the integration of the new Northrop Grumman Innovation Systems sector. Warden earned a bachelor's degree from James Madison University and a master's degree in business administration from George Washington University. Currently, she serves on the Boards of Directors for the Federal Reserve Bank of Richmond, the Board of Directors for the Wolf Trap Foundation and the James Madison University Board of Visitors. In July 2018, Warden was elected as the next CEO of Northrop Grumman, which will take effect in January 2019.



**Blake Larson - Corporate VP and President of Innovation Systems Sector**

As Corporate Vice President, Larson oversees the strategy, capture, design, build and delivery of space, defense and aviation-related systems to customers around the world. Prior to this role he served as the COO of Orbital ATK, where he held numerous leadership roles, including Senior Vice President, President of the Aerospace Group, and Executive Vice President of the company's Space Systems and Missions Systems sectors. Larson earned a bachelor of science degree in electrical engineering from the University of Minnesota Institute of Technology and a Master of Science degree in management of technology from the University of Minnesota Carlson School of Management.



Date	Insiders	Net Shares Sold	Net Shares Purchased	Closing Price	Shares Transacted
12-Nov-18	Kalan Lesley A	-4158.00		\$277.55	910798
5-Nov-18	Purvis Shawn N	-807.00		\$279.44	1.296M
2-Nov-18	Bush Wesley G	-10,000		\$273.80	1.835M
1-Nov-18	Kalan Lesley A		1,254	\$273.15	1.809M
29-Oct-18	Purvis Shawn N	-1,565		\$256.30	2.521M
3-Oct-18	Cheston Shelia C	-10,440		\$317.63	877,453
28-Sep-18	2 Company Directors		306	\$317.37	1.016M
17-Sep-18	Antkowiak Patrick M	-5,137		\$311.02	1.115M
30-Aug-18	2 Company Directors	-54,543		\$298.69	1.012M
27-Aug-18	Kalan Lesley A	-1,065		\$300.13	636,201
2-Aug-18	Bush Wesley G	-20,000		\$298.69	924,338
1-Aug-18	Bedingfield Kenneth L	-1,442		\$300.90	1.447M
31-Jul-18	3 Company Directors	-15,031		\$300.49	1.724M
12-Nov-18	Perry David T	-4,425		\$294.83	1.273M
29-Jun-18	2 Company Directors		307	\$307.70	695,075
16-May-18	11 Company Directors		5,313	\$321.16	982,509

## PEER GROUP ANALYSIS

**Boeing**

The Boeing Company designs, manufactures, and sells airplanes, rotorcraft, rockets, satellites, and missiles worldwide. Boeing is among the largest global aircraft manufacturers, was the largest aerospace company globally in 2017, and was the fifth-largest defense contractor worldwide in 2017 in terms of revenue. Despite Boeing's largest sector being Commercial Airplanes, the company also derives over \$21.1B of its revenue from its Defense, Space, and Security sector.

**Lockheed Martin**

Lockheed Martin is a global aerospace, defense, security, and advanced Technologies Company. The company's headquarters is in North Bethesda, MD near Washington DC and employs approximately 100,000 people worldwide. Lockheed Martin is the second largest aerospace company in the world in terms of total revenue as of 2017, with over 67% of its revenue coming from Aeronautics and Rotary and Missions Systems segments.

**Raytheon**

Raytheon Company is a technology company, which specializes in defense and other government markets. Based out of Waltham, MA, the company offers integrated products, services and solutions in various markets, including sensing; effects; command, control, communications, computers, cyber and intelligence; mission support, and cyber security. The company operates through five business segments; Integrated Defense Systems; Intelligence, Information and Services; Missile Systems; Space and Airborne Systems, and Force point.

**BAE Systems**

BAE systems is a defense, aerospace, and security company. It is the largest defense contractor in Europe and among the largest defense companies. Headquartered in London, England, it offers a full range of products and services for air, land and naval forces, advanced electronics, security, information technology solutions and support services. BAE systems operates through the following segments: Electronic Systems, Cyber and Intelligence, Platforms and Services, Platforms and Services, and Platform and Services.

**General Dynamics**

General Dynamics is a global aerospace and defense company. Headquartered in West Falls Church, Virginia, the company offers a portfolio of products and services in business aviation; combat vehicles, weapons systems and munitions; information technology services and C4ISR solutions. Popular products include M1 Series Abrams Main Battle Tanks, Atlas rocket family, and Gulfstream jets. The company operates through four segments: Information Systems & Technologies, Aerospace, Marine Systems, and Combat Systems.

