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www.spadeindex.com / defense

Commentary

Typically this newsletter would cover the most important issue that drives defense stocks...the release of the White House’s proposed budget for the coming fiscal year and for analysts to identify the programs and companies that are the winners and losers. However, the FY20 budget as submitted to Congress by the Trump Administration is considered, by those who work on and with Capitol Hill, to be highly flawed and pitching changes to existing programs that Democrats and some Republicans find unpalatable. Some analysts have said that it is *Dead on Arrival*.

A significant rewrite and battle is anticipated and it wouldn’t be a surprise to see a continuing resolution be the end result keeping the status quo as a better option that finding a politically acceptable solution that both President Trump and the democratically-held House of Representatives can agree upon. A defense budget representing more than half of what the federal government collects in personal income taxes, a \$1 trillion annual deficit, and cuts to non-defense programs with strong bi-partisan support such as those that benefit the poor and elderly (ie. Medicare and Medicaid) are seen as unrealistic as we approach major 2020 elections. Although there is, without a doubt significant, waste in the existing federal budget, the choices made in the FY20 proposal simply have little chance of approval.

Three Things We Expect

- * Budget size consistent with prior years. No major declines or increases in overall spending.
- * Increased spending for space as the “Space Force” begins and new research targeting additional space warfare capabilities is added.
- * Gains for Navy and missile defense is likely as are declines for Army ground vehicles

A Rebound From the 4Q18 Sell-Off

The SPADE Defense Index outperformed the market from 2012-2017 by a whopping average of 7.3% annually. In 2018 it continued to surge through the first three quarters before getting caught in the 4Q18 selloff. As investors sold winners, DXS saw quarterly declines of 19.49% vs. the 13.97% of the market.

SPADE Defense Index Statistics

3/31/19 Close	6741.93
12/31/18 Close	5754.86

All-time Intraday High:
 3 October 2018 7228.54

All-time Closing High:
 3 October 2018 7193.30

	SPADE Defense	S&P500
1Q19	17.15%	13.07%
2018	-8.15%	-6.24%

**SPADE Defense Index
 March 2019 Rebalance**

No additions were made to the index.

**Corporate Actions Affecting the
 Index During the Quarter**

SAIC closed on its acquisition of Engility (EGL).

Cerbus Capital closed on its acquisition of Sparton (SPA)

Transdigm closed on its acquisition of Esterline (ESL)

Licensed Products

Exchange Traded Fund (ETF)

The SPADE Defense Index has been licensed to Invesco and serves as the underlying index for the Invesco Aerospace & Defense ETF (NYSE Arca: PPA).

1Q19 Leaders

1	Triumph Group	65.74%
2	Mercury Computer	35.50%
3	Transdigm	33.50%
4	Viasat	31.47%
5	BWX Technologies	29.69%
6	Booz Allen	29.00%
7	Key W Holdings	28.85%
8	Woodward	27.73%
9	CACI	26.38%
10	Ball Corp	25.90%

1Q19 Laggards

1	Maxar Tech	-66.39%
2	Intelsat	-26.79%
3	AAR Corp	-12.94%
4	Comtech	-4.60%
5	Esterline Tech	0.86%
6	Aerojet Rocketdyne	0.85%
7	Aerovironment	0.68%
8	Sparton	1.76%
9	Mantech	3.31%
10	FireEye	3.58%

Holdings

Giant	28.57%
Large	29.57%
Medium	34.34%
Small	7.02%

**ETF Statistics (NYSE Arca: PPA)
Invesco Aerospace & Defense**

Exchange / Ticker Symbol:	NYSE / PPA
Assets (3/31/19)	\$864 M
Closing Price (3/31/19)	\$57.97
Yield (TTM)*	1.49%
1Q19 Volume**	3,995,100
Turnover*	7%

