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Military Market Trends: Funding Cutbacks Drive Commonality in Electronics

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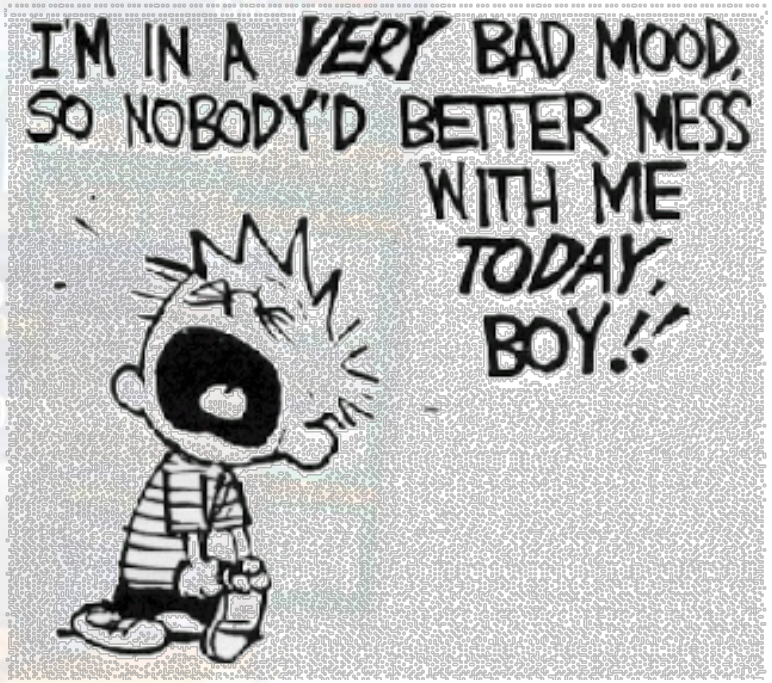
Military EMBEDDED SYSTEMS

Agenda

- Market Mood
- Driving Commonality
- COTS Today
- Market Trends
- Export Reforms
- Summary
- Appendix

Market mood

- The biggest threat to this industry: Sequestration
- Primes and integrators have been hurt the most
- Uncertainty is the theme today.



Not all doom and gloom

- Fully government funded technology development like the JTRS program is a thing of the past.
- DoD to share development costs with industry.
- Military wants systems that can be fielded faster and at lower costs.
  - *Which makes this an opportunity for vendors who can do that.*
- Products that can be used across multiple platforms.
  - *In other words "open architectures and commonality."*

"We want finished product, we want COTS. No more Powerpoints."

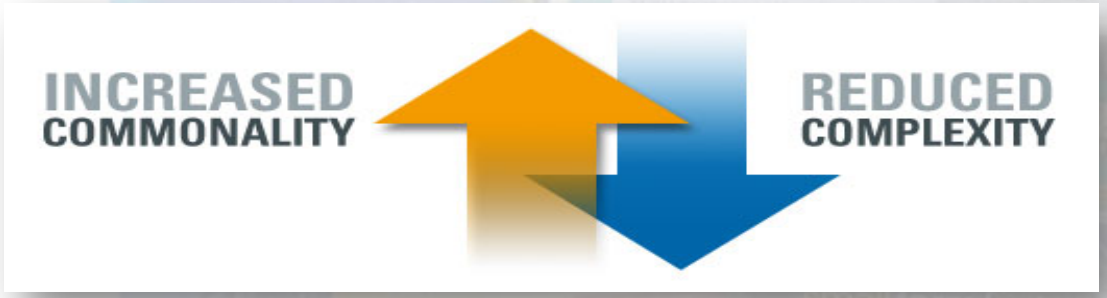
Gen. Crosby

Army Aviation Command

Driving Commonality

- **Budget constraints drive commonality**.
- Having separate manuals & maintainers for every single component, equipment, and system..

  - *Gets Very Expensive*..



Old Dell Computer motto rings true

- Using same component or computer across multiple platforms – via open architectures – saves money on back end.

