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Date
29 September 2017

FITT Research

Missile Defense: Money Well Spent; Budgets Unlikely to Stay Flat

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F.I.T.T. for investors

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Missile Defense value proposition coming to the forefront

The rising rhetoric and public demonstrations by North Korea of their missile technology have brought to newspaper front pages the threat of a missile being launched at US territory for the first time in decades. The National Missile Defense Act of 1999 was passed to anticipate and address such a threat as stated: "It is the policy of the United States to deploy, as soon as is technologically possible, an effective National Missile Defense system capable of defending the territory of the United States against limited ballistic missile attack (whether accidental, unauthorized, or deliberate), which spurred the establishment of the Ballistic Missile Defense System." That Act, along with the US withdrawal from the Anti-Ballistic Missile Treaty in 2001, set the stage for the near-tripling of the Missile Defense budget from $3B/yr from 1985-2000 toward the $8-10B run-rate it has been at ever since. After declining in constant dollar terms nearly 25% over the last decade, the politics and growing missile threats to US territory are setting the table for another leg up in Missile Defense spending, which we think could claw back all those declines in relatively short order.

US budgets have largely stayed put as international has grown

On the back of the 1999 National Missile Defense Act and increasing global hostilities, the US ramped its spending heavily on the full spectrum of missile defense, from sensors to interceptors to command & control systems. That spending has stayed at elevated levels since the early 2000s with modest ups and downs. However, in the current decade, it's actually been the international market growth in missile defense that is the most pronounced. In fact, in the US, the Missile Defense budget appropriations have been ~$8B for the last 10 years and the baseline proposal from the Obama administration was for a flat $8B from here through 2022. In contrast, the international market for missile defense made most of its big gains in the last 10 years since the Middle East foreign policy in 2006 shifted to a more relaxed missile export policy, which in part was establishing a balance vs. Iran. Importantly, with the rising tensions globally and a Ballistic Missile Defense Review (BMDR) set for release this Fall, we see a strong case that both the US and international markets could have solid growth over the next 5yrs.

But the US is likely to step it up from here; defense names poised to benefit - RTN moves to Buy

We believe the US will be reopening the purse strings on the Missile Defense budget both in the area of the increasing production of currently developed

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Key Changes

Company	Target Price	Rating
GD.N	200.00 to 210.00	-
LLL.N	190.00 to 205.00	-
RTN.N	180.00 to 210.00	Hold to Buy
LMT.N	305.00 to 340.00	-
NOC.N	285.00 to 325.00	-

Source: Deutsche Bank

Top picks

The Boeing Company (BA.N),USD255.28	Buy
Huntington Ingalls (HII.N),USD223.46	Buy
L3 Technologies (LLL.N),USD188.97	Buy
Lockheed Martin (LMT.N),USD310.13	Buy
Northrop Grumman (NOC.N),USD286.84	Buy
Raytheon (RTN.N),USD184.55	Buy

Source: Deutsche Bank

Valuation and Risks
We use historical fwd PE multiples for valuation purposes, as it is the most widely used metric across our coverage. Sector risks: lower/higher than expected defense funding, program execution, less favorable contracting/contract wins.

systems (doubling the planned interceptors) as well as the start of new programs from space sensors to boost phase of missile defense. The US Companies within our coverage universe that have the most exposure to missile defense are: RTN, LMT, BA, and NOC/OA. On a market-cap adjusted basis, Raytheon is the most exposed to missile defense trends and helps push us to upgrade the stock to Buy from Hold, while other Buy rated defense names NOC and LMT should also benefit. Despite a relatively thin content of Missile Defense business today, NOC seems the best poised for growth in the area given its pending acquisition of OA and the likely pivot of the US to again consider the merits of boost phase missile defense, as well as higher space-based missile defense asset investments. NOC remains our top Defense pick. On the back of this report, we raised our price targets for NOC, RTN and LMT present additional 15% upside in the names over the next 12mo (see Figure 32 for details).

Companies featured

The Boeing Company (BA.N),USD255.28			Buy
	2016A	2017E	2018E
EPS (USD)	7.23	10.13	11.34
P/E (x)	18.4	25.2	22.5
EV/EBITDA (x)	10.8	13.3	11.6
General Dynamics (GD.N),USD206.80			Hold
	2016A	2017E	2018E
EPS (USD)	9.87	9.77	10.41
P/E (x)	14.8	21.2	19.9
EV/EBITDA (x)	9.7	13.6	13.0
Huntington Ingalls (HII.N),USD223.46			Buy
	2016A	2017E	2018E
EPS (USD)	12.14	11.64	12.63
P/E (x)	12.7	19.2	17.7
EV/EBITDA (x)	7.5	10.3	9.5
L3 Technologies (LLL.N),USD188.97			Buy
	2016A	2017E	2018E
EPS (USD)	8.21	8.80	9.45
P/E (x)	16.8	21.5	20.0
EV/EBITDA (x)	11.3	13.1	12.2
Lockheed Martin (LMT.N),USD310.13			Buy
	2016A	2017E	2018E
EPS (USD)	12.38	12.59	14.22
P/E (x)	19.2	24.6	21.8
EV/EBITDA (x)	10.9	12.5	11.2
Northrop Grumman (NOC.N),USD286.84			Buy
	2016A	2017E	2018E
EPS (USD)	12.19	12.40	13.76
P/E (x)	17.4	23.1	20.8
EV/EBITDA (x)	11.6	14.7	14.1
Orbital ATK (OA.N),USD132.64			Hold
	2016A	2017E	2018E
EPS (USD)	5.53	6.09	6.65
P/E (x)	15.0	21.8	20.0
EV/EBITDA (x)	9.0	12.1	11.5
Raytheon (RTN.N),USD184.55			Buy
	2016A	2017E	2018E
EPS (USD)	7.45	7.47	8.29
P/E (x)	18.0	24.7	22.3
EV/EBITDA (x)	10.7	14.0	12.9

Source: Deutsche Bank

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Missile Threats Expanding; Policy/Budgets Will Follow

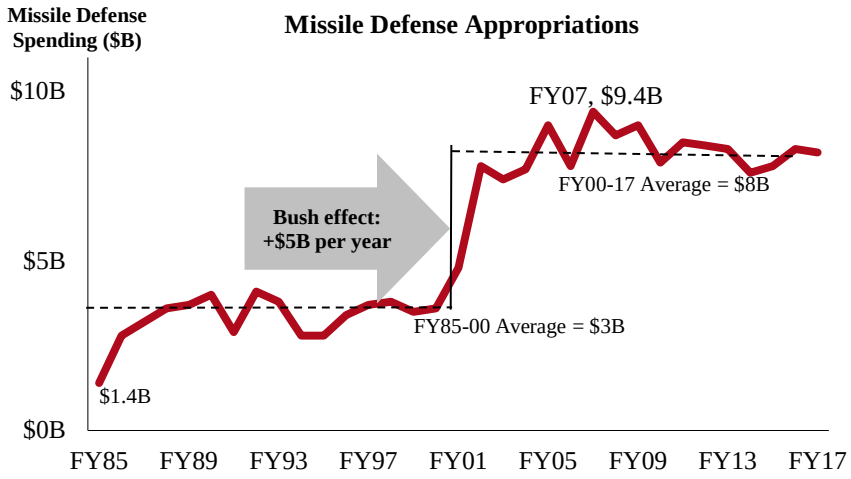
Almost 30 years ago, the Cold War threat posture gave wave to a peace dividend that was reversed by the attacks on 9/11. The US response to those attacks was swift, meant to "take the fight to the terrorists" and thereby limit further potential attacks on US soil. The approach has been largely successful and certainly more successful than the population probably thought in the months following 9/11, when Gallup polls showed 80% of the population thought terrorist acts would continue with regular occurrence. Beyond the spending on overseas operations, though, was also a significant increase in the US missile defense budget. The budget increase and heightened national security posture toward missile defense were already set in motion prior to 9/11 (i.e. George W. Bush ran on a very clear Missile Defense expansion platform), but the higher overall defense spending allowed forward-thinking military planners to significantly accelerate the missile defense build-up from a $3-4B run-rate to a $7-10B run-rate.

As the Missile Defense spending was on the rise, so too was the number of ballistic missile launches and initiation of new ballistic missile developments (see Figure 2 and Figure 3). In particular, the mid-2000s saw the rise in the threat of Iran's nuclear ambitions to the broader Middle East region; the missile activity then and now remains a concern, but the major pivot in the last year (in particular, recent months) for military planners has been toward the situation in North Korea. Increasingly, Iran and North Korea are cementing a strong validation of the requirements that originally established the National Missile Defense Act of 1999.

"It is the policy of the United States to deploy, as soon as is technologically possible, an effective National Missile Defense system capable of defending the territory of the United States against limited ballistic missile attack (whether accidental, unauthorized, or deliberate) with funding subject to the annual authorization of appropriations and the annual appropriation of funds for National Missile Defense."
PL 106-38

While the passage of the National Missile Defense Act of 1999 was important as a foundation, the tipping point higher of the Missile Defense budget was the policy shift in the George W. Bush administration that moved the US past the limitations of the long-standing 1972 Anti-Ballistic Missile ("ABM") Treaty. The Clinton administration's policy was moving in the direction of higher missile defense spending, but it was the withdrawal from the ABM Treaty in December 2001 that opened the flood gates of Missile Defense budgets (as shown in Figure 1). Looking forward, there are some policy constraints, particularly in space, which if lifted could supercharge selective growth, but overall, we see growth in MDA as less policy governed and more politically- and threat-driven. Moreover, we expect growth will come in areas of Missile Defense that were explored 15 years ago, but wherein the technology hadn't reached the level of maturity for viable solutions, particularly in the boost phase of missile defense as well as in space-based sensor solutions. We also expect the DoD to redouble their efforts in testing the system, which is far from easy.

Figure 1: History of Missile Defense Budgets--10 years of stagnation likely to end

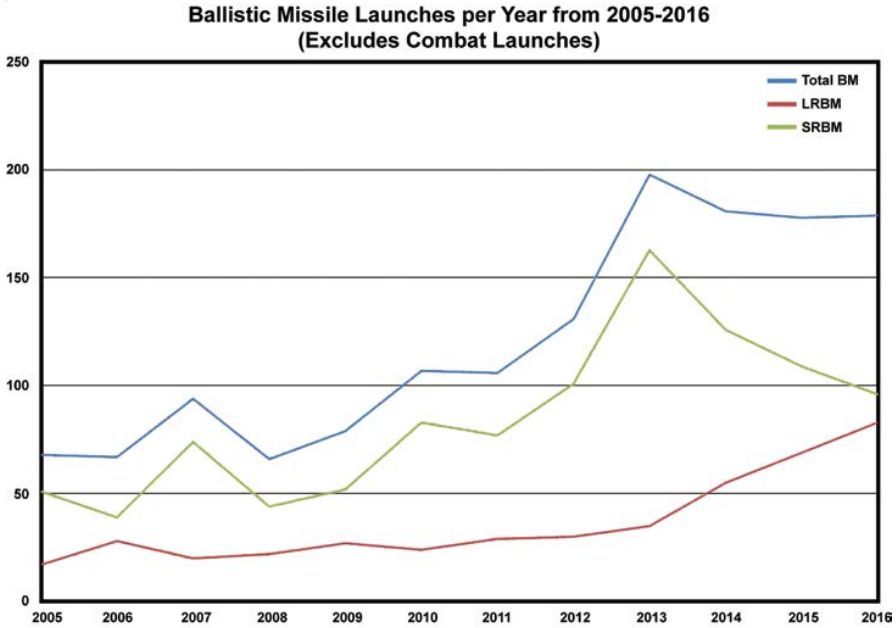


Source: Department of Defense, Deutsche Bank

Politics and threats collision will drive higher spending

The threat from expanding missile technology by potentially adversarial nations is on the rise and has been since the early 2000s (see Figure 3). The most visible signal of that being the acceleration in missile technology breakthroughs and launches by North Korea. On the back of this accelerating tension is a rising tide of political support. A bipartisan call for higher missile defense spending seems to be gaining traction, with the "Advancing America's Missile Defense Act of 2017" gaining 27 cosponsors in the Senate (21 Republicans, 5 Democrats and 1 Independent) introduced in May 2017. The bill laid out a few points for its rallying cry, but in particular drove home that a 23% decline in Missile Defense Agency budget since 2006 (while Iran and North Korea activity was going in the opposite direction) needed to be corrected. In the Bill, there is explicit language to: 1) increase the number of ground-based interceptors (by 28 with expansion to 100 interceptors vs. the 44 scheduled to be in place at the end of 2017, 2) reintroduce the development and deployment of space-based missile defense sensors (e.g. Space Tracking and Surveillance System--STSS), and 3) evaluation and testing of radar and sensors for the ground-based midcourse systems (e.g. LRDR) as well as the system as a whole (for which testing funding has declined over 83% since 2006). More additions are possible following recommendations from the Department of Defense's upcoming Ballistic Missile Defense Review ("BMDR") and Missile Defeat Review ("MDR"). Even more near-term, the DoD this week released details of a budget reprogramming request for 2017 for over $400M ~5% of the Missile Defense budget) toward previously unfunded missile defense efforts consistent with the desires laid out in the "Advancing America's Missile Defense Act of 2017".

Figure 2: Tripling of Ballistic Missile Launches in 10 years



Source: Ballistic And Cruise Missile Threat, June 2017, US Defense Intelligence Ballistic Missile Analysis Committee

The two largest contributors to the rise in ballistic missile launches over the last 5 years are, not surprisingly, Iran and North Korea accelerating their testing programs on their ballistic missile programs, for which they account for the bulk of new systems under development (as shown in Figure 3). The irony of the next few years for the United States is that it will be initiating its own $100B effort to develop a new Intercontinental Ballistic Missile under the Ground Based Strategic Deterrent (GBSD), as well as $20B to develop a new Nuclear Cruise Missile under the Long Range Standoff (LRSO) program, which will make the US negotiating position against ballistic missile development globally that much more tenuous, and ironically will further solidify the case for higher Missile Defense spending.