source: * Morningstar & ** Yahoo Finance 3/31/19

1Q19 Results

1	Triumph Group	65.74%
2	Mercury Computer	35.50%
3	Transdigm	33.50%
4	Viasat	31.47%
5	BWX Technologies	29.69%
6	Booz Allen	29.00%
7	Key W Holdings	28.85%
8	Woodward	27.73%
9	CACI	26.38%
10	Ball Corp	25.90%
11	KBR	25.76%
12	AXON Int'l	24.37%
13	Vectrus	23.22%
14	Oshkosh Truck	22.54%
15	Heico	22.44%
16	Leidos	21.57%
17	United Technologies	21.05%
18	SAIC	20.80%
19	Hexcel	20.61%
20	Honeywell	20.28%
21	Ducommon	19.82%
22	OSI Systems	19.51%
23	L-3 Communication	18.84%
24	Raytheon	18.73%
25	Boeing	18.27%
26	Harris	18.61%

27	Perspecta	17.42%
28	Teledyne Tech	14.46
29	Lockheed Martin	14.63%
30	Elbit Systems	13.14%
31	MOOG	12.22%
32	Curtiss Wright	10.99%
33	Kratos	10.93%
34	Textron	10.15%
35	Northrop Grumman	10.09%
36	FLIR Systems	9.28%
37	Huntington Ingalls	8.87%
38	General Dynamics	7.68%
39	Cubic Corp	4.65%
40	Kaman	4.19%
41	FireEye	3.58%
42	Mantech	3.31%
43	Sparton	1.76%
44	Aerovironment	0.68%
45	Aerojet Rocketdyne	0.85%
46	Esterline Tech	0.86%
47	Comtech	-4.60%
48	AAR Corp	-12.94%
49	Intelsat	-26.79%
50	Maxar Tech	-66.39%

Portfolio Price / Earnings*	18.20
Portfolio Price / Book*	3.82
Portfolio Price / Sales*	1.67
Portfolio Price / Cash Flow*	15.07

Beta (3-year) *	1.18
Alpha (3-year)*	6.67
R-squared (3 years)*	63.00

source: * Morningstar 3/31/19

Capture Ratio	1-Yr	3-Yr	5-Yr	10-Yr
Upside	187.48	144.7	128.16	111.35
Downside	154.23	111.95	81.29	76.86

PPA Dividend History

Commentary (continued from page 1)

2018	\$0.4441
2017	\$0.3635
2016	\$0.7082
2015	\$0.5019
2014	\$0.2196

But to paraphrase in reverse the song by Blood, Sweat, and Tears (*Spinning Wheel*) what goes down, must go up, 1Q19 saw defense stocks surge by 17.15% bettering the market by 4.08%. This in spite of major negative news by one of the indexes largest holdings, Boeing.

On 10 March 2019, Ethiopian Airlines Flight 302 crashed six minutes after take-off. The cause of the accident was believed to be similar to the Lion Air accident on 29 October 2018 that killed the crew and passengers. In both cases, it involved the 737-MAX-8 which is responsible for 60% of Boeing’s current profits and 33% of its forecasted revenues over the next five years.

In both cases, the cause is believed to be the newly designed MCAS (Maneuvering Characteristics Augmentation System). In order to improve fuel efficiency, this new electronic device was added to help the engine recover from an engine stall at takeoff.

continued on page 4

Two-year chart comparing SPADE Defense Index (DXS) (black) with the S&P500 (gold)



Commentary (continued from page 3)

In the aftermath of the accident, the plane was grounded around the world. Combined with resultant calls to investigate the FAA approval of the plane, Boeing has seen a number of orders delayed or cancelled. Even with updated software to correct the program, the issue will likely stay in the news for the next quarter plus. Forthcoming quarterly earnings should provide additional color to the reaction by airline rebates issues, and the setback for the lawsuits that will soon follow. Boeing peaked at \$446.01 prior to the accident, sinking to \$361.53 before stabilizing, though with increased volatility.

An obvious black mark for the firm which historically has an impressive safety record, however, long-term the stock and company should be fine. Commercial airline manufacturing is essentially a duopoly and their primary competitor, Airbus, is fully booked for years. That said, we fully expect delivery delays, writeoffs associated with additional engineering activity, and the eventual lawsuits.