  - *That is just at the hardware level.*

- Software supportability costs scale even higher when maintaining software baselines and enabling security for trusted computing.

Source: Interviews with Bill Guyan & Andrew Shepard

Driving Commonality

- Commonality improves operational flexibility.
  - *Via common displays, a vehicle crew can move from one platform to another, interfacing with the vehicle's systems and C4ISR applications through this common display.*

SD7310 smart display from General Dynamics Canada

- Commonality means leveraging combined investments from multiple vendors to reduce through-life costs of the system
- Mitigates obsolescence risks by drawing on larger supply base.

Source: Interviews with Bill Guyan & Andrew Shepard

Commonality initiatives

- **Future Airborne Capability Environment (FACE)**
  - *Developing software protocols to enable avionics software code and solutions to be ported across multiple platforms, potentially saving the DoD millions in the long-term.*
- **OpenVPX**
  - *Ecosystem of companies working together to develop and implement open and interoperable architectural framework for VPX high performance embedded computing platforms.*
- **Common Avionics Architecture System (CAAS)**
  - *Based on open architecture approach that leverages adopted industry standards across multiple helicopter platforms*
  - *Cuts technology insertion costs as well as capability retrofits.*
- **UAS Control Segment (UCS) Architecture**
  - *Creating a common control station software framework that can work with the control stations of every UAV adopted by each of the Services.*
  - *Goal to develop an architecture, based upon Service Oriented Architecture (SOA) principles.*

COTS Today

- Within the budget cuts lies a silver lining for COTS vendors
  - *The drive toward commonality and open architectures often means more COTS usage not less.*
- COTS business actually grew during Clinton years
  - *R&D was cut*
  - *Many still didn't trust COTS technology as being reliable enough for mission critical systems.*
- 20 years since DoD Sec. Perry issued memo famous buy COTS memo
- COTS & Mil Spec no longer separate terms, many embedded electronics suppliers offer COTS mil-spec products today.

Dark Sides of COTS still exist

- Obsolescence
  - *The biggest risk associated with COTS . While military platforms last 50 years, commercial technology has short life spans of 6 months to 2 years.*
- Consumer Market Driven
  - *Will not change as commercial component suppliers answer to large volume consumer markets.*
- COTS in Space
  - *Heck no. COTS is still a bad word in the rad-hard community. The C for commercial bugs them.*

Defining COTS Today

- What is COTS today?
  - *It's always been a method of procurement, but has unfortunately evolved into a marketing hyperbole as well. At least it hasn't become a verb.*
- COTS is more about meeting Technology Readiness Levels (TRLs) now, with TRL levels 6 through 7 being the bulls eye.
- How do you define it?

"I think of COTS as anything available off the shelf or with a tweak to it for specific applications, which is more the norm than having items being ordered right out of a catalog. If the customer is paying you for the product to be designed from the ground up then it is not COTS it is custom. In other words a Non-Developmental Item (NDI), which many prefer to use instead of COTS."

Technology Readiness Levels

Phase	TRL	Maturity Level
System test, launch, and operations	9	System verified by successful mission
Technology demonstration	8	System flight-qualified through test
	7	System prototype demonstrated in space environment
System/subsystem development	6	System demonstrated in relevant environment (ground or space)
Technology development	5	Component and/or breadboard validation in a relevant environment
	4	Components validated in laboratory
Feasibility verification	3	Analytical and experimental critical function, characteristic proof-of-concept
	2	Technology concept and application formulated
Basic technology research	1	Basic principles observed and reported

COTS variations

- **GOTS**: Government-Off-the-Shelf
- **MOTS**: Military-off-the-shelf
- **ROTS**: Rugged-off-the-shelf
- **NOTS**: NATO-off-the-shelf
- For space products and avoiding the dreaded C in COTS, Ken O'Neill of Microsemi suggested:
  - ***QOTS***: *QML class Q off the-shelf*
  - ***VOTS***: *QML class V off-the-shelf shelf*
  - ***SOTS***: *class JAN S off-the-shelf*
- **KOTS**: Kinda-off-the-shelf (Suggested by a bus dev guy at Cisco years ago)
- And of course….
- **ShOTS**: Won't spell this one out, but unfortunately there's a lot of it floating around…

Military Radio & Networking Market

COTS & open standards drive military communications and networking applications. SDR is a solved problem for defense apps as SDR enabled systems are everywhere in U.S. military. NDI-type procurement is the future.