Figure 3: Global Ballistic Missile Systems under development

#	System	Country	Year	Range (km)
1	V-2 SRBM	Germany	1942	320
2	SS-1 SRBM	Soviet Union	1948	270
3	SS-2 SRBM	Soviet Union	1949	1,200
4	SS-3 MRBM	Soviet Union	1955	1,200
5	SS-6 ICBM	Soviet Union	1957	8,000+
6	SS-9 ICBM	Soviet Union	1963	10,200+
7	CSS-1 MRBM	China	1964	1,250
8	CSS-2 MRBM	China	1966	2,500
9	SS-13 ICBM	Soviet Union	1966	9,500
10	CSS-3 ICBM	China	1970	5,500+
11	CSS-4 ICBM	China	1971	12,000+
12	SS-18 ICBM	Russia	1973	10,000+
13	SS-19 ICBM	Russia	1973	9,000+
14	CSS-5 MRBM	China	Late 1970s	1,750+
15	JL-1 SLBM	China	1981	1,700
16	SS-24 ICBM	Russia	1982	10,100+
17	SS-25 ICBM	Russia	1983	11,000+
18	SCUD-B SRBM	North Korea	1984	300
19	No Dong MRBM	North Korea	1993	1,200+
20	SS-27 ICBM	Russia	1994	11,000+
21	SS-26 SRBM	Russia	1996	350
22	TD-1 MRBM	North Korea	1998	2,000+
23	Shahab 3 MRBM	Iran	1998	Up to 2,000
24	Agni-II MRBM	India	1999	2,000+
25	CSS-10 ICBM	China	1999	7,000+
26	Agni-I SRBM	India	2002	700
27	Fateh-110 SRBM	Iran	2002	300
28	CSS-5 Mod 5 MRBM	China	Mid-2000s	1,500+
29	TD-2 ICBM/SLV	North Korea	2006	12,000+
30	Sejjil MRBM	Iran	2009	2,000
31	Emad MRBM	Iran	2015	Up to 2,000
32	Shaheen-3 MRBM	Pakistan	2015	2,750
33	Hwasong-10 (Musudan) IRBM	North Korea	2016	3,000+
34	Bukkeukseong-2 MRBM	North Korea	2017	1,000+
35	Hwasong-12 IRBM	North Korea	2017	3,000+

Source: Ballistic And Cruise Missile Threat, June 2017, US Defense Intelligence Ballistic Missile Analysis Committee

"Iran, Iran, Iran"

While commander of US CENTCOM, then-General (now Secretary of Defense) Jim Mattis listed the three biggest threats to the US as, "Iran, Iran, Iran." (We'd guess if he were in charge of PACOM, the response might have been North Korea, North Korea, North Korea). The US continues to view the Iranian government as the foremost state sponsor of terrorism and a broader enabler of missile proliferation as well as a country intent on the development of nuclear weapons.

Iranian firepower

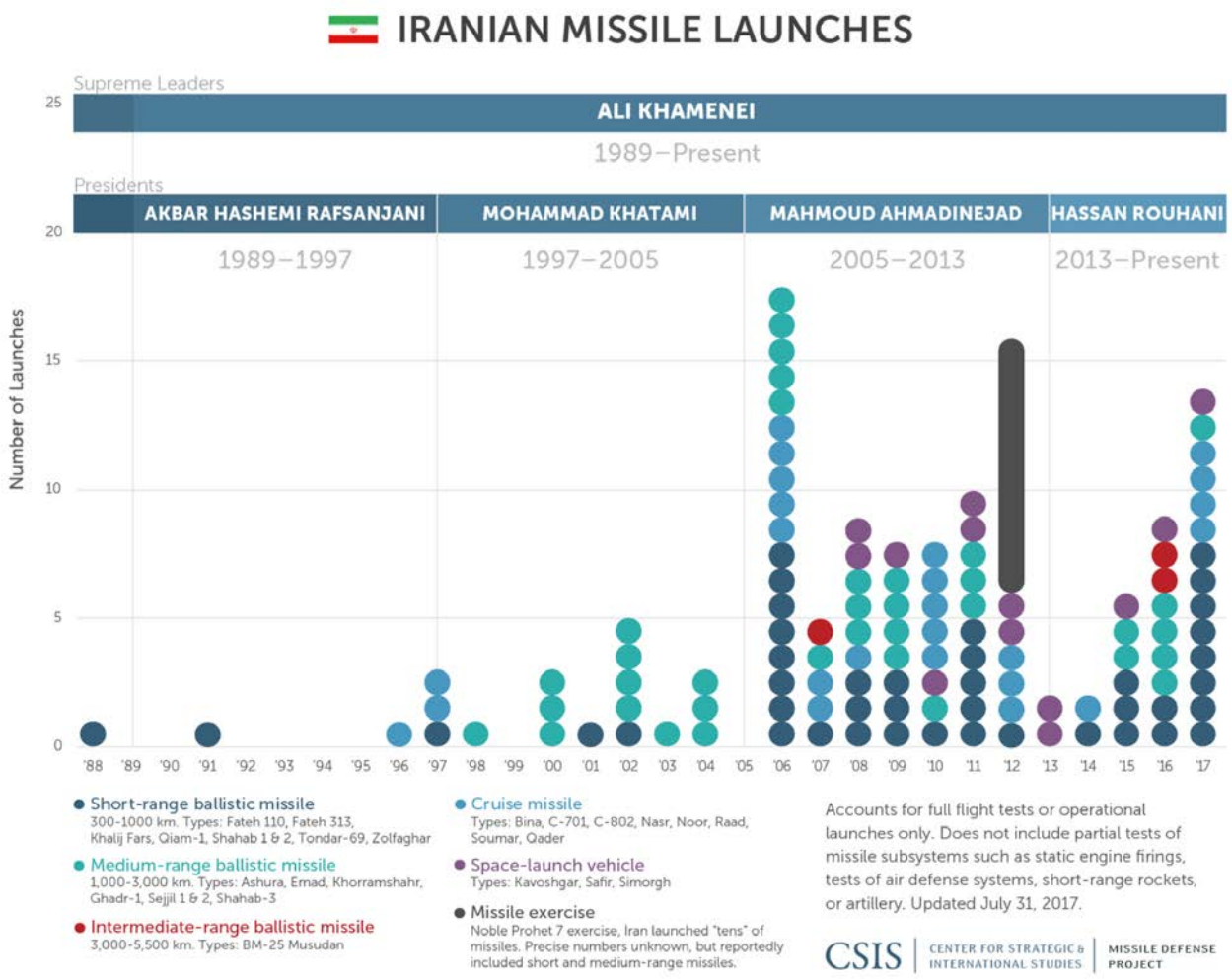
Although the range of Iran's ballistic missiles today limits its reach (Figure 4), the US Intelligence Community expects that Iran will continue to pursue intercontinental ballistic missile capabilities as the primary means of US deterrence over the long-term. Though under harsh economic sanctions, Iran continues to hone its ballistic missile capability under the auspice of its space launch vehicle program. Some analysts predict that Iran may be able to deploy an operational ICBM by 2020 and, more urgently, Iran's Simorgh space launch vehicle would be capable of ICBM ranges if configured accordingly. Iran has also steadily increased its SRBM and MRBM stockpile and is developing new missiles that build upon the accuracy and lethality of existing systems.

Figure 4: Iranian Missile Portfolio and Range

Source: Center for Strategic and International Studies

In spite of the 2015 nuclear deal with the Obama administration aimed at curbing Iran's nuclear program, Iran continues to invest in and make advances in its ballistic missile technology, as well as increase its cruise missile testing, as shown in Figure 5. In light of the further launches in 2017, the Trump administration clamped down on further sanctions in June on suppliers that the Treasury Department viewed as central to the ballistic missile program. The 2015 deal language ambiguity of "calling upon" Iran to not undertake ballistic missile technology advancement vs. the stricter language from a 2010 resolution that said Iran "shall not" undertake missile technology is providing the confidence to Iran to continue with its testing at pace with prior years. There are no signs that Iran has any intention of curbing its missile technology advancement in spite of the 2015 deal, and instead most anticipate that the country will continue to press ahead on developing a missile capable of reaching the US by 2020.

Figure 5: Iranian Missile Launches under Ayatollah Khamenei



Source: Center for Strategic and International Studies

North Korea's sabre rattling to realism

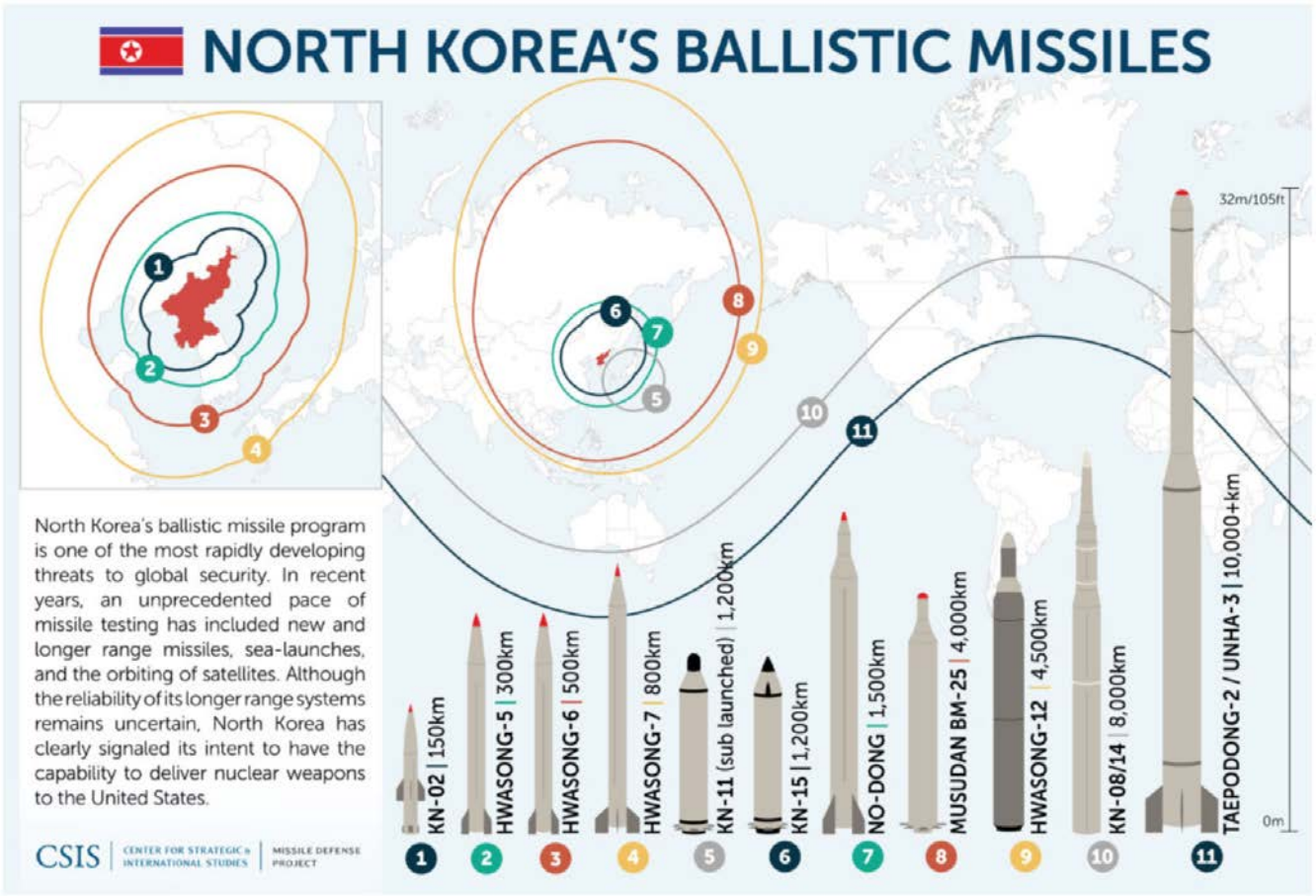
US policy on North Korea in recent decades has been coined as "strategic patience," containing North Korean aggression just enough to avoid all-out war. That patience is being increasingly tested as North Korea's missiles start to put territories of the US in range. With the up-tick in missile tests, nuclear testing, and now even more bellicose actions from the regime, the US is faced with the dilemma of trying to disrupt the fast-track that North Korea is marching down through military action if diplomatic attempts continue to show no signs of success, or instead accept the consequence of the end state that North Korea is driving toward. No matter the strategy employed, however, a key element of any option will be a bolstering of missile defense efforts at all costs, which should provide discouragement for adversaries to believe that they can use ballistic missiles as tools of intimidation.

North Korean Firepower

North Korea's national security strategy has pivoted from its use of a conventional military to asymmetric capabilities and the development of weapons of mass destruction. The country has expanded the size and sophistication of its missile

arsenal to include close range ballistic missiles and ICBMs (Figure 6). The intelligence community continues to struggle in getting high-quality information on where the missile and nuclear programs are in their development in large part due to the closed nature of society in North Korea.