**APPENDIX**

**Exhibit I: Price Target Calculations**

<b>EV/EBITDA Valuation</b>	<b>LTM Multiple</b>	<b>NTM Multiple</b>
Period 1 EBITDA	\$920	\$920
Period 2 EBITDA	\$976	\$976
Period 3 EBITDA	\$982	\$982
Period 4 EBITDA	\$1,431	\$1,431
<b>NTM EBITDA</b>	<b>\$4,309</b>	<b>\$4,309</b>
Target EV/EBITDA	16.41x	15.18x
<b>Enterprise Value</b>	<b>\$70,711</b>	<b>\$65,411</b>
Less: Net Debt	-12,661	-12,661
<b>Equity Value</b>	<b>\$58,049.69</b>	<b>\$52,749.62</b>
Latest diluted share count	174.9	174.9
<b>Target Price</b>	<b>\$331.90</b>	<b>\$301.60</b>
Current Price	\$249.84	\$249.84
<b>Return</b>	<b>34.71%</b>	<b>22.58%</b>
<b>Total Return</b>		
<b>Change in Multiple</b>	0.25x	
<b>Change in EBITDA</b>	2.00%	

	<b>EV/EBITDA NTM Multiple</b>				
	14.68x	14.93x	15.18x	15.43x	15.68x
\$4,138	\$274.96	\$280.87	\$286.79	\$292.70	\$298.62
\$4,223	\$282.05	\$288.08	\$294.12	\$300.16	\$306.19
\$4,309	\$289.28	\$295.44	\$301.60	\$307.76	\$313.92
\$4,395	\$296.51	\$302.80	\$309.08	\$315.36	\$321.64
\$4,483	\$303.89	\$310.30	\$316.71	\$323.12	\$329.52

	<b>EV/EBITDA NTM Multiple Returns</b>				
	14.68x	14.93x	15.18x	15.43x	15.68x
\$4,138	10.05%	12.42%	14.79%	17.16%	19.52%
\$4,223	12.89%	15.31%	17.72%	20.14%	22.55%
\$4,309	15.79%	18.25%	20.72%	23.18%	25.65%
\$4,395	18.68%	21.20%	23.71%	26.23%	28.74%
\$4,483	21.63%	24.20%	26.76%	29.33%	31.89%

**Exhibit II: Comps Table**

**Comparable Company Analysis - Northrop Grumman Corporation**

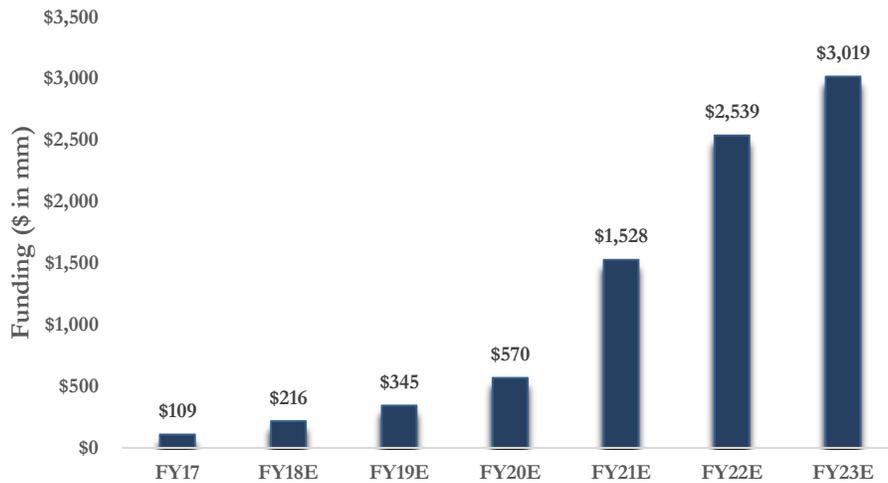
*\$ USD in Millions Except Per Share Amounts*