DoD wants to leverage the use of commercial technology such as cloud computing, social media, and commercial mobile devices. *Companies that answer that call will do well*

Commonality: Shrinking Army & Marine deployments require new gear to be multi-functional. Examples are smartphone devices for warfighter, tactical app stores, and other devices based on Android and iPhone functionality. Generals want troops to have same functionality their relatives have at home.

"The Army wants connectivity you can fit in a pocket and that can handle extreme temperatures."

Richard Lane,

VP, Strategic Business Development
AMREL

Source: Industry interviews and Frost & Sullivan data

Military Radio & Networking Market

Future Trends

- Wireless networked force a long-term goal. Network connectivity still a major challenge as warfighters often don't know if they will have Wi-Fi, cell or sat/tac connections in the field. Broadband coverage rarely available to dismounted soldier.
- Wireless being used by more than Special Ops with regular Army NIE experiments continuing, some elements included in Capability Set 13 being deployed as Nett Warrior with a mix of "program" radios, COTS cell phones and wireless. However, the Army and Marine Corps have yet to embrace it with large procurement spending.
- The DoD has also stated that it wants to be more spectrally efficient with more investment in cognitive radio technology.
- Portable, affordable and energy efficient cognitive radios are long term goal.

The Wave Relay Android Kit from Persistent Systems pairs Android devices with Wave Relay, a radio system that provides a secure Mobile Ad Hoc Network (MANET)

Source: Industry interviews, Frost & Sullivan

Military Radio & Networking Market

Market Numbers:

- The FY 2015 budget calls for about $260 million for SDR based programs like JTRS and MIDS.
  - *Key suppliers such as General Dynamics, Exelis, BAE, Rockwell Collins, ViaSat.*
  - *Harris and Thales, especially for interim SDR radios.*
- Waveform development continues, interim solutions adequate, shrinking force means fewer systems needed.
- The European market for military networking and communication is about $90 million and Asia is about $30 million. Global Leaders are General Dynamics, BAE, Thales, Finnmeccanica-Selex. Countries in both regions are also reducing forces, but improving C4ISR capabilities.

Source: Brad Curran, Frost & Sullivan

Military Radio & Networking Market

Market Numbers

- For networking technology there were 246 awards in 2013 totaling $17.6 billion for enterprise and tactical applications with General Dynamics as the leading provider.
- Tactical networks totaled 96 contracts for $20.8 billion in 2013 with Harris as the leading company in tactical and enterprise applications. Harris is the leader in radio technology as well, thanks to their family of Falcon radios (pictured)
- For airborne radio applications Rockwell Collins is the leader while ViaSat is the front-runner for data link technology."

Source: Brad Curran, Frost & Sullivan

Radar & ISR Market

- COTS suppliers thriving in Intelligence, Surveillance and Reconnaissance (ISR) applications.
  - *Big contracts in 2013 focused on radar, unmanned vehicles, electro-optical/infrared (EO/IR), and night vision technology.*
  - *Big money for radar still in missile defense, which is proliferating.*

Radar Contracts			
Year	**Contracts**	**Size**	**Leader**
2012	88	$4.26 billion	Raytheon
2013	79	$4.03 billion	Raytheon
2014*	41	$2 billion	Raytheon

* skewed with Lockheed Martin winning the $914 million Space Fence contract in June

- Radar applications range from large missile defense systems to small radars that find incoming artillery and mortar rounds.
- Maritime radar: surface ship self-defense to deter incoming anti-ship missiles from potential adversaries in the Western Pacific.
- For 2013 there were 41 maritime contracts for $1.59 billion, with Raytheon leading. Raytheon won the U.S. Navy's Air and Missile Defense Radar (AMDR) contract – a next-generation defensive system for Arleigh Burke-class destroyers last year.