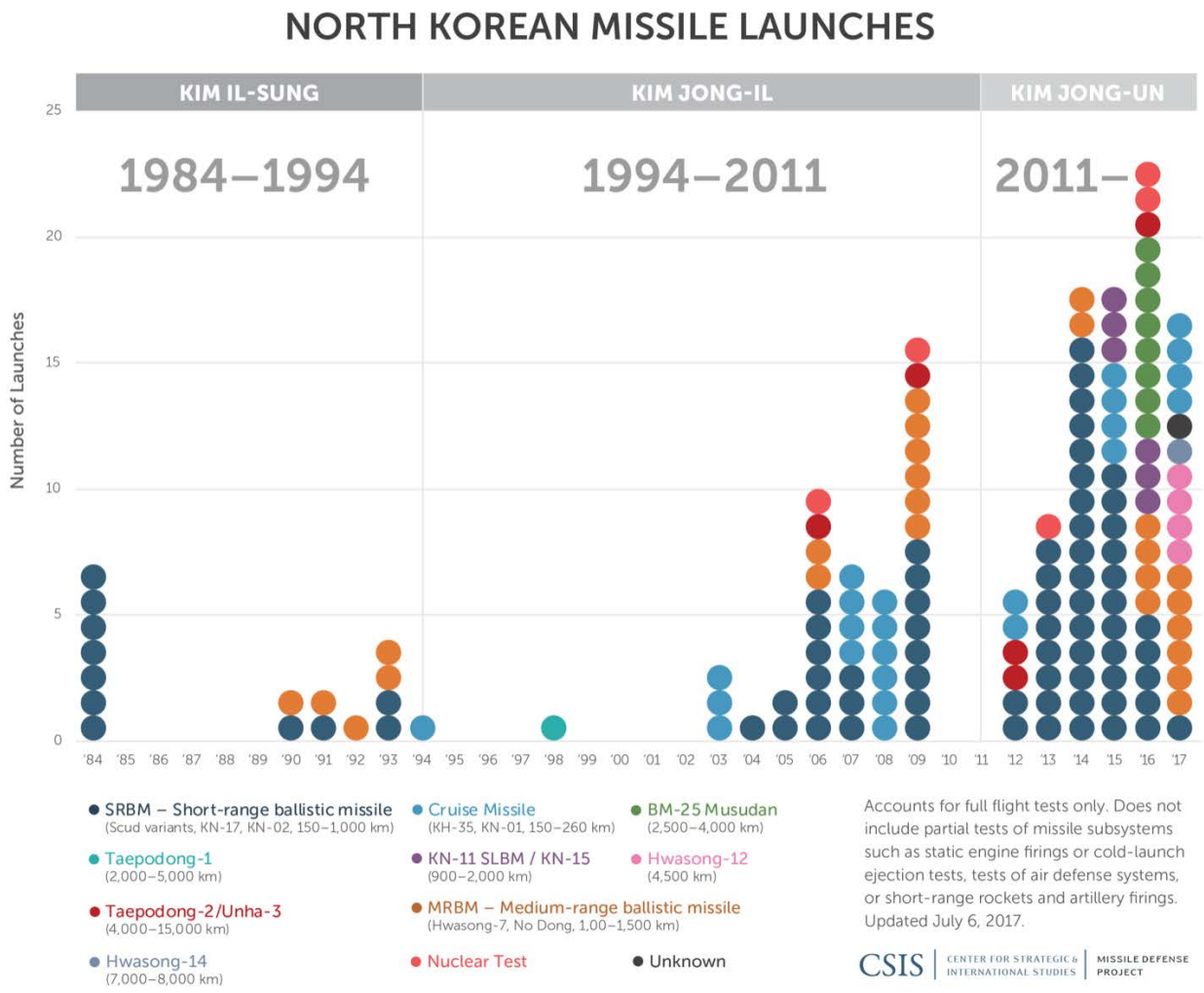
Figure 6: North Korea's Ballistic Missile Stockpile



Source: Center for Strategic and International Studies

North Korean missile testing has escalated in recent years (Figure 7), with the most recent test of the Hwasong-14 showing the potentiality of hitting Alaska and Guam and, if at an Eastern-facing trajectory, Hawaii. The configuration of the ballistic missile they tested in August could have rocket motors used in ICBMs capable of ranging the continental USA. Current leader Kim Jong Un has fired more missile tests than his predecessors, and continues to threaten the security of his neighbors and the US and its territories. The September test of a new thermonuclear bomb design, which caused an earthquake and exhibited an explosive yield nearly 10 times greater than the H-bomb the USA dropped on Hiroshima, potentially brings North Korea across the nuclear threshold and raises the stakes of a US-North Korean conflict to devastating proportions.

Figure 7: North Korean Missile Launches



Source: Center for Strategic and International Studies

US Missile Defense Systems

Missile Defense Systems

The US Missile Defense umbrella encompasses all components designed to defeat ballistic missiles of hostile origin and various ranges. The systems begins with the sensors that identify launches and track targets, the command, control and battle management system for the systems and ends with the interceptors that neutralize the incoming missile. The system has components in space, in the air, on land and on sea and represents one of the most complex set of programs in the portfolio of the department of defense. The primary authority responsible for the fielding of the integrated, layered defense is the Missile Defense Agency with close cooperation with the each of the Armed Services that often have a role in acquiring and operating pieces of the overall system. Figure 8 from the Missile Defense Agency provides a snapshot of the systems that comprise the US ballistic missile defense system.

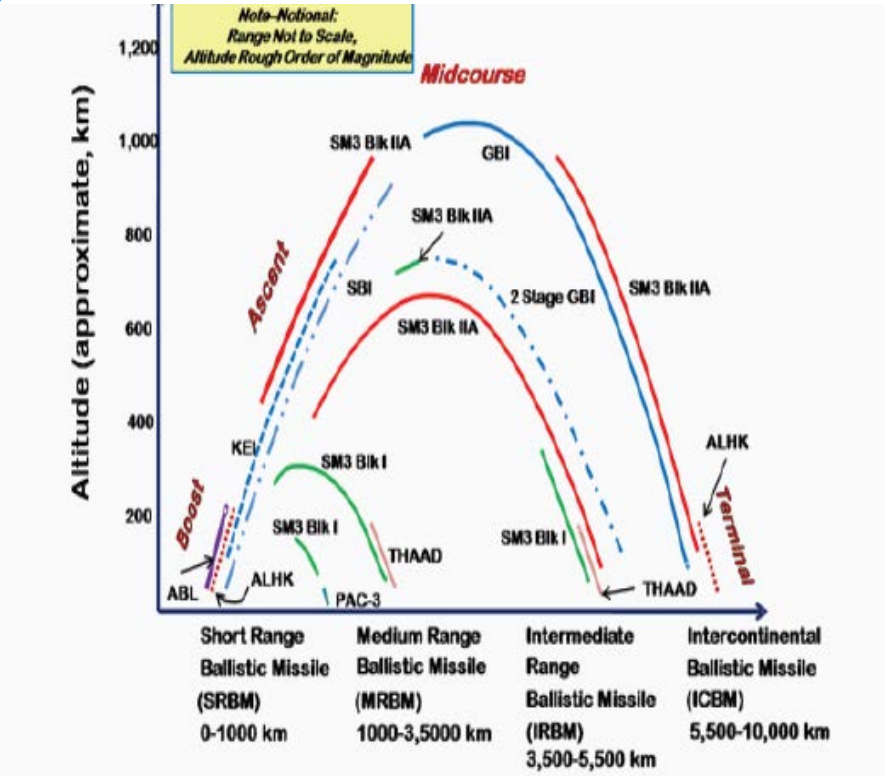
Figure 8: US Ballistic Missile Defense-- Sensors and Systems

Source: Missile Defense Agency

The US ballistic missile defense system protects US interests from all types of ballistic missiles with the various systems in the different layers (boost, midcourse and terminal) along with the missile defense sensors working in concert to create a firing solution against ballistic threats. Unlike cruise missiles, most of a ballistic missile's trajectory is unpowered and guided only during brief stretches of flight,

and the trajectory occurs in three stages: launch/boost, free-flight/midcourse, and re-entry/terminal into Earth's atmosphere. Figure 9 highlights four types of balistic missile families (as characterized by range) and the pieces of the Missile Defense systems meant to neutralize the threat.

Figure 9: The pieces of Missile Defense and their mission vs. different threats



Source: National Academy of Sciences (acronyms: ABL-Airborne Laser, KEI-Kinetic Energy Interceptor, SMX-Standard Missile, ALHK-Air-launched Hit-to-kill, THAAD-Theater High Altitude Area Defense, GBI-Ground Based Interceptor)

Aegis Ballistic Missile Defense

Aegis BMD is the naval component of the Ballistic Missile Defense System. The system builds upon the Aegis Weapons System, Standard Missile, and the Navy and Joint Forces' Command, Control and Communications System. The system uses variants of the SM-3 to intercept short-to-intermediate-range ballistic missiles during midcourse. It is integrated on certain Ticonderoga-class cruises and Arleigh Burke Guided Missile Destroyers. The system provides air and fleet defense against enemy aircraft and cruise missiles using SM-2, SM-6, ESSM and ship defense systems (e.g. CIWS), as well as the control of Tomahawk missiles.

The system is currently deployed on 84 US naval vessels, 33 of which have ballistic missile defense capabilities. The number is scheduled to increase by 3 with the FY18 addition of three new Flight IIA destroyers. It is the first missile defense system produced by the MDA that has been purchased by an ally (Japan). As the Navy moves into DDG51 Flight III ships, the current SPY-1 radar (made by LMT) will be swapped out for the SPY-6 (made by RTN).

Figure 10: AEGIS/ SM-3 launch

Source: Missile Defense Agency

Aegis Ashore

Aegis Ashore is the land-based variant of the Aegis BMD System. It is currently deployed in Romania as part of the NATO missile defense system, with a second site currently under construction in Poland. The system serves as a midcourse defense against medium- and intermediate-range missiles. The system uses the Lockheed Martin SPY-1 radar and battle management systems along with the Raytheon built SM-3. PACOM Commander Admiral Harry Harris has recommended to Congress that the US operationalize the Aegis Ashore test

facility in Hawaii in order to bolster defenses against a possible North Korean missile attack.

Figure 11: AEGIS Funding-- FY18 PR

AEGIS Ballistic Missile Defense										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	882.7	17	1,054.1	-	986.5	6	-	-	986.5	6
Procurement	712.0	46	513.9	35	624.1	34	-	-	624.1	34
Total	1,594.7	63	1,568.0	35	1,610.6	40	-	-	1,610.6	40

Note: The FY 2016 RDT&E includes 17 SM-3 Block IIA missiles. The FY 2018 RDT&E includes 6 SM-3 IIA missile. The FY 2016-2018 Procurement is comprised of SM-3 Block IB missiles.

Numbers may not add due to rounding

* FY 2016 includes actuals for Base and OCO

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Source: Comptroller of the Department of Defense

Prime: Lockheed Martin (Aegis Weapon System, SPY-1), Raytheon (Standard Missile, SPY-6).

Sub: Boeing Defense, Orbital ATK, Honeywell, Engility, Naval Surface Warfare Center, SPAWAR Systems Cener, Johns Hopkins University Applied Physics Lab, MIT

Standard Missile Family

The Standard Missile Family is a family of shipborne (though also used on land with Aegis Ashore) guided missiles designed to provide air and cruise missile defense as part of the Aegis combat system. The SM-2 has two variants, both of which have successfully intercepted various targets and uses semi-active radar for homing, with a blast-fragment warhead containing a radar and contact fuse. The SM-2 interceptors are all solid-fueled and tail-controlled, designed to launch from a Mk41 Vertical Launching System or Mk26 Guided Missile Launching System. The SM-3, a ship-launched anti-ballistic missile, is an extended-range surface-to-air missile; though designed to intercept short-to-intermediate-range ballistic missiles, it has also been employed in an anti-satellite capacity. The SM-3 is primarily used by the US, though operated as well by Japan. The SM-3 has the same solid rocket booster and dual thrust rocket motor as SM-2 Block IV, but has an extended range from additional missile thrust during a third stage of flight. The SM-6 is an endo-atmospheric interceptor that uses blast-fragmentation to intercept missiles in their terminal phase; the body combines the solid rocket booster and dual thrust rocket motors of the SM-3 and the SM-2 airframe. The Navy is upgrading to the SM-6, with the plan to purchase ~1,800 missiles. International sales of standard missiles have been particularly strong over the last decade to US friends and allies. As part of Aegis, the Standard Missile during testing has had an 80% success rate with 35 hits and 7 misses across the portfolio of SM variants.

Prime: Raytheon

Sub: Aerojet Rocketdyne, Orbital ATK

Figure 12: SM-6 Launch

Source: Missile Defense Agency

Figure 13: SM Funding-- FY18 PR

Standard Family of Missiles										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	111.3	-	120.6	-	158.6	-	-	-	158.6	-
Procurement	417.3	101	543.7	125	510.9	117	35.2	8	546.1	125
Spares	17.1	-	4.9	-	15.0	-	-	-	15.0	-
Total	545.7	101	669.2	125	684.5	117	35.2	8	719.7	125

* FY 2016 includes actuals for Base and OCO. *Numbers may not add due to rounding*
**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Source: Comptroller of the Department of Defense

Ground-based Midcourse Defense System (GMD)

GMD is the only U.S. missile defense asset solely devoted to defending the U.S. homeland from long-range ballistic missile attacks, providing Combatant Commanders the capability to defend the US (including Hawaii and Alaska) from long-range ballistic missiles during the midcourse phase (vs. boost or terminal phase). GMD has a much larger coverage area than AEGIS, THAAD, and Patriot, which are generally classified as regional missile defense systems. Because GMD is not capable of shorter range defense missions, the short- and medium-range missiles employed by North Korea that threaten South Korea and Japan, for example, are outside the operational purview of GMD. That said, with the possible development of a operational ICBM by North Korea, the deployment of GMD is particularly timely. The Ground-Based Interceptor is comprised of a three-stage, solid fuel booster and exoatmospheric kill vehicle; the solid fuel booster missile carries the kill vehicle toward the target's predicted location and the killl vehicle uses data from ground-based radars and on-board sensors to ram the warhead with a closing speed of ~15,000mph. Interceptors are currently in Fort Greely, Alaska, and Vandenberg Air Force Base. By the end of 2017, there are expected to be 44 ground based interceptors (GBIs) installed. The GMD fire control centers are in Colorado and Alaska. Of the 18 GMD Interceptor tests, 10 were hits (including the most recent in May 2017) and 8 were misses.

Prime: Boeing

Sub: Raytheon (exoatmospheric kill vehicle, radar), Northrop Grumman (BMC3), Orbital ATK (ground-based interceptor)

Figure 14: GMD Funding-- FY18 PR

Ground-based Midcourse Defense										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	1,598.0	-	1,192.7	-	1,370.4	-	-	-	1,370.4	-
Total	1,598.0	-	1,192.7	-	1,370.4	-	-	-	1,370.4	-

* FY 2016 includes actuals for Base and OCO *Numbers may not add due to rounding*
** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Source: Comptroller of the Department of Defense

Figure 15: GMD Interceptor Launch

Source: Missile Defense Agency

Figure 16: The Full Field of US Missile Defense Assets

Source: Center for Strategic and International Studies

Phased Array Tracking Radar to Intercept On Target (PATRIOT)

The Patriot system is the Army's primary air and missile defense system. Though originally designed as an antiaircraft system, the Patriot and its related interceptors have since been designed for defense against tactical ballistic missiles, with capability to defend against aircraft and cruise missiles. The system

is used in 13 countries and, in addition to the launcher, includes radars, control and command units, and other equipment.