Changes to the Defense Landscape

While defense related IPOs have been rare in recent years, the past few months have seen a significant shakeup in the publicly listed defense sector landscape. Typically several hundred, mostly smaller M&A deals, take place annually as firms acquire contractors for the contracts they

More Diversification = Lower Risk

	PPA	ITA
# holdings	48	36
Weight Boeing	8.14%	12.98%
Weight of firms with 737 Max8 exposure	24.71%	37.73%
Post-crash, portfolio return (10-day)	(0.05%)	(1.70%)
Post-crash, portfolio return (1-mo)	2.72%	0.70%

hold or to add staff with certain highly technical capabilities.

According to PriceWaterhouse, 2018 saw 413 transactions in the aerospace and defense sector space with an average size of \$350.6M, up \$73M over the 10 year average. In total there were \$57.8 Billion worth of deals, up 83% over the 10-year average.

What is unusual is the uptick in large deals and or wholesale restructurings.

Recently the sector has seen several significant deals amongst public companies. Including the acquisitions of Rockwell Collins by United Technologies, the merger of Alliant Techsystems and Orbital Sciences and their subsequent acquisition by Northrop Grumman, SAIC buying Engility, General Dynamics buying CSRA for \$9.6B and the proposed \$16.2B merger of L-3 and Harris Corporation.

Spinoffs

Restructuring among large diversified firms that are in the Top 100 defense firms in the world continues to play out with United Technologies and

Honeywell each splitting into three separate firms while retaining their profitable aerospace and defense manufacturing divisions. [Honeywell spinning off Garrett, its automotive transportation systems and Resideo, its home and global distribution business. UTX plans to spin off its Carrier HVAC business as well as Otis Elevator in 2019].

IPOs

Although they have been rare in recent years, several are forecast to occur over the next several months, led by Palantir Technology with an expected valuation of \$30B - \$40B. Though the firm is largely unknown by many outside the industry, they are a surveillance technology firm that operates heavily in the classified intelligence world. We continue to track a number of smaller IPO deals, such as a spinoff of the defense power systems by DPW Holdings and some valuations from firms held by private equity. If the market holds up, we expect to see at least 3 IPOs in the A&D space by year's end.

Index Performance (ex div)

	SPADE Defense Index
3-Yr	39.67%
5-Yr	61.15%
10-Yr	260.55%
20-Yr	573.19%

Data through 1/1/19

	SPADE Defense Index	S&P500	Alpha (bps)
YTD	17.15%	13.07%	408
2018	[8.15%]	[6.24%]	191
2017	28.92%	19.42%	950
2016	17.95%	9.53%	842
2015	3.23%	[0.73%]	396
2014	11.77%	11.39%	38
2013	48.27%	29.60%	1867
2012	16.30%	13.41%	289
2011	[2.75%]	[0.00%]	[275]
2010	9.62%	12.78%	[316]
2009	21.71%	23.45%	[174]

	SPADE Defense Index	S&P500	Alpha (bps)
2008	[38.03%]	[38.49%]	46
2007	22.17%	3.53%	1864
2006	19.33%	13.62%	571
2005	5.30%	3.00%	230
2004	20.47%	8.99%	1148
2003	37.27%	26.38%	1089
2002	[2.87%]	[23.37%]	2050
2001	0.94%	[13.04%]	1488
2000	4.98%	[10.14%]	1512
1999	15.31%	19.53%	[422]
1998	6.63%	26.67%	[2004]

Even following December 2018's ~20% decline, the value of the SPADE Defense Index, through 2018, was still up roughly 40% over a three-year period!

Without factoring in reinvested dividends, through 2018 SPADE Defense Index was up 260%+ over a decade and 573%+ over two decades!

About the SPADE Defense Index

The SPADE Defense Index (NYSE: DXS) provides an investment benchmark for the value that the market ascribes to companies involved with defense, homeland security, and space.

The Index is designed to reflect the broad diversity of activities that is representative of companies involved with the sector – including industrial firms that manufacture aircraft, tanks, ships, and missiles; and those involved with current and next generation systems related to network centric warfare and information technology; intelligence, surveillance, and reconnaissance; satellites; border security; and defense systems that protect the lives of our servicemen and servicewomen.