Source: Brad Curran, Frost & Sullivan

Unmanned Aircraft Market

- 'Every platform a sensor, and every sensor networked.'
  - *As troop strength is decreased and budgets reduced, military users are becoming more reliant on UAS payloads.*
- DoD ISR requirements worldwide are driving the need for more capable sensors and more persistent platforms.
- Program of record spending DoD RDT&E within FY 2015 comes to about $17.8 billion. Operations & Maintenance funding adds another billion dollars as we enter "sustainment decade"

"If you bend metal and make airplanes it is going to be a tough road, but if you make command and control technology, flight controls, communication technology, and sensors and the business model continues to open up it could be a time of opportunity for."

Ron Stearns

Research Director at G2 Solutions

Source: G2 Global Solutions & Frost & Sullivan

Other Military Market Trends

- Ground systems will be the dog for quite some time.
  - *U.S. has pulled back world wide footprint.*
  - *No ground wars means little need for ground combat vehicles.*
- Avionics upgrade opportunities will be steady part of aircraft market
  - *No new platforms funded*
  - *Need to sustain and modernize current fleets*
- Contracts are more spread out, involving more companies and reducing not only cost but risk.
- Top ten prime contractors
  - *2011*
    - 290 companies had about sixty percent of the prime contracts.
  - *2012*
    - 435 companies had only 41 percent of the prime contracts awarded.
  - *2013*
    - Trend continues with 415 companies with prime contracts.

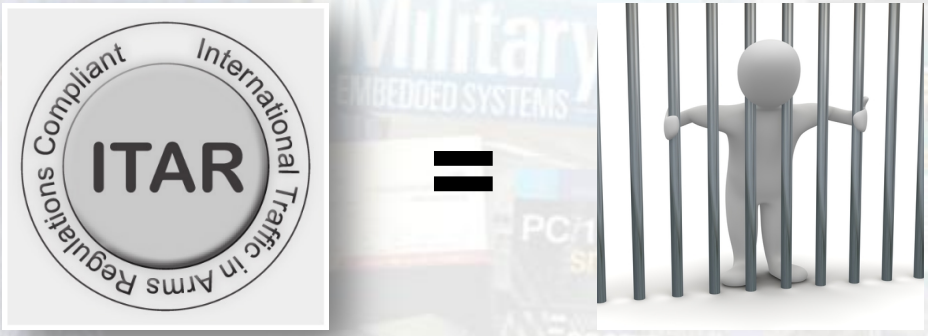
Source: Frost & Sullivan and G2 Solutions

Market Trends Summary

- COTS & open standards drive military communications and networking applications. Reduced forces worldwide means more demand for networked devices that can perform multiple functions.
- Radar, C4ISR, unmanned systems are best bets for COTS suppliers as these will want to take advantage of commercial processing performance advantages.
- *"It doesn't matter if it is only an 80 percent solution -- who cares. Why spend 20 percent more for that extra five to ten percent of capability if it might just turn into a "nice to have"* Michel Merluzeau, G2 Solutions.
- IRADs, while not a large revenue producer, should keep many busy as primes and integrators going forward will invest their own money in development and will likely outsource embedded electronics.
- Contracts more spread out, meaning more companies can compete for awards

Export Compliance Reforms

- U.S. export compliance regulations such as the International Traffic in Arms Regulations (ITAR) handcuff American defense electronics suppliers -- preventing them from competing internationally.
- Also hard for European and other international firms to do business with the U.S.



- "ITAR Free" is a common sight at exhibit stands at European Defense trade shows
- Obama Administration reforms promise to loosen those controls for non-combat related aircraft and commercial satellite related items.

Export Compliance Reforms

- New rules and changes to ITAR and Export Administration Regulations (EAR), moved a very large set of controlled aircraft and aircraft parts common to State's U.S. Munitions List (USML) Category VII to the Commerce Control List (CCL).
- Those products are now authorized for export to ***36 countries***
  - *provided exporters meet all requirements of license exception Strategic Trade Authorization (STA).*
- Exports must be for the end use of government organizations such as the military, police, search and rescue, etc.