Figure 17: PATRIOT Launch

Source: Raytheon

PAC-3 Missile

The PAC-3 variant is the most technologically advanced iteration of the PATRIOT system. The interceptor uses hit-to-kill technology, hitting the target directly and containing only a small high explosive warhead as the kill enhancer. The upgraded system is dedicated almost completely to the anti-ballistic missile mission and can hold up to 4 PAC-3 missiles per canister on the launcher (enabling 16 shots vs. 4 on the legacy Patriot missile system). The system is almost entirely autonomous, with the AN/MSQ-104 Engagement Control Station, the command and control center for PAC-3.

Figure 18: PAC-3 in action

Source: Missile Defense Agency

Figure 19: Patriot/PAC-3 Funding-- FY18 PR

Patriot/PAC-3										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	88.0	-	84.0	-	167.0	-	-	-	167.0	-
Procurement	242.0	-	425.0	58	329.1	-	-	-	329.1	-
Spares	33.0	-	34.0	-	19.0	-	-	-	19.0	-
Total	363.0	-	543.0	58	515.1	-	-	-	515.1	-

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Source: Comptroller of the Department of Defense

Prime: Raytheon, Lockheed Martin (PAC-3 Upgrade, AN/MPQ-53 radar)

Terminal High Altitude Area Defense (THAAD)

The THAAD system affords the US the ability to intercept and destroy ballistic missiles both inside or outside the atmosphere during their terminal phase of flight. The land-based system is globally-transportable and rapidly-deployable, using hit-to-kill technology (kinetic energy) to intercept an incoming warhead (similar to PAC-3--just a much larger missile with longer range 120mi vs. 20mi for the PAC-3). The battery consists of four components: the launcher (truck-mounted, highly mobile), interceptors (8 per launcher), radar (AN/TPY-2, the largest air-transportable x-band radar in the world) and fire control (links the THAAD components together). Because THAAD uses kinetic energy instead of a warhead to intercept a ballistic missile (short-, medium-, and intermediate-range), the warhead of a nuclear-tipped ballistic missile will not detonate upon termination. Through 19 THAAD interceptor tests, the system has recorded 15 hits (with the last successful test in July 2017) and the other 4 were incomplete due to target failure.

Figure 20: THAAD Launch

Source: Missile Defense Agency

Prime: Lockheed Martin.

Sub: Raytheon, Boeing, Aerojet Rocketdyne, Honeywell, BAE, Oshkosh, MiltonCAT, Orbital

Figure 21: THAAD Funding-- FY18 PR

Terminal High Altitude Area Defense (THAAD)										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	218.6	-	272.5	-	266.4	-	-	-	266.4	-
Procurement	448.0	34	520.6	36	451.6	34	-	-	451.6	34
Total	666.6	34	793.1	36	718.0	34	-	-	718.0	34

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Source: Comptroller of the Department of Defense

Command and Control

Command and Control, Battle Management, and Communications (C2BMC)

C2BMC is the hardware and software interface for the ballistic missile defense system that integrates sensors and fire control units. The systems allow for the most comprehensive picture of battlespace for all operators in the BMDS, enabling the warfighter to choose optimal firing solutions and affords combatant commanders to plan engagements most effectively. As of 2016, there were more than 70 C2BMC workstations.

Prime: Northrop Grumman

Sensors

Shooting something out of the sky is great, but the only way to shoot it down is to spot it, track it and discriminate it against other targets. Within the Ballistic Missile Defense program, sensors on the ground, on the sea and in space provide the eyes of the system. The initial detection of launches is generally secured by infrared sensors in Space, while the tracking detection and discrimination detection is generally handled by radar systems on land and at sea. There has been little new unclassified new starts in the space-based sensor arena, which we expect will change very soon. In the land- and sea- based sensors market, there seems to be far more new development program decisions and plans revealed in the last couple years with the AMDR (Air and Missile Defense Radar), LRDR (Long Range Discrimination Radar) and the LTAMDS (Lower-Tier Air-and-Missile Defense Sensor) programs. There are also initial steps being taken to look at the US's large monolithic early warning radars for upgrades.

Space Based Sensors

SBIRS is the Space-based Infrared System (funded by the Air Force budget vs. MDA budget). The constellation of geosyncronous orbit (GEO) and high elliptical orbit (HEO) satellites and complementary ground systems provides early missile detection and warning. The system is positioned as the first US asset to detect a ballistic missile launch. The system had a first deployed capability in 2006 and started development in 1996, but didn't reach initial operating capacity till 2013. The fourth GEO satellite in the constellation is set for a 2018 launch on an Atlas V and the company is contracted to build a fifth and sixth satellite that weren't part of the original constellation plan.

Prime: Lockheed Martin

STSS (Space Tracking and Surveillance System) is a two satellite constellation demonstrator that was originally envisioned as part of a much bigger constellation named SBIRS-Low satellites, but that program was cancelled and descoped in 2009 and reborn within the Missile Defense Agency (vs. the Air Force) as the STSS program. We see a potential for resurrection/growth on this program, which was originally envisioned as a constellation of 20-30 satellites that would provide more accurate tracking. Likely more than just an ironic historical footnote, the primary players in the original SBIRS-Low concept were TRW (now owned by NOC) and Spectrum Astro (now owned by Orbital ATK). As a result of Northrop Grumman's heritage on the program, we'd anticipate they will be the largest beneficiary of any rebirth on the program, which was in 2001 estimated at $23B. While some studies, particularly the 2012 National Academy of Sciences study on Missile Defense, have dismissed the effectiveness of a large space-based constellation for space based tracking and discrimination, the ability of the system to track and provide targeting for a missile from launch to descent demonstrated in the last 5 years is going to be enough to drive the DoD to restart the program.

Prime: Northrop Grumman, Payloads by Raytheon

Land Based Sensors

Early Warning Radar is the sensor for the Ballistic Missile Defense System, providing early detection and tracking of incoming ballistic missiles. The sensors support the intercept of missiles above the atmosphere and help provide an immediate, accurate determination of a threat vs. non-threat aerial object. The Updated Early Warning Radar (UEWR) would be key to determining the launch of a ballistic missile and a quick, precise location for intercept should Iran or North Korea launch a ballistic missile at CONUS, OCONUS, or a US ally.

Prime: Raytheon

The TPY-2 is a forward deployed X-band radar, which provides better resolution and discrimination than the large early warning radars, but generally have more limited range, I.e. they can capture only the early part of a North Korean or Iranian launch, and do not provide 360 degree coverage. The radar can be terminal (where it serves as the primary sensor for the THAAD system) or forward-based (tracking missiles in boost/early midcourse as part of GMD system). Raytheon has delivered 10 of these radar systems to the Missile Defense Agency, with 7 deployed in terminal mode and 5 in forward-mode (with remaining systems deployed in Turkey, Israel, and Persian Gulf, keeping watch on Iran).

Prime: Raytheon

The LTAMDS (Lower-Tier Air-and-Missile Defense Sensor) is an Army program that is gaining momentum as a replacement for the current Patriot's MPQ-65 radar system. One of the more significant needing to get incorporated into the LTAMDS is a 360 degree capability. With Raytheon as the incumbent, but RTN having unseated LMT on the Aegis radar platform, we expect a lively competition between the two.

Prime: Raytheon or Lockheed Martin

Long range discriminating radar (LRDR) is a development program for the Missile Defense Agency that is meant to augment and in some cases replace existing Ballistic Missile Defense sensors. The program was competitively awarded to Lockheed Martin in 2015 with an initial contract of $784M. The radar will operate in the S-band (vs. the X-band) with a planned install in Alaska in 2020 to support long-range target discrimination.

Prime: Lockheed Martin

Sea Based Sensors

The SPY-1 and SPY-6 are the present and future sea-based missile defense Aegis mounted radar systems. SPY-1, manufactured by LMT, is a S-band multi-function phased array radar system which can track multiple targets and simultaneously keep surveillance of the sky. The system is currently deployed on Ticonderoga and Arleigh Burke-class destroyers.

Prime: Raytheon and Lockheed Martin

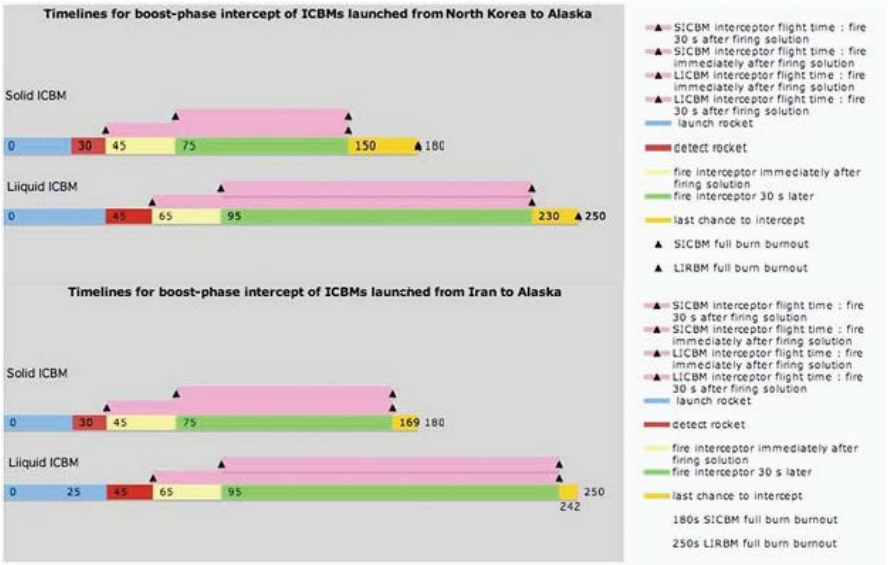
The Sea-based X-Band (SBX) radar has an 18m diameter antenna and is the highest resolution of any of the very large radar systems used by the US. The system has been deployed out of the Alaskan Aleutian Islands as well as Pearl Harbor, Hawaii, and is tasked with the mission of surveilling the Pacific Coast. There is anticipation that once the LRDR goes operationally in 2020, the SBX will be moved to the East Coast.

Prime: Raytheon

Where has my boost phase defense gone?

The single biggest area of new development in missile defense is likely in the boost phase, where today the US government has no program of record to attempt to deter or destroy the missile in this part of the ballistic missile flight regime. 15 years ago, there were three funded systems in the boost phase missile defense area with the assumption that one of the three would make it out of the technology proving ground to the operational context. The three programs were the Kinetic Energy Interceptor, the Space Based Laser and the Airborne Laser. All three met there demise as funding becoming harder and as more resources were being directed to ground wars in the Middle East making these "Star Wars" systems seemingly both esoteric and ahead of their time. The boost phase is the optimal phase during which to destroy a ICBM for the obvious reason that the destruction could occur far from the destination and also that the failure in the boost doesn't hinder the other layers of a missile defense system from being employed as well. The obvious challenges of the boost phase is the speed over which identification, tracking, intercept and kill have to take place (see Figure 22).

Figure 22: Timelines for ICBM boost phase intercept to the US



Source: National Academy of Science, 2012, "Making Sense of Missile Defense"

The boost phase of the US Ballistic Missile Defense Systems was always the most ambitious and NOC was the contractor who was knee deep in the three systems being developed (prime on two and a principal subcontractor on the third), so they in particular felt the pain when the boost phase money and enthusiasm dried up. If there was a return of money to the boost phase, NOC would likely be pleased with their most recent announced acquisition of Orbital ATK. The original KEI program was a team of NOC, RTN, Orbital and ATK (before the latter two were combined). Moreover, the Space-Based Laser was another Northrop owned contract before it was cancelled, which the space business at Orbital ATK could also help facilitate making a comeback. A fourth option for boost phase missile defense has also been evolving with the intention of creating a High Altitude, Long Endurance (HALE) unmanned system equipped with a high-energy directed energy system to take out missiles in their boost phase. This fourth option would seem to also play into NOC's historical strength in both high-energy weapons and unmanned systems. In June 2017, the MDA issued a solicitation to industry for a system that could stay on station at more than 63,000 feet for at least 36 hours cruising at Mach 0.45 and carrying a payload between 5k an 12.5k lbs. Given the likelihood that the platform would have a limited run, NOC's Global Hawk would seem to be the right (almost) off-the-shelf platform, though we would also expect LMT to be energized to approach the MDA's RFI with a modified U-2 unmanned platform.

Outside the system today: Medium Extended Air Defense System (MEADS)

MEADS is a joint missile defense project between the US, Germany, and Italy. The system was originally designed to replace the Patriot with the intention of bridging the gap between smaller surface-to-air systems (e.g. Stinger missile) and higher levels of missile defense (THAAD). The system is designed to intercept short-range ballistic missiles, cruise missiles, and various other atmospheric threats. MEADS is the first system to provide continuous, on-the-move protection for maneuver forces, providing 360-degree protection. Germany selected MEADS as the basis for its tactical air-defense system. Lockheed's work on the MEADS system makes

them a formidable competitor for Raytheon on the LTAMDS competition to replace the Patriot radar system.

Prime: MEADS International (MBDA Italia, MBDA Deutschland, Lockheed Martin)

Figure 23: MEADS (German Configuration)

Source: Lockheed Martin

Missile Defense Budgetary Landscape

Missile Defense Agency Budget

The FY18 budget for the Missile Defense Agency shows a topline of $7.9B; though a reduction of 4% from the amount appropriated last year by Congress, the topline is $471M higher than the FY18 topline planned by the Obama plan for the FY18 MDA budget. The Senate's version of the 2018 NDAA requests $8.5B for FY18 MDA funding, over $600M of additional funds from President Trump's budget request, and helping bolster homeland, regional, and space missile defense. Moreover, the Congress seems receptive to both FY17 reprogramming requests for Missile Defense as well as potential supplemental requests for FY18 for Missile Defense. All-in, we wouldn't be surprised to see the current $8B run-rate break to the upside toward $9-10B in the next couple years. We think much of that planned boost could become evident at the conclusion of the DoD's Ballistic Missile Defense Review this fall.