Company	Ticker	Market Valuation		LTM Financial Statistics				LTM Profitability Margins			EV Multiples			Price Multiples		
		Equity Value	Enterprise Value	Sales	Sales Growth (%)	EBITDA	Net Income	EBITDA (%)	EBIT (%)	Net Income (%)	EV / EBITDA	NTM EV / EBITDA	EV / Sales	P/E	NTM P/E	NTM P/S
<b>Northrop Grumman Corporation</b>	<b>NOC</b>	<b>55,135.9</b>	<b>67,796.9</b>	<b>285.7</b>	<b>10.5%</b>	<b>4,309.0</b>	<b>2,750.0</b>	<b>15.1%</b>	<b>12.7%</b>	<b>9.6%</b>	<b>15.7x</b>	<b>11.7x</b>	<b>2.0x</b>	<b>15.1x</b>	<b>14.7x</b>	<b>1.3x</b>
General Dynamics Corporation	GD	60,627.8	72,698.8	340.9	12.3%	4,922.0	3,072.0	14.4%	12.5%	9.0%	14.8x	11.9x	1.9x	16.5x	15.5x	1.4x
BAE Systems Plc	BAESY	-	22,599.7	174.7	(5.2%)	2,007.0	770.0	11.5%	7.2%	4.4%	11.3x	-	-	-	10.6x	0.8x
The Boeing Company	BA	211,610.7	213,576.7	981.5	6.1%	12,953.0	10,168.0	13.2%	11.0%	10.4%	16.5x	13.0x	2.1x	23.4x	20.6x	1.9x
Lockheed Martin Corporation	LMT	98,598.6	112,486.6	544.9	9.3%	8,514.0	3,151.0	15.6%	13.3%	5.8%	13.2x	11.4x	1.8x	16.5x	15.7x	1.6x
Raytheon Company	RTN	58,898.1	62,438.1	264.8	6.6%	4,760.0	2,470.0	18.0%	15.8%	9.3%	13.1x	10.2x	2.0x	19.6x	15.2x	1.7x
<b>Mean</b>		<b>107,433.8</b>	<b>96,760.0</b>	<b>461.4</b>	<b>8.8%</b>	<b>6,631.6</b>	<b>3,926.2</b>	<b>14.5%</b>	<b>12.0%</b>	<b>7.8%</b>	<b>13.8x</b>	<b>11.6x</b>	<b>2.0x</b>	<b>19.1x</b>	<b>15.3x</b>	<b>1.3x</b>
<b>Median</b>		<b>79,613.2</b>	<b>72,698.8</b>	<b>340.9</b>	<b>6.6%</b>	<b>4,922.0</b>	<b>3,072.0</b>	<b>14.4%</b>	<b>12.5%</b>	<b>9.0%</b>	<b>13.2x</b>	<b>11.6x</b>	<b>2.0x</b>	<b>18.2x</b>	<b>15.3x</b>	<b>1.6x</b>
<b>High</b>		<b>211,610.7</b>	<b>213,576.7</b>	<b>981.5</b>	<b>12.3%</b>	<b>12,953.0</b>	<b>10,168.0</b>	<b>18.0%</b>	<b>15.8%</b>	<b>10.4%</b>	<b>16.5x</b>	<b>13.0x</b>	<b>2.1x</b>	<b>23.4x</b>	<b>20.6x</b>	<b>1.9x</b>
<b>Low</b>		<b>58,898.1</b>	<b>22,599.7</b>	<b>174.7</b>	<b>(5.2%)</b>	<b>2,007.0</b>	<b>770.0</b>	<b>11.5%</b>	<b>7.2%</b>	<b>4.4%</b>	<b>11.3x</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>10.6x</b>	<b>0.8x</b>