Source: Kay Georgi

Export Compliance Reforms

- Parts and components that are staying on the USML -those that are 'specially designed' for combat aircraft.
  - *B1B; B2; F-15SE; F/A-18 G,H, and F; F-22; F-35 Joint Strike Fighter (JSF); and the F-117 Stealth jet*
  - *As well as items that are specifically called out on a positive list contained in the revised USML Category VIII.*

- Mission critical technology that is listed in USML Category VIII on all aircraft – not just military aircraft -- will be not be allowed to be moved over to Commerce.
  - *However, any parts and components not specifically called out in USML Category VIII will move over to Commerce.*

Source: Kay Georgi

Export Compliance Reforms

- Defense suppliers need to spend money for compliance now or spend more money in fines and penalties later.
  - *The fines have functioned as a deterrent as the multi-million dollar penalties have forced companies to get their act together so they don't get hit with a fine or even worse – criminal charges.*
- The large companies have made strong efforts to put in place best practices on export compliance and then following them.

"The State Directorate of Defense Trade Controls (DDTC) and the [Department of Justice (DOJ) continue to level ITAR fines and big ones."

Kay Georgi,

Partner, Arent Fox, LLP

Source: Kay Georgi

Export Compliance Reforms

- Make sure you know the rule changes because big fines are still happening and you don't want that violation letter coming from State or the Justice Dept. claiming you need to pay restitution to the victim of your crime – the U.S. Warfighter.
- Two of the most recent being United Technologies Corp. (UTC) and Raytheon getting hit with $55 million and $8 million penalties respectively.
- For more on fines, visit www.pmddtc.state.gov/compliance/consent_agreements.html.

Source: U.S. State Department

Export Compliance Reforms

- All those big fines may drive one to drink, if so I recommend …
  ITAR vodka

- *Available for order on the web and made by the Sichuan Yibin Global Group out of China…*

Ironic isn't it….?

Summary

- Sequestration has made life tough, but it's not all doom and gloom.
- Commonality is the new theme and COTS and open architecture designs should do well in this environment.
- Military wants to leverage commercial technology such as cloud computing, social media, and commercial mobile devices to create a networked force
- Shrinking Army & Marine deployments require new gear to be multi-functional
- Best investment bets are C4ISR, radar, electronic warfare, and unmanned systems.
- Export reform is here and may open new opportunities internationally, but for any company I recommend getting a good attorney. It's too easy to slip up and not worth the resulting fines.

Links

Articles

- U.S. military market a sustainment market
- For Every soldier, a smartphone
- Wireless Innovation Forum's contributions to SCA 4.1
- Evolving radio technology: SDR to cognitive radio
- Shrinking DoD budget still has funding for aircraft upgrades
- Cognitive Radio's fate uncertain as spectrum battle plays out
- Commonality and reduced SWaP drive vetronics designs
- ITAR fines can cripple your business
- Export compliance reforms on the way for aircraft and satellite suppliers
- Full speed ahead: FACE initiative fosters reuse, cuts costs and delivery time of military avionics systems

Sources

- Frost & Sullivan
- G2 Solutions
- Kay Georgi, Partner, Arent Fox, LLP
- Pay-Per-View Webcast led by Kay Georgi: Managing ITAR/Export compliance reform for defense electronics suppliers
- FACE Consortium
- UCS
- VITA

- Apply to be a contributor, by emailing me at jmchale@opensystemsmedia.com

Source: Referenced from mil-embedded.com

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Thank you.

Thank a warfighter this week. If you see one at the airport, just say "thanks for your service." They don't hear it enough.