Of note, the budget represents a flattening of declines in the RDT&E account, up to $6.2B from last year's $5.9B and the $5.5B proposed for FY18 in President Obama's last budget proposal (see Figure 24) . The increase in RDT&E comes at the cost of some procurement (namely the Aegis SM interceptor), though homeland defenses received a boost in President Trump's budget, which could potentially signal a renewed focus on the Ballistic Missile Defense Review. A few programs had funding cuts in President Trump's budget, e.g. testing programs, as well as THAAD, offset by higher funding for Israeli missile defense assets, as well as higher funding for homeland defenses (GMD, Sea-based X-band Radar, Long Range Discrimination Radar) and Improved Homeland Defense Interceptors.

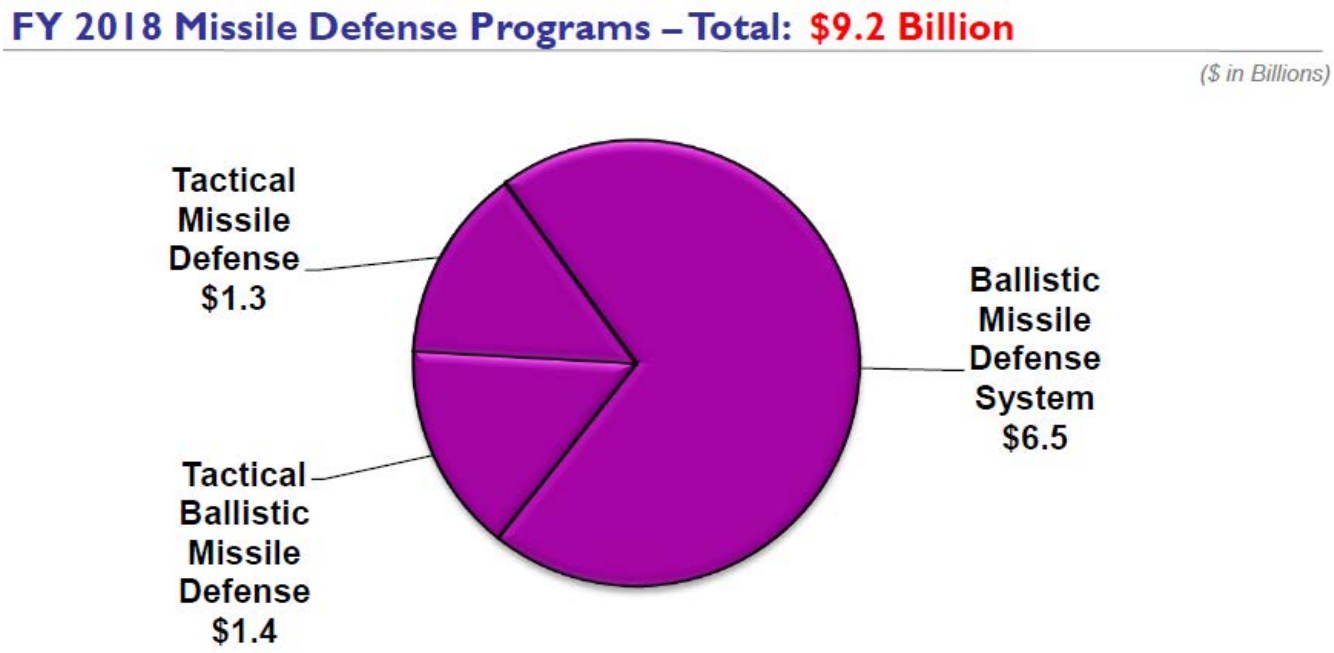
Figure 24: Missile Defense Agency Budget-- FY17, FY18PR-FYDP

	FY17	FY18	FY19	FY20	FY21	FY22
TOTAL O&M	461.03	504.06	495.95	522.60	544.28	574.89
TOTAL PROCUREMENT	1575.40	1178.37	1576.81	1535.53	1522.41	1555.09
TOTAL RDT&E	5990.25	6200.72	5762.53	6124.67	6028.16	6142.15
TOTAL MILCO	193.64	3.00	168.18	39.14	231.25	188.91
TOTAL MDA BUDGET	8220.315	7886.153	8003.466	8221.94	8326.101	8461.044
% Growth		*-4%*	*1%*	*3%*	*1%*	*2%*

Source: Missile Defense Agency

Figure 25 shows funding for missile defense programs in the FY18 budget, including funding for the Army's PAC-3 and the Navy's SM-3, which are outside the Missile Defense Agency's budget. Similar to Figure 24, this level of funding has been largely static for 10 years in nominal terms (and declining in real terms), but we are seeing increasing positive upward pressure signals in Congress and the Pentagon.

Figure 25: FY18 Funding by Classification

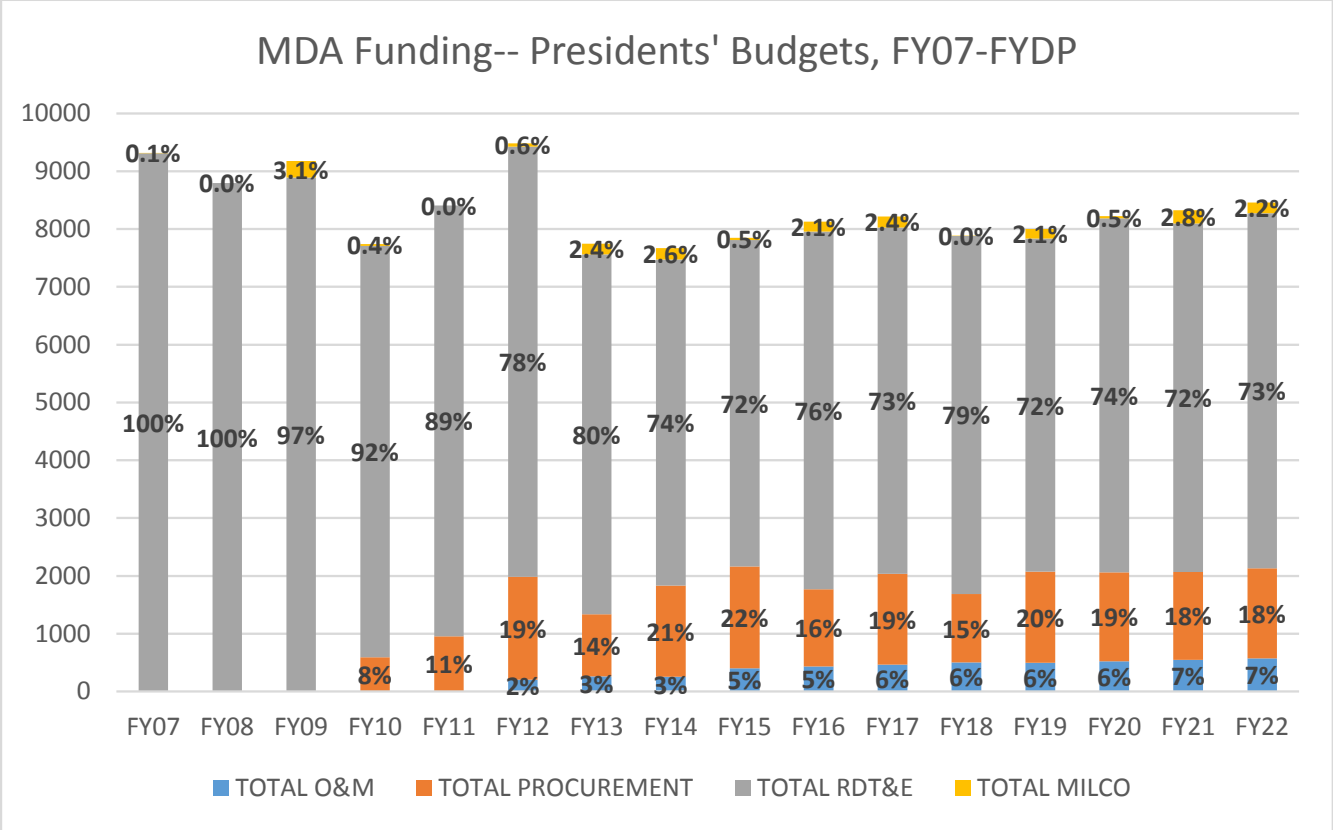


Source: Comptroller of the Department of Defense

Historical US Budget Trends and Future Directions

In Figure 26 we depict the trajectory of Missile Defense Funding in the Presidents' Requests from the last 10 fiscal years. Though there is some volatility and a noticeable drop in FY13 from sequestration, MDA budgets appear to be clawing back from their lows, with a low-SD growth trajectory over the FYDP, but not nearly the trajectory we anticipate will play out, which is likely closer to a high-SD, low DD trajectory.

Figure 26: Missile Defense Agency Funding



Source: Comptroller of the Department of Defense

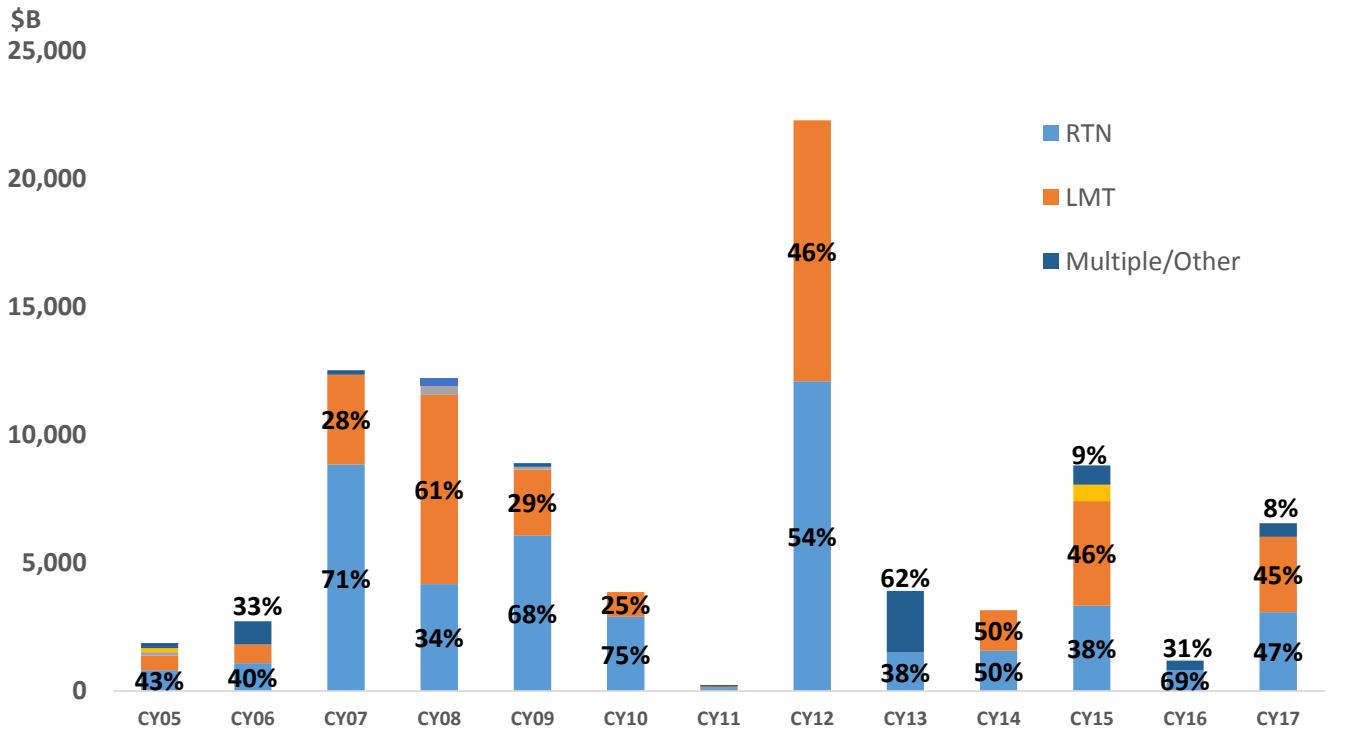
Given the FY19 budget submission by the Trump administration will be the first that really lays out the vision for where money should be put, we take the numbers in outlook in Figure 24 as merely placeholders that will should have solid upside. In fact, both congressional action and an ongoing review by the Missile Defense Agency of the overall Missile Defense enterprise (Ballistic Missile Defense Review--BMDR) points to likely changes ahead both in funding (higher) and scope (larger). Moreover, the Congressional language in the FY18 Defense Authorization Bill further supports a view for further expansion in budgets, requesting $8.5B for the Missile Defense Agency.

International Missile Defense Interest Remains High

In the Figure 27 we depict the sizing of Missile Defense Funding through Foreign Military Sales notifications. FMS notifications represent an indication of interest by foreign governments for US military exports. The typical yield from FMS notifications is usually about 50% of the stated value with a couple year delay from the original notification to contractual agreement. As shown in the Figure, the international missile defense figures are lumpy, but there has been a clear uptick in the buying behavior over the last 10 years vs. the prior 10 years. As depicted, FMS notifications represent $88B of missile defense buys from 2005 to 2017. Of those buys, RTN and LMT had the greatest market share. With no end in sight to global hostilities and a continued shift in government spending priorities to national defense, we see international buys remaining a source of growth in missile defense spending over the next 5+ years. Importantly, the 2017 data also

doesn't yet reflect the potential for $20B in Saudi Missile Defense items ($13.5B for 7 THAAD batteries and another $7B for Patriot systems) as part of the May 20, 2017 potential deal announced during a Trump state visit to Saudi Arabia. We anticipate these to come through as notifications eventually.