Company	Ticker	General		LTM Return on Investment			LTM Leverage Ratios			Coverage Ratios		Credit Ratings				
		Tax Rate	Beta	ROIC (%)	ROE (%)	ROA (%)	Dividend Yield (%)	Tot. Debt / Cap (%)	Tot. Debt / Equity (%)	EBITDA / Int. Exp. (x)	(EBITDA - Capex) / Int. Exp. (x)	EBIT / Int. Exp. (x)	WACC	Moody's	S&P	
<b>Northrop Grumman Corporation</b>	<b>NOC</b>	<b>33.9%</b>	<b>0.79</b>	<b>12.3%</b>	<b>35.3%</b>	<b>8.5%</b>	<b>1.8%</b>	<b>68.4%</b>	<b>3.2x</b>	<b>216.6%</b>	<b>13.8x</b>	<b>10.4x</b>	<b>12.1x</b>	<b>7.6%</b>	<b>Baa1</b>	<b>BBB</b>
General Dynamics Corporation	GD	28.6%	1.04	15.8%	25.3%	7.5%	2.0%	25.8%	2.7x	34.8%	-	-	-	9.1%	A2	A+
BAE Systems Plc	BAESY	22.0%	0.76	9.5%	16.6%	3.4%	3.5%	46.0%	2.1x	85.3%	10.3x	8.3x	6.7x	10.8%	Baa2	BBB
The Boeing Company	BA	18.4%	1.12	78.5%	-	9.9%	1.9%	96.4%	0.9x	2698.3%	23.4x	20.1x	19.5x	10.7%	A2	A+
Lockheed Martin Corporation	LMT	63.4%	0.78	29.4%	207.2%	6.7%	3.0%	104.5%	1.7x	-	11.7x	9.7x	9.7x	7.8%	Baa1	BBB+
Raytheon Company	RTN	35.8%	0.85	27.7%	23.3%	8.2%	2.0%	32.5%	1.1x	48.2%	18.1x	15.5x	15.5x	8.6%	A3	A+
<b>Mean</b>		<b>33.6%</b>	<b>0.91</b>	<b>32.1%</b>	<b>67.8%</b>	<b>7.1%</b>	<b>2.5%</b>	<b>61.1%</b>	<b>1.7x</b>	<b>716.7%</b>	<b>15.9x</b>	<b>13.4x</b>	<b>12.9x</b>	<b>9.4%</b>	-	-
<b>Median</b>		<b>28.6%</b>	<b>0.85</b>	<b>27.7%</b>	<b>23.8%</b>	<b>7.5%</b>	<b>2.0%</b>	<b>46.0%</b>	<b>1.7x</b>	<b>66.8%</b>	<b>14.8x</b>	<b>12.6x</b>	<b>12.8x</b>	<b>9.1%</b>	-	-
<b>High</b>		<b>63.4%</b>	<b>1.12</b>	<b>78.5%</b>	<b>207.2%</b>	<b>9.9%</b>	<b>3.5%</b>	<b>104.5%</b>	<b>2.7x</b>	<b>2698.3%</b>	<b>23.4x</b>	<b>20.1x</b>	<b>19.5x</b>	<b>10.8%</b>	-	-
<b>Low</b>		<b>18.4%</b>	<b>0.76</b>	<b>9.5%</b>	<b>16.6%</b>	<b>3.4%</b>	<b>1.9%</b>	<b>25.8%</b>	<b>0.9x</b>	<b>34.8%</b>	<b>10.3x</b>	<b>8.3x</b>	<b>6.7x</b>	<b>7.8%</b>	-	-

**Exhibit III: GBSD Budget Proposal**

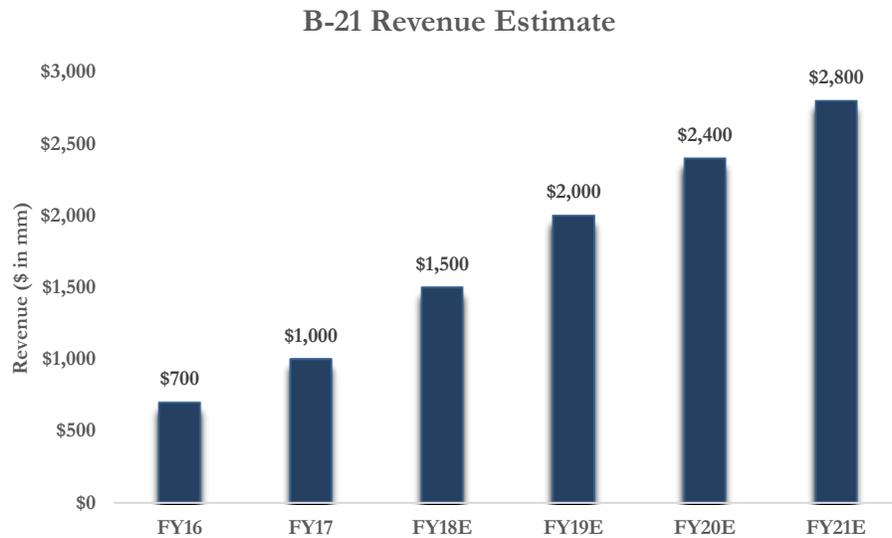
**GBSD Budget Proposal**



**Exhibit IV: B-21 Revenue Estimate**

<b>B-21 Raider Revenue Potential through FY'38</b>			
	<u>Number of B-21s Ordered</u>	<u>Cost Per Plane</u>	<u>Potential Revenue</u>
<b>Bear</b>	100	\$564,000,000	\$56,400,000,000
<b>Base</b>	150	\$564,000,000	\$84,600,000,000
<b>Bull</b>	250	\$564,000,000	\$141,000,000,000