Military EMBEDDED SYSTEMS

DOD Market Trends

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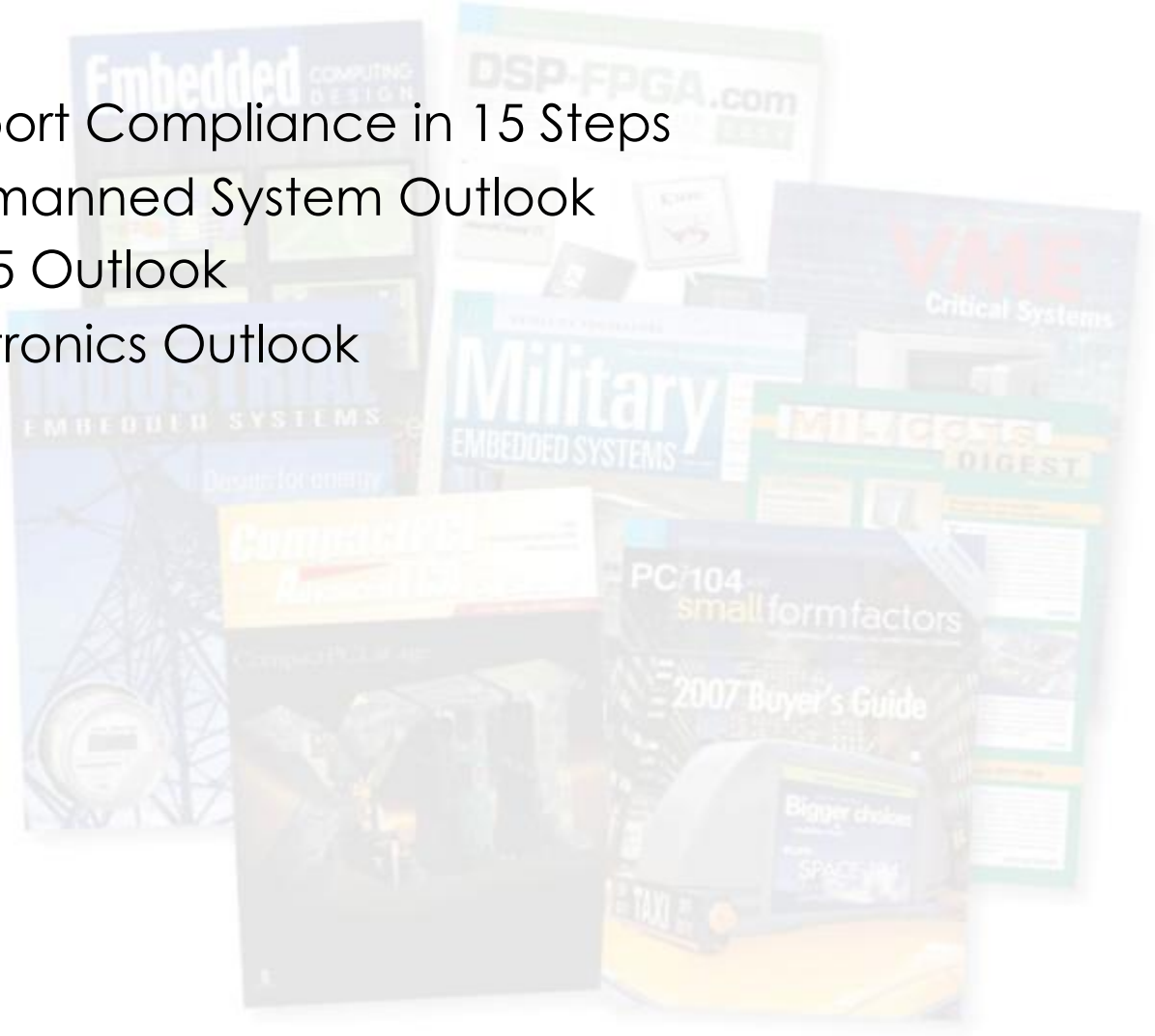
Appendix

I. Export Compliance in 15 Steps
II. Unmanned System Outlook
III. F-35 Outlook
IV. Vetronics Outlook



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Export compliance in 15 steps

Appendix I

Kay Georgi
Export compliance attorney and Partner
Arent Fox LLP in Washington

Military EMBEDDED SYSTEMS

Export compliance in 15 steps

1. Get management buy-in for your compliance program – If management does not support the program, it likely will not work.
2. Identify two persons in your organization who will be your export compliance personnel – one is not enough. If you do not have good candidates, you may have to recruit from outside your organization.
3. Make sure your export compliance personnel have thorough export control training – For most companies except the largest, this usually means outside training.