Figure 27: Foreign Military Sales (FMS) Missile Defense Notifications by Contractor (2005- YTD 2017) ($88B in total over 63 FMS requests)

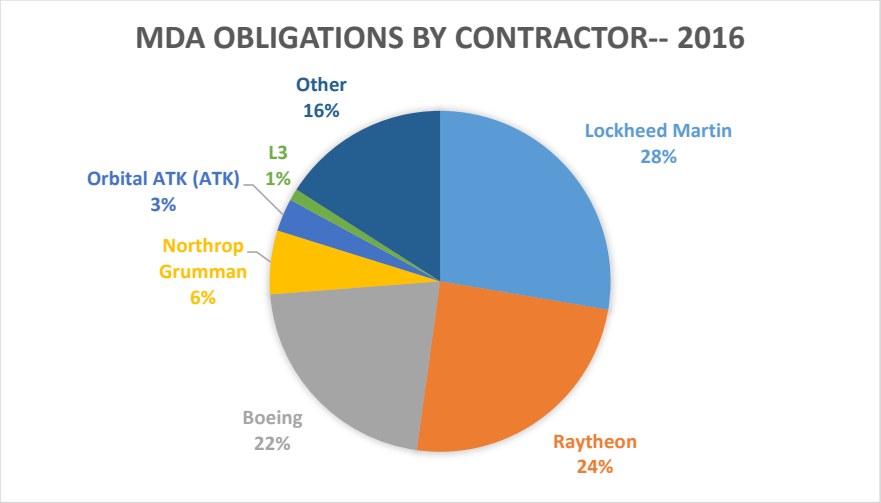


Source: DoD, Deutsche Bank

How to invest in the Missile Defense Theme

Figure 28 provides a snapshot of contractual actions taken by the Missile Defense Agency in FY2016. Domestically, we estimate that the Missile Defense Agency accounts for about 80% of US Missile Defense-related spending, with the Army, Navy and Air Force each having additional contributions to the mission. As shown, LMT, RTN and BA are the largest players in the Missile Defense arena.

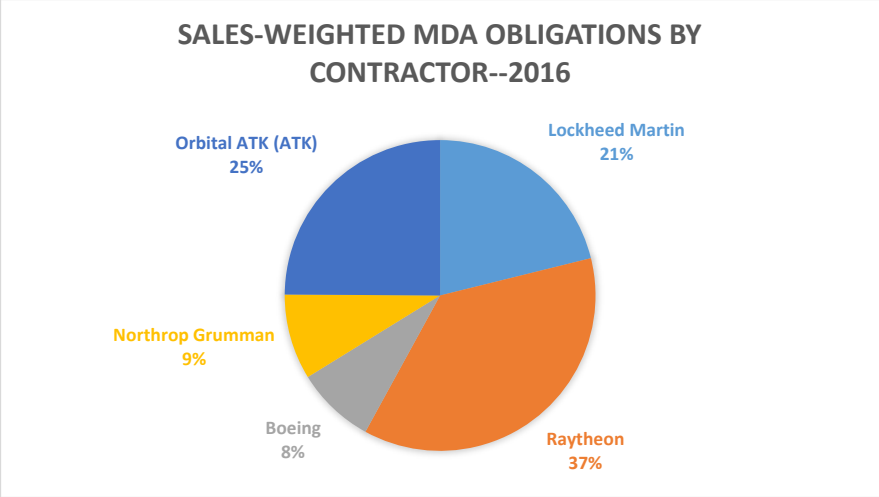
Figure 28: Snapshot: Missile Defense Agency Spend by Contractor



Source: Federal Procurement Data System
**Note: Data does not include non-MDA missile defense related sales domestically or international MDA sales*

Figure 29 provides a snapshot of contractual actions taken by the Missile Defense Agency in FY2016, weighted by contractors' sales for that year. As shown, Raytheon has the largest relative portion of contractual obligations by sales, with Orbital ATK in second.

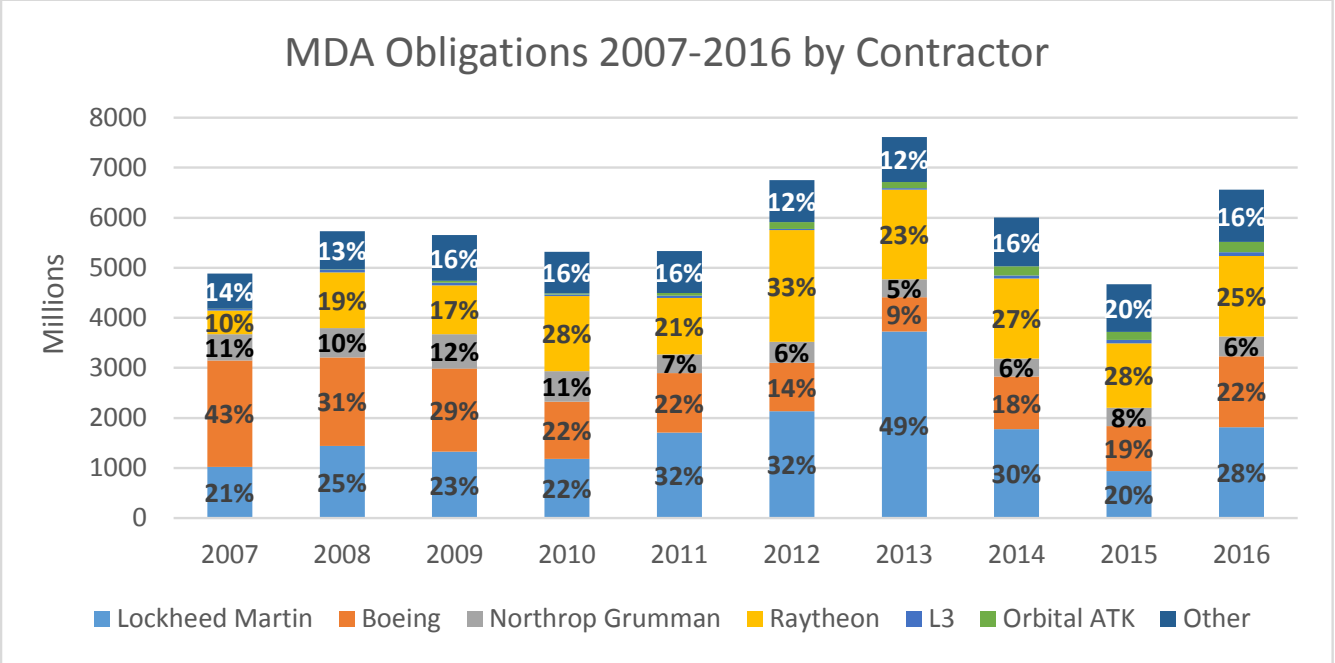
Figure 29: Snapshot: Missile Defense Agency Spend by Contractor (Sales-weighted)



Source: Federal Procurement Data System
**Note: Data does not include non-MDA missile defense related sales domestically or international MDA sales*

Looking historically, Figure 30 gives the MDA contractual obligation/expenditures that have taken place over the last decade. There is modestly more volatility in the obligations vs. the budget over the same period, Figure 24 (through 2022), though the trend is broadly the same--flat--in nominal dollars over the last decade. There are some share shifts below the surface to observe that are telling, however. For example, NOC's position in the Missile Defense Budget is half of what it was a decade ago in large part because they were on programs that have either run their course (STSS) or been canceled (Airborne Laser, KEI and Space Based Laser). The acquisition of Orbital ATK claws back some of that share (OA a decade ago had almost no direct obligations form MDA) and likely provides one more element of the acquisition logic in addition to other portfolio overlap benefits and the obvious financial accretion. BA and LMT have had more ups and downs in their exposure while RTN's contractual obligations seem to be more stable over the period.

Figure 30: Missile Defense Agency Obligations: 2007-2016



Source: Federal Procurement Data System
**Note: Data does not include non-MDA missile defense related sales domestically or international MDA sales*

RTN (Upgrade to Buy, $210 PT) (~25% of sales)

Primary programs that Raytheon works on in the Missile Defense arena include the AMDR (which will be fitted on Flight III Aegis destroyers going forward), the PAC-3 and original Patriot systems, the THAAD TYP-2 radar, the SM-3 and SM-6 missile and the EKV. Raytheon has the most comprehensive offering in the field of Missile Defense with both sensors and interceptors in the company's portfolio. RTN and LMT tend to trade off the lead position in terms of the Missile Defense Agency contract obligations (see Figure 30); however, when further adding the SM-6 (Navy budget) and Patriot spending (Army budget), which are outside the MDA budget, RTN is likely the largest player in Missile Defense and is certainly the most significant market-cap adjusted basis. This position would be even further bolstered after considering international missile defense sales. In terms of financial reporting, the bulk of the Raytheon's Missile Defense business is housed in the Integrated Defense reporting segment, but also includes SM-3, SM-6 and EKV work in the Missiles Segments and likely some sensor payload work in the Space and Airborne Systems segment.

The opportunities for growth by Raytheon on the Missile Defense front primarily come from the AMDR program and further expansion/interest of international customers in extending their missile defense abilities, as well as the overall expectation of ours that US Missile Defense budgets are set to modestly lift higher. The opportunities to the downside for Raytheon is primarily on the EKV program, which is being augmented/replaced by the RKV (of which they are a partner on) as well as the replacement of the Patriot radar.

Our price target for RTN is based on a market (S&P 500) relative forward PE multiple times our 2019 estimated economic EPS + the NPV of future cash pension recovery. While we assume the market is able to maintain its current

multiple over the coming years, we do see 10-15% compression for RTN from the current ~40% premium (see figure 32). Key downside risks include: light orders, pension and defense budget cuts.

LMT (Buy, $340 PT) (~10% of sales)
Primary programs that Lockheed Martin works on in the Missile Defense arena include Aegis Sea-based Missile Defense (inclusive of the AEGIS SPY-1 radar, the AEGIS combat system), Aegis Ashore, THAAD, PAC-3 missiles and MEADS. On the sensors side, LMT builds SBIRS satellites that provide early launch detection. In addition, the company is likely to pursue development of the replacement radar for the Patriot. Supporting the launch of the SM-3 and SM-6 missiles is also LMT's MK41 Vertical Launch System.

Lockheed Martin's biggest opportunities for growth in the missile defense area is likely in the international market through both the THAAD and potentially MEADS system. Importantly, there is a growth opportunity for LMT if they could capture the next generation Patriot radar, which is moving into competition. The biggest source of downside risk for LMT will be the replacement of the company's SPY-1 radar with the RTN AMDR radar on Aegis-equipped destroyers in Flight III and beyond. Lockheed Martin should continue to maintain their Aegis integration contract. Lockheed Martin also had some supplier quality problems on the THAAD program, which resulted in lower than expected shipments in 2016, though those issues appear to have been cleared and we don't see any other issues with that program.

Our price target for LMT is based on a market (S&P 500) relative forward PE multiple times our 2019 estimated economic EPS + the NPV of future cash pension recovery. While we assume the market is able to maintain its current multiple over the coming years, we do see 10-15% compression for LMT from the current ~45% premium. Given companies will likely be further into a defense spending cycle, for conservatism we are assuming 10-15% compression in PE. Downside risks: defense budget uncertainty, program execution, acquisition integration risk, larger pension contribution requirements.

OA (Hold, $134.50 PT) (~10% of sales)
Primary programs that Orbital ATK works on in the Missile Defense arena include the Ground Based Missile Defense interceptor and Missile Defense targets. Orbital ATK is also a supplier of propulsion to other Missile Defense interceptors as well. In the area of targets, the number of testing activities for missile defense is likely to accelerate (i.e. just 3 GMD test in the last 7 years). On the Ground Based Midcourse Defense (GMD) program, Orbital ATK is the sole supplier of the interceptor boosters (GBI), of which there is a complement of 44 to be installed by the end of 2017. We anticipate the number of GBIs will be scaled significantly (perhaps 2x) the current 44 planned with upside to as much as 100 interceptors installed.

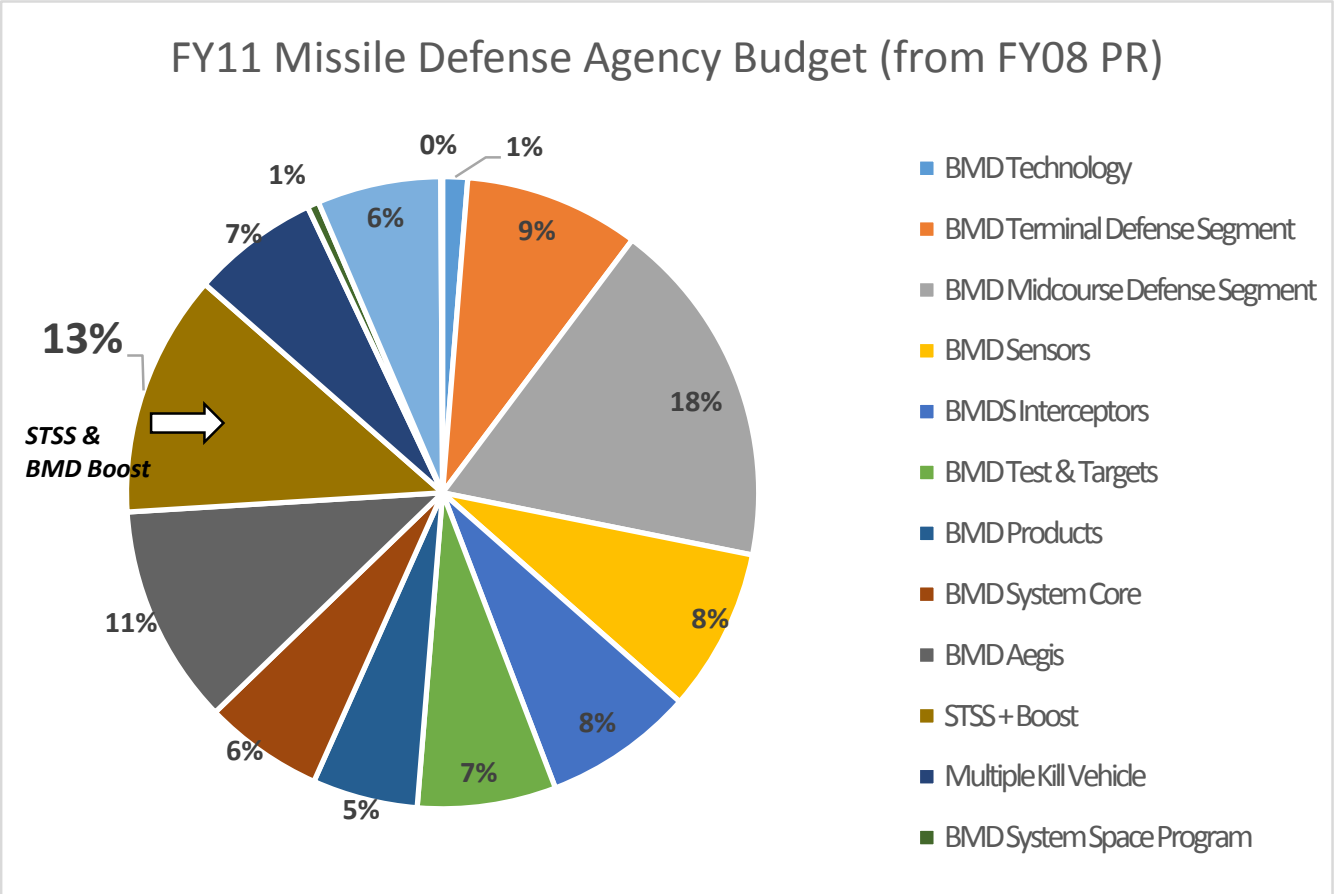
NOC (Buy, $325 PT) (~5% of sales)
Primary programs that Northrop Grumman works on in the Missile Defense arena include the Ground Based Midcourse Defense Fire Control and Communications, and the IAMD Battle Command System (IBCS). Of the larger defense contractors, General Dynamics and Northrop Grumman have the least exposure to Missile Defense, though we think NOC is a name that has some of the best potential to pick up share from what is a relatively low level. The acquisition of Orbital ATK will certainly accelerate that share expansion as OA likely grows NOC's Missile Defense sales by about 50%. However, even at the proforma sales to the MDA,