SPADE Indexes specializes in designing and managing equity benchmarks for ETF and other products.

Rules

The Index was designed to be RIC (registered investment company) compliant for the purpose of enabling financial products. Companies are required to meet a variety of eligibility criteria including market valuation, liquidity, and listing on a major U.S. exchange. Full details are available on our website.

- * Market Cap: Minimum \$100M
- * Share Price: Minimum \$5.00
- * Sufficient Liquidity

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End of 1Q19		100.000%					Market	Forward	Price/	Price/	PEG	
							Cap	P/E	Sales	Book	5 yr	Div Yld
		Percent	31-Dec-18	29-Mar-19	YTD	QTD	intraday	(ttm)	ttm	mrq	expected	forward %
Company	Ticker	3/29/19	Price	Price	% Ch	% Ch						
AXON International Inc.	AAXN	0.84%	43.75	54.41	24.37%	24.37%	3.20	40.91	7.62	6.85	1.89	
AAR Corp	AIR	0.30%	37.34	32.51	-12.94%	-12.94%	1.12	10.73	0.57	1.24	0.90	0.93%
Aerojet Rocketdyne	AJRD	0.71%	35.23	35.53	0.85%	0.85%	2.80	21.53	1.47	6.48	1.21	
AeroVironment	AVAV	0.43%	67.95	68.41	0.68%	0.68%	1.61	41.46	4.71	3.54	1.36	
Boeing Co	BA	7.17%	322.5	381.42	18.27%	18.27%	215.30	16.33	2.13	638.89	0.84	2.20%
Booz Allen	BAH	2.20%	45.07	58.14	29.00%	29.00%	8.14	19.44	1.24	12.14	1.22	1.59%
Ball Corp	BLL	3.92%	45.98	57.89	25.90%	25.90%	19.34	19.10	1.66	5.61	1.49	0.69%
BWX Technologies	BWXT	1.25%	38.23	49.58	29.69%	29.69%	4.70	17.77	2.61	20.04	2.3	1.38%
Caci Intl	CACI	1.19%	144.03	182.02	26.38%	26.38%	4.53	16.41	0.97	2.01	3.70	
Comtech	CMTL	0.15%	24.34	23.22	-4.60%	-4.60%	0.56	19.68	0.87	1.08	1.36	1.76%
Cubic Corp	CUB	0.40%	53.74	56.24	4.65%	4.65%	1.75	21.38	1.39	1.89	-41.50	0.49%
Curtiss Wright	CW	1.28%	102.12	113.34	10.99%	10.99%	4.85	15.19	2.01	3.17	2.38	0.53%
Ducommun	DCO	0.13%	36.32	43.52	19.82%	19.82%	0.50	15.83	0.79	1.93	0.85	
Elbit Systems	ESLT	1.45%	114.02	129	13.14%	13.14%	5.51	26.67	1.50	3.01		1.35%
FireEye	FEYE	0.88%	16.21	16.79	3.58%	3.58%	3.35	54.16	4.04	5.07	0.78	
Flir Systems	FLIR	1.70%	43.54	47.58	9.28%	9.28%	6.45	18.16	3.63	3.44	0.96	1.44%
General Dynamics	GD	5.54%	157.21	169.28	7.68%	7.68%	48.88	13.01	1.35	4.16	1.77	2.43%
Heico	HEI	3.33%	77.48	94.87	22.44%	22.44%	11.64	40.54	6.33	8.47	2.88	0.15%
Huntington Ingalls	HHI	2.29%	190.31	207.2	8.87%	8.87%	8.63	12.32	1.06	5.73	1.57	1.68%
Honeywell Intl	HON	7.10%	132.12	158.92	20.28%	20.28%	115.75	18.20	2.77	6.38	4.00	2.07%