**Exhibit V: B-21 Revenue Potential for Program Life**



**Exhibit VI: F-35 Production Over Useful Life**

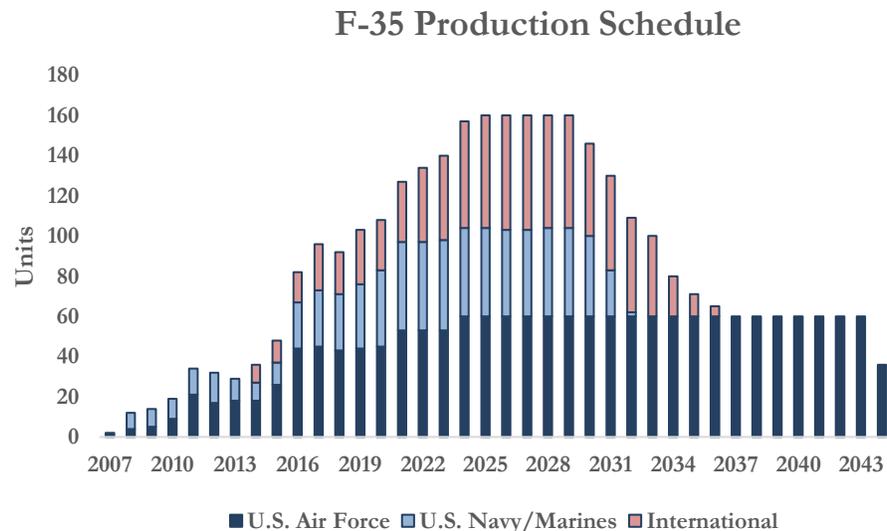
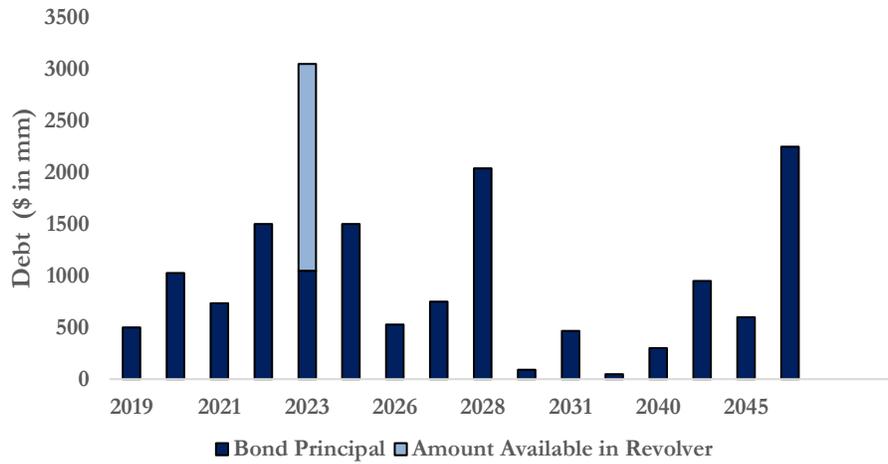


Exhibit VII: Northrop Grumman Debt Distribution

**NOC Debt Distribution**



**DISCLAIMER**

This report is prepared strictly for educational purposes and should not be used as an actual investment guide. The forward-looking statements contained within are simply the author's opinions. The writer does not own any NOC stock.

**TUIA STATEMENT**

Established in honor of Professor William C. Dunkelberg, former Dean of the Fox School of Business, for his tireless dedication to educating students in “real-world” principles of economics and business, the William C. Dunkelberg (WCD) Owl Fund will ensure that future generations of students have exposure to a challenging, practical learning experience. Managed by Fox School of Business graduate and undergraduate students with oversight from its Board of Directors, the WCD Owl Fund's goals are threefold:

- Provide students with hands-on investment management experience
- Enable students to work in a team-based setting in consultation with investment professionals.
- Connect student participants with nationally recognized money managers and financial institutions

Earnings from the fund will be reinvested net of fund expenses, which are primarily trading and auditing costs and partial scholarships for student participants.