NOC would be just 1/3 the size of their larger defense peers. That being said, a resurgence in either boost phase missile defense or in space based sensors would both organically accelerate NOC's sales more than others.

The biggest opportunity for growth for Northrop Grumman in the missile defense area would likely come from a budgetary pivot to support boost phase missile defense where disproportionate benefit would go to NOC given their product positioning and historical expertise in the science and technology required to accomplish the boost phase mission. The other of unfunded requirements that Northrop Grumman could find a strong growth opportunity in would be if increased funding were put toward space-based warning and tracking systems. Northrop Grumman's Space Tracking and Surveillance System ("STSS") as well as its SBIRS payload work for LMT should put NOC in the catbird seat for funding increases in the space side of Missile Defense. As seen in Figure 31, the boost phase mission and STSS were once a meaningful part (~13%) of the MDA budget (today these areas combine for 1% of the Missile Defense Agency budget) and could become a focus of budget growth in FY19 and beyond. The biggest source of downside risk would come from mixed performance results on the IBCS program, as well as an inability to recover some of the lost services/modeling and simulation work currently performed under the MDA Integration and Operations center contract that was bid away by Jacobs Engineering in late summer.

Our price target for NOC is based on a market (S&P 500) relative forward PE multiple times our 2019 estimated economic EPS + the NPV of future cash pension recovery. While we assume the market is able to maintain its current multiple over the coming years, we do see 10-15% compression for NOC from the current ~40% premium. Given companies will likely be further into a defense spending cycle, for conservatism we are assuming 10-15% compression in PE.

Figure 31: STSS + Boost once a meaningful part of MDA Budgets...



Source: Comptroller of the Department of Defense

BA (Buy, $300 PT) (~2% of total sales, ~7% of Boeing defense sales)

Primary programs that Boeing works on in the Missile Defense arena include the Ground Based Midcourse Defense program, which it was named the prime contractor on in 2001. The system was first activated in 2004 and is by the end of 2017 scheduled to implant 44 Ground Based Interceptors at sites in California and Alaska. the company is also the prime contractor on the recently award Redesigned Kill Vehicle (RKV), which is a joint program with Lockheed Martin and Raytheon to upgrade and supplement the Raytheon-led Exoatmospheric Kill Vehicle (EKV). Boeing was also once a key provider in the now nascent boost-phase work in the area of missile defense, particularly as the prime contractor on the Airborne Laser. We see the Airborne Laser coming back, but on a high altitude unmanned platform, which would put the odds against Boeing to reclaim a prime position vs. NOC or even LMT in our view.

The biggest growth and risk opportunity for Boeing is probably on the Ground Based Midcourse Defense program as there are calls in Congress to double the number of Ground Based Interceptors currently deployed; however, at the same time, BA's prime contract responsibility ends in December 2018 with the outcome of that work up in the air. The most recent commentary from the MDA indicates a

desire to extend BA's contract to the mid-2020s but after that there are indications that the prime contract would be subdivided.

Valuation and Risks

On the back of this report, we've have upgraded shares of Raytheon to a Buy and have updated a number of our defense company estimates and price targets. We've increased the underlying organic revenue growth rates for LMT, NOC and RTN (please see figures 33-35) and rolled forward multiple valuation to 2019E of companies in our defense coverage. We are using the market (S&P 500) relative forward PE as our basis for valuation and assume that the market is able to maintain its current forward multiple (~19x). Our defense coverage currently trades at anywhere from a 10% to 45% premium to the market based on our current 2017 estimated EPS (or economic EPS + pension NPV). We are rolling our valuation to 2019 estimates and assume mid-SD relative market multiple compression for mid-cap stocks, while large cap defense stocks see a more conservative 10-15% multiple compression.

Sector risks: lower/higher than expected defense funding, program execution, less favorable contracting/contract wins

Figure 32: Defense Stock Valuation

	Last Price	Rating	CAS/ERISA NPV/share	Implied Price less CAS/ERISA NPV	Implied economic P/E 2017	2018	2019	Relative Mkt Multiple	S&P on '17 18.8x	Previous PT	Current PT	Upside	Current Relative Multiple
GD	$206.80	Hold		$207	21.2x	19.9x	18.9x	100%	18.8	$200	210	2%	112%
HII	$223.46	Buy	$12	$211	23.8x	22.2x	21.3x	120%	22.6	$240	240	7%	126%
LLL	$188.97	Buy		$189	21.5x	20.0x	19.2x	110%	20.7	$190	205	8%	114%
LMT	$310.13	Buy	$23	$287	27.6x	24.8x	22.3x	130%	24.5	$305	340	10%	146%
NOC	$286.84	Buy	$15	$272	26.4x	24.1x	20.4x	125%	23.6	$285	325	13%	140%
RTN	$184.55	Buy	$15	$169	26.3x	23.6x	21.6x	130%	24.5	$180	210	14%	139%
				Average	24.9x	22.7x	20.8x						
				S&P	18.8x	17.3x	15.7x						

Source: Deutsche Bank, company reports, Factset

Figure 33: LMT Income Statement

	2017E				Realigned						
(Millions of $USD, except EPS)	**1QA**	**2QA**	**3QE**	**4QE**	**2014A**	**2015A**	**2016A**	**2017E**	**2018E**	**2019E**	**2020E**
LMT Income Statement											
Revenues											
Missiles and Fire Control [MFC]	1,489	1,637	1,750	2,062	7,680	6,770	6,608	6,938	7,077	7,431	7,803
Rotary and Mission Systems [RMS]	3,101	3,410	3,500	3,788	7,147	9,091	13,462	13,799	13,799	14,350	15,068
Aeronautics	4,106	5,225	5,500	5,719	14,920	15,570	17,769	20,550	21,400	22,750	23,500
Space Systems	2,361	2,413	2,250	2,285	8,065	9,105	9,409	9,309	9,495	9,780	10,171
Total Revenue	**$11,057**	**$12,685**	**$13,000**	**13,854**	**$45,600**	**$46,132**	**$47,248**	**$50,596**	**$51,771**	**$54,312**	**$56,542**
% ch	***7%***	***10%***	***13%***	***1%***	***1%***	***1%***	***2%***	***7%***	***2%***	***5%***	***4%***
Operating Profit											
Missiles and Fire Control [MFC]	219	268	280	283	1,358	1,282	1,018	1,050	1,080	1,190	1,280
Rotary and Mission Systems [RMS]	108	254	265	293	843	844	906	920	1,145	1,245	1,370
Aeronautics	436	550	550	604	1,649	1,681	1,887	2,140	2,250	2,450	2,600
Space Systems	288	256	240	226	1,039	1,171	1,289	1,010	1,040	1,080	1,100
Segment Operating Profit	**1,051**	**1,328**	**1,335**	**1,406**	**5,588**	**5,486**	**5,100**	**5,120**	**5,515**	**5,965**	**6,350**
	(6%)	***4%***	***(6%)***	***9%***	***(3%)***	***(2%)***	***(7%)***	***0%***	***8%***	***8%***	***6%***
FAS/CAS pension adjustment	217	219	220	224	376	471	902	880	1,050	1,310	2,625
Total Other Unallocated	(119)	(62)	(75)	(69)	(253)	(521)	(453)	(325)	(300)	(300)	(300)
Total Operating Profit	**1,149**	**1,485**	**1,480**	**1,561**	**5,711**	**5,436**	**5,549**	**5,675**	**6,265**	**6,975**	**8,675**
Operating Margin											
Missiles and Fire Control [MFC]	14.7%	16.4%	16.0%	13.7%	17.7%	18.9%	15.4%	15.1%	15.3%	16.0%	16.4%
Rotary and Mission Systems [RMS]	3.5%	7.4%	7.6%	7.7%	11.8%	9.3%	6.7%	6.7%	8.3%	8.7%	9.1%
Aeronautics	10.6%	10.5%	10.0%	10.6%	11.1%	10.8%	10.6%	10.4%	10.5%	10.8%	11.1%
Space Systems	12.2%	10.6%	10.7%	9.9%	12.9%	12.9%	13.7%	10.8%	11.0%	11.0%	10.8%
Total Operating Margin	**10.4%**	**11.7%**	**11.4%**	**11.3%**	**12.5%**	**11.8%**	**11.7%**	**11.2%**	**12.1%**	**12.8%**	**15.3%**
Segment Operating Margin	**9.5%**	**10.5%**	**10.3%**	**10.1%**	**12.3%**	**11.9%**	**10.8%**	**10.1%**	**10.7%**	**11.0%**	**11.2%**
Other non operating income (exp), net	1	(2)	0	2	6	30	0	1	0	0	0
Interest Expense	155	160	160	160	340	443	663	635	635	635	635
Pretax Income	**995**	**1,323**	**1,320**	**1,403**	**5,377**	**5,023**	**4,886**	**5,041**	**5,630**	**6,340**	**8,040**
% Sales	9.0%	10.4%	10.2%	10.1%	11.8%	10.9%	10.3%	10.0%	10.9%	11.7%	14.2%
Taxes	232	381	372	396	1,656	1,418	1,133	1,381	1,576	1,775	2,251
Effective tax rate	23.3%	28.8%	28.2%	28.2%	30.8%	28.2%	23.2%	27.4%	28.0%	28.0%	28.0%
Net Income, adjusted	**763**	**942**	**948**	**1,007**	**3,721**	**3,605**	**3,753**	**3,660**	**4,054**	**4,565**	**5,789**
% Sales	6.9%	7.4%	7.3%	7.3%	8.2%	7.8%	7.9%	7.2%	7.8%	8.4%	10.2%
Net Income, reported	**763**	**942**	**948**	**1,007**	**$3,614**	**$3,605**	**$5,302**	**$3,660**	**$4,054**	**$4,565**	**$5,789**
EPS, Adjusted	**$2.61**	**$3.23**	**$3.27**	**$3.49**	**$11.54**	**$11.46**	**$12.38**	**$12.59**	**$14.22**	**$16.24**	**$20.90**
% ch	***(2%)***	***13%***	***(9%)***	***6%***	***21%***	***(1%)***	***8%***	***2%***	***13%***	***14%***	***29%***
EPS, GAAP cont ops	**2.61**	**3.23**	**3.27**	**3.49**	**11.21**	**11.46**	**12.38**	**12.59**	**14.22**	**16.24**	**20.90**
% ch	***(2%)***	***13%***	***(9%)***	***6%***	***24%***	***2%***	***8%***	***2%***	***13%***	***14%***	***29%***
EPS, Reported	**$2.61**	**$3.23**	**$3.27**	**$3.49**	**$11.21**	**$11.46**	**$17.49**	**$12.59**	**$14.22**	**$16.24**	**$20.90**
FCF/sh					***9.37***	***13.23***	***13.61***	***16.79***	***14.27***	***16.40***	***19.41***
FAS/CAS per share	($0.57)	($0.54)	($0.54)	($0.56)	($0.81)	($1.07)	($2.29)	($2.20)	($2.65)	($3.36)	($6.82)
Economic EPS, cont ops	**$2.04**	**$2.70**	**$2.72**	**$2.93**	**$10.73**	**$10.38**	**$10.10**	**$10.39**	**$11.57**	**$12.89**	**$14.08**
% ch	***(0%)***	***16%***	***(10%)***	***9%***	***1%***	***(3%)***	***(3%)***	***3%***	***11%***	***11%***	***9%***
Avg Diluted Shares	292.8	291.2	290.0	288.8	322.4	314.7	303.1	290.7	285.0	281.0	277.0