Harris Corp	HRS	3.93%	134.65	159.71	18.61%	18.61%	18.82	17.61	2.92	5.51	1.16	1.71%
Hexcel	HXL	1.55%	57.34	69.16	20.61%	20.61%	5.87	17.78	2.68	4.44	1.92	0.87%
Intelsat	I	0.57%	21.39	15.66	-26.79%	-26.79%	2.16	-10.04	1.00	---	-0.12	
Kaman	KAMN	0.43%	56.09	58.44	4.19%	4.19%	1.63	17.93	0.87	2.57	2.01	1.37%
KBR	KBR	0.71%	15.18	19.09	25.76%	25.76%	2.69	10.43	0.55	1.57	1.27	1.70%
KEY W Holding	KEYW	0.11%	6.69	8.62	28.85%	28.85%	0.43	71.83	0.84	1.48	6.39	
Kratos Defense & Security	KTOS	0.43%	14.09	15.63	10.93%	10.93%	1.63	33.26	2.63	3.12	3.81	
Leidos	LDOS	2.47%	52.72	64.09	21.57%	21.57%	9.21	12.82	0.90	2.83	1.51	2.01%
L-3 Communications Hldgs	LLL	3.94%	173.66	206.37	18.84%	18.84%	16.37	16.24	1.60	2.79	1.92	1.65%
Lockheed Martin	LMT	7.11%	261.84	300.16	14.63%	14.63%	84.89	12.47	1.58	60.50	1.27	2.98%
Mantech International'a'	MANT	0.57%	52.29	54.02	3.31%	3.31%	2.15	21.87	1.10	1.53	2.48	2.01%
Maxar Technologies	MAXR	0.06%	11.96	4.02	-66.39%	-66.39%	0.24	0.81	0.11	0.37	1.25	1.01%
Moog Inc.	MOGA	0.80%	77.48	86.95	12.22%	12.22%	3.18	14.76	1.15	2.38	1.70	1.15%
Mercury Computer Sys	MRCY	0.79%	47.29	64.08	35.50%	35.50%	3.11	31.26	5.43	3.80	1.53	
Northrop Grumman	NOC	5.21%	244.9	269.6	10.09%	10.09%	45.76	12.20	1.53	5.62	1.04	1.80%
OSI Systems	OSIS	0.43%	73.3	87.6	19.51%	19.51%	1.58	20.66	1.41	3.18	1.23	
Oshkosh Truck	OSK	1.43%	61.31	75.13	22.54%	22.54%	5.26	9.71	0.66	2.18	1.20	1.46%
Perspecta	PRSP	0.88%	17.22	20.22	17.42%	17.42%	3.27	10.06	0.89	1.49	2.15	0.95%
Raytheon Co	RTN	5.82%	153.35	182.08	18.73%	18.73%	51.39	13.81	1.90	4.48	0.61	2.08%
SAIC	SAIC	0.87%	63.7	76.95	20.80%	20.80%	4.55	16.44	0.98	2.37	3.27	1.69%
Transdigm	TDG	4.00%	340.06	453.99	33.50%	33.50%	24.01	22.25	6.07		2.54	
Teledyne Technologies	TDY	2.26%	207.07	237.01	14.46%	14.46%	8.58	23.4	2.96	3.84	0.86	
Triumph Group	TGI	0.25%	11.5	19.06	65.74%	65.74%	0.95	7.91	0.28		1.34	0.84%
Textron	TXT	3.15%	45.99	50.66	10.15%	10.15%	11.85	12.42	0.85	2.3	0.82	0.16%
United Technologies	UTX	7.16%	106.48	128.89	21.05%	21.05%	111.15	14.85	1.67	2.86	1.89	2.31%
Vectrus	VEC	0.08%	21.58	26.59	23.22%	23.22%	0.30	7.11	0.23	1.35		
Viasat Inc	VSAT	1.20%	58.95	77.5	31.47%	31.47%	4.69		2.40	2.49	-2.76	
Woodward	WWD	1.55%	74.29	94.89	27.73%	27.73%	5.89	18.01	2.35	3.59	1.37	0.69%

Data Provided by Yahoo Finance, Thomson Reuters (P/E, PEG), Morningstar (div)