Source: Deutsche Bank, company reports

Figure 34: NOC Income Statement

	2017E										
(Millions of $USD, except EPS)	**1QA**	**2QA**	**3QE**	**4QE**	**2014A**	**2015A**	**2016A**	**2017E**	**2018E**	**2019E**	**2020E**
NOC Income Statement											
Revenues											
Aerospace Systems	2,898	2,970	2,900	2,877	9,910	9,940	10,828	11,645	12,720	13,728	14,640
Mission Systems	2,739	2,781	2,800	2,881	11,001	10,674	10,928	11,201	11,537	12,114	12,720
Technology Services	1,194	1,175	1,130	1,181	4,902	4,819	4,825	4,680	4,680	4,727	4,869
Orbital ATK									2,417	5,034	5,233
Intersegment Eliminations	(564)	(551)	(550)	(535)	(1,834)	(1,907)	(2,073)	(2,200)	(2,200)	(2,200)	(2,200)
Total Revenue	**6,267**	**6,375**	**6,280**	**6,404**	**23,979**	**23,526**	**24,508**	**25,326**	**29,154**	**33,403**	**35,261**
% ch	***5%***	***6%***	***2%***	***0%***	***(3%)***	***(2%)***	***4%***	***3%***	***15%***	***15%***	***6%***
Operating Profit											
Aerospace Systems	312	315	320	326	1,285	1,205	1,236	1,273	1,410	1,540	1,670
Mission Systems	353	374	360	373	1,557	1,410	1,445	1,460	1,500	1,570	1,660
Technology Services	131	134	115	115	461	514	512	495	490	500	510
Orbital ATK									261	657	781
Intersegment Eliminations	(70)	(70)	(69)	(66)	(204)	(209)	(258)	(275)	(260)	(260)	(260)
Segment Operating Profit	**726**	**753**	**726**	**747**	**3,099**	**2,920**	**2,935**	**2,953**	**3,401**	**4,007**	**4,361**
% ch	***4%***	***3%***	***(1%)***	***(3%)***	***1%***	***(6%)***	***1%***	***1%***	***15%***	***18%***	***9%***
FAS/CAS pension adjustment	136	137	125	102	269	348	316	500	600	650	800
Total Other Unallocated	(30)	(35)	(50)	(85)	(172)	(192)	(58)	(200)	(175)	(175)	(175)
Total Operating Profit	**832**	**855**	**801**	**764**	**3,196**	**3,076**	**3,193**	**3,253**	**3,826**	**4,482**	**4,986**
Operating Margin											
Aerospace Systems	10.8%	10.6%	11.0%	11.3%	13.0%	12.1%	11.4%	10.9%	11.1%	11.2%	11.4%
Mission Systems	12.9%	13.4%	12.9%	12.9%	14.2%	13.2%	13.2%	13.0%	13.0%	13.0%	13.1%
Technology Services	11.0%	11.4%	10.2%	9.7%	9.4%	10.7%	10.6%	10.6%	10.5%	10.6%	10.5%
Orbital ATK									10.8%	13.1%	14.9%
Total Operating Profit Margin	**13.3%**	**13.4%**	**12.8%**	**11.9%**	**13.3%**	**13.1%**	**13.0%**	**12.8%**	**13.1%**	**13.4%**	**14.1%**
Segment Operating Profit Margin	**11.6%**	**11.8%**	**11.6%**	**11.7%**	**12.9%**	**12.4%**	**12.0%**	**11.7%**	**11.7%**	**12.0%**	**12.4%**
Other income, net	16	28	13	(7)	23	15	31	50	15	15	15
Interest expense	75	76	75	75	282	301	301	301	459	616	616
Pretax Income	**773**	**807**	**739**	**683**	**2,937**	**2,790**	**2,923**	**3,002**	**3,383**	**3,881**	**4,385**
% Sales	12.3%	12.7%	11.8%	10.7%	12.2%	11.9%	11.9%	11.9%	11.6%	11.6%	12.4%
Taxes	133	255	229	208	868	800	723	825	998	1,145	1,293
Effective tax rate	17.2%	31.6%	31.0%	30.5%	29.6%	28.7%	24.7%	27.5%	29.5%	29.5%	29.5%
Net Income, adjusted	**640**	**552**	**510**	**475**	**2,069**	**1,990**	**2,200**	**2,176**	**2,385**	**2,736**	**3,091**
% Sales	10.2%	8.7%	8.1%	7.4%	8.6%	8.5%	9.0%	8.6%	8.2%	8.2%	8.8%
Net Income, reported	**640**	**552**	**510**	**475**	**2,069**	**1,990**	**2,200**	**2,176**	**2,385**	**2,736**	**3,091**
EPS, Adjusted	**$3.63**	**$3.15**	**$2.91**	**$2.71**	**$9.75**	**$10.39**	**$12.19**	**$12.40**	**$13.76**	**$16.02**	**$18.26**
% ch	***20%***	***10%***	***(13%)***	***(8%)***	***17%***	***6%***	***17%***	***2%***	***11%***	***16%***	***14%***
EPS, GAAP cont ops	**3.63**	**3.15**	**2.91**	**2.71**	**9.75**	**10.39**	**12.19**	**12.40**	**13.76**	**16.02**	**18.26**
% ch	***20%***	***10%***	***(13%)***	***(8%)***	***17%***	***6%***	***17%***	***2%***	***11%***	***16%***	***14%***
EPS, Reported	**$3.63**	**$3.15**	**$2.91**	**$2.71**	**$9.75**	**$10.39**	**$12.19**	**$12.40**	**$13.76**	**$16.02**	**$18.26**
% ch	***20%***	***10%***	***(13%)***	***(8%)***	***17%***	***6%***	***17%***	***2%***	***11%***	***16%***	***14%***
FAS/CAS per share	($0.64)	($0.53)	($0.49)	($0.40)	($0.89)	($1.30)	($1.32)	($2.07)	($2.44)	($2.68)	($3.33)
Economic EPS, cont ops	**$2.99**	**$2.61**	**$2.42**	**$2.30**	**$8.86**	**$9.09**	**$10.87**	**$10.33**	**$11.32**	**$13.34**	**$14.93**
% ch	***11%***	***1%***	***(18%)***	***(12%)***	***13%***	***3%***	***20%***	***(5%)***	***10%***	***18%***	***12%***
Avg Diluted Shares	176.1	175.5	175.2	175.2	212.1	191.6	180.5	175.5	173.3	170.8	169.3

Source: Deutsche Bank, company reports

Figure 35: RTN Income Statement

(Millions of $USD, except EPS)	2017E 1QA	2017E 2QA	2017E 3QE	2017E 4QE	2014A	2015A	2016A	2017E	2018E	2019E	2020E
RTN Income Statement											
Revenues											
Integrated Defense Systems	1,398	1,462	1,450	1,495	6,085	5,847	5,476	5,805	6,095	6,400	6,720
Intelligence, Information & Services	1,507	1,555	1,480	1,590	5,984	6,111	6,194	6,132	6,316	6,506	6,701
Forcepoint	144	138	150	162		328	566	594	624	655	688
Missile Systems	1,756	1,901	2,000	2,192	6,309	6,556	7,071	7,849	8,320	8,819	9,348
Space and Airborne Systems	1,555	1,608	1,600	1,622	6,072	5,796	6,199	6,385	6,640	6,840	7,045
Corporate and Eliminations/Adjs	(360)	(372)	(360)	(345)	(1,624)	(1,391)	(1,437)	(1,437)	(1,466)	(1,495)	(1,525)
Total Revenue	**6,000**	**6,292**	**6,320**	**6,716**	**22,826**	**23,247**	**24,069**	**25,328**	**26,529**	**27,724**	**28,976**
% ch	***4%***	***4%***	***4%***	***8%***	***(4%)***	***2%***	***4%***	***5%***	***5%***	***5%***	***5%***
Operating Profit											
Integrated Defense Systems	212	245	225	228	974	864	950	910	975	1,030	1,120
Intelligence, Information & Services	111	115	118	111	508	646	467	455	480	500	515
Forcepoint	16	2	18	24		30	51	60	86	99	113
Missile Systems	216	236	260	313	800	868	916	1,025	1,100	1,175	1,250
Space and Airborne Systems	190	218	210	232	846	829	817	850	890	920	960
Segment Operating Profit	**745**	**816**	**831**	**908**	**3,128**	**3,237**	**3,201**	**3,300**	**3,531**	**3,724**	**3,958**
% ch	***19%***	***(12%)***	***4%***	***8%***	***(7%)***	***3%***	***(1%)***	***3%***	***7%***	***5%***	***6%***
FAS/CAS Pension/PRB(post-2010) Adjustment	108	109	108	103	286	185	435	428	462	642	800
Corporate and Eliminations	(112)	(76)	(94)	(93)	(235)	(409)	(396)	(375)	(344)	(319)	(291)
Total Operating Profit	**741**	**849**	**845**	**918**	**3,179**	**3,013**	**3,240**	**3,353**	**3,649**	**4,047**	**4,467**
						13.3%	12.7%	12.4%	12.8%	12.9%	13.2%
Operating Margin											
Integrated Defense Systems	15.2%	16.8%	15.5%	15.3%	16.0%	14.8%	17.3%	15.7%	16.0%	16.1%	16.7%
Intelligence, Information & Services	7.4%	7.4%	8.0%	7.0%	8.5%	10.6%	7.5%	7.4%	7.6%	7.7%	7.7%
Forcepoint	11.1%	1.4%	12.0%	14.8%		9.1%	9.0%	10.1%	13.8%	15.1%	16.4%
Missile Systems	12.3%	12.4%	13.0%	14.3%	12.7%	13.2%	13.0%	13.1%	13.2%	13.3%	13.4%
Space and Airborne Systems	12.2%	13.6%	13.1%	14.3%	13.9%	14.3%	13.2%	13.3%	13.4%	13.5%	13.6%
Total Operating Margin	**12.4%**	**13.5%**	**13.4%**	**13.7%**	**13.9%**	**13.0%**	**13.5%**	**13.2%**	**13.8%**	**14.6%**	**15.4%**
Segment Operating Margin (pre-Elim)	**12.4%**	**13.0%**	**13.1%**	**13.5%**	**13.7%**	**13.9%**	**13.3%**	**13.0%**	**13.3%**	**13.4%**	**13.7%**
Segment Operating Margin (with-Elim)	**11.8%**	**12.4%**	**12.6%**	**13.0%**	**13.7%**	**13.3%**	**12.7%**	**12.4%**	**12.8%**	**12.9%**	**13.2%**
Interest Expense	58	51	48	55	213	233	232	212	197	197	197
Interest Income	5	5	4	2	10	11	16	16	16	16	16
Other Expense, net	(7)	35	0	9	(7)	4	(6)	37	0	0	0
Pretax Income, adjusted	**695**	**768**	**801**	**856**	**2,983**	**2,787**	**3,030**	**3,120**	**3,468**	**3,866**	**4,286**
% Sales	11.6%	12.2%	12.7%	12.7%	13.1%	12.0%	12.6%	12.3%	13.1%	13.9%	14.8%
Taxes, adjusted	198	221	256	276	790	733	857	952	1,092	1,218	1,350
Effective tax rate	***28.5%***	***28.8%***	***32.0%***	***32.3%***	***26.5%***	***26.3%***	***28.3%***	***30.5%***	***31.5%***	***31.5%***	***31.5%***
Less Net Income To Noncontrolling Interests	(9)	(6)	(2)	3	14	(7)	(37)	(14)	3	11	19
Net Income, cont ops adjusted	**506**	**553**	**546**	**577**	**2,179**	**2,061**	**2,210**	**2,182**	**2,372**	**2,637**	**2,916**
% Sales	8.4%	8.8%	8.6%	8.6%	9.5%	8.9%	9.2%	8.6%	8.9%	9.5%	10.1%
Net Income, cont ops reported	**506**	**553**	**546**	**577**	**2,179**	**2,061**	**2,210**	**2,182**	**2,372**	**2,637**	**2,916**
Discont operations	0	0	1	(1)	65	13	1	0	0	0	0
Net Income, Reported	**506**	**553**	**547**	**576**	**2,244**	**2,074**	**2,211**	**2,182**	**2,372**	**2,637**	**2,916**
EPS, cont ops adjusted	**$1.73**	**$1.89**	**$1.88**	**$1.97**	**$6.97**	**$6.75**	**$7.45**	**$7.47**	**$8.29**	**$9.42**	**$10.53**
EPS, GAAP cont ops	**$1.73**	**$1.89**	**$1.88**	**$1.97**	**$6.97**	**$6.75**	**$7.45**	**$7.47**	**$8.29**	**$9.42**	**$10.53**
Discont operations	0.00	0.00	0.00	(0.00)	0.21	0.04	0.00	0.00	0.00	0.00	0.00
EPS, Reported	**$1.73**	**$1.89**	**$1.89**	**$1.96**	**$7.18**	**$6.80**	**$7.45**	**$7.47**	**$8.29**	**$9.42**	**$10.53**
FAS/CAS per share	($0.26)	($0.27)	($0.25)	($0.24)	($0.67)	($0.45)	($1.05)	($1.02)	($1.11)	($1.57)	($1.98)
Economic EPS, cont ops	**$1.46**	**$1.63**	**$1.63**	**$1.73**	**$6.30**	**$6.31**	**$6.39**	**$6.46**	**$7.19**	**$7.85**	**$8.55**
% Ch	***24%***	***(23%)***	***6%***	***9%***	***(3.1%)***	***0.1%***	***1.4%***	***0.9%***	***11.3%***	***9.2%***	***19.0%***
Avg Diluted Shares	292.8	292.0	290.0	293.2	312.6	305.2	296.8	292.0	286.0	280.0	277.0

Source: Deutsche Bank, company reports

Appendix 1

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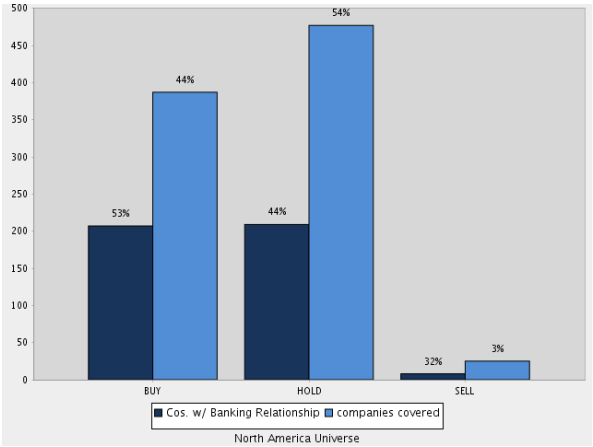

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