Source: Kay Georgi, Partner at Arent Fox LLP

Export compliance in 15 steps

4. Classify all the products, services, software, and technology that your company exports. This might mean classifying all items, even if you do not export them in the traditional sense, if you employ foreign nationals or procure offshore. Put in your new product development a gate for classification, and put in your new contract review system a gate for classification.
5. Make sure any controlled products are identified in your ERP system or in another fashion so that your personnel will know that they are controlled. If you procure controlled products, be sure your vendor understands and agrees to implement export compliance procedures (and is ITAR registered as applicable). If you procure overseas, make sure you obtain any necessary license or other authorization to do so.

Source: Kay Georgi, Partner at Arent Fox LLP

Export compliance in 15 steps

6. Put in place automatic and other gates in your ERP system and in your sales/customer service departments to make sure that any controlled products are not exported, re-exported, imported (for items on the U.S. Munitions List and U.S. Munitions Import List), or transferred without any required license.
7. Put in place a gate in your Returns and Repairs department, to make sure that all returns of defense articles to the U.S. are properly authorized (exemption claimed) and returned pursuant to license or exemption. Also make sure the department recognizes if the item has ended up in the hands of an unlicensed end user.

Source: Kay Georgi, Partner at Arent Fox LLP

Export compliance in 15 steps

8. Create a technology control plan to cover controlled technology, and be sure to include IT, human resources, and procurement/purchasing (for offshore procurement) departments in your plan. In particular, with the assistance of IT, HR, and procurement departments:
   - *a) Put in place Standard Operating Procedures (SOPs) to identify, correctly label, and protect controlled technology.*
   - *b) Put in place SOPs to identify and to obtain DSP-5 licenses for foreign persons hired both permanently and temporarily (e.g. through temp agencies).*
   - *c) Analyze the risks associated with your IT system and use encryption, secure FTP sites for communications with customers, user access controls, software that can identify access, and the location of servers to reduce risk of inadvertent exports/ access issues. Put in place SOPs for the above.*
   - *d) Create and put in place a laptop, USB, blackberry/smart phone SOP*
   - *e) Create and put in place SOP for international travel*
   - *f) Create and put in place SOP for visits*

Source: Kay Georgi, Partner at Arent Fox LLP

Export compliance in 15 steps

9. Create a license/agreements management system, including the export process and filing of Automated Export Records, to ensure compliance with all licenses, license exceptions (EAR), or license exemptions (ITAR). Make sure your foreign licensees understand and agree to all license conditions.
10. Be sure to screen all customers and suppliers against the restricted party lists, both at the initial input stage and on a regular (or evergreen) basis, record, and preserve screens.
11. Train personnel for red flags of prohibited end use and diversion and create a process for resolution of red-flag screening.

Source: Kay Georgi, Partner at Arent Fox LLP

Export compliance in 15 steps

12. Create a problem management to deal with issues as they arise, as well as government inquiries and visits and voluntary disclosures.
13. Put all of the aforementioned procedures into a compliance manual and SOPs.
14. Train and test all personnel, or at least most personnel, on the compliance manual and SOPs on a regular basis.
15. Audit regularly, alternating responsible internal auditors (if you have them) with experienced outside auditors. Follow up on audit results. File voluntary disclosures where warranted.

Source: Kay Georgi, Partner at Arent Fox LLP

Appendix II: Unmanned Aircraft Systems Outlook

- Sustainment decade: Major DoD programs of record are nearing the end of their production runs such as Air Force RQ-4 variants and the MQ-9. The MQ-1C will likely see the end of its run in 2015.
- Platforms can last ten to fifteen years as long as upgrades are made to the sensors, communications, and weapons systems to meet the stand-off detection and ISR requirements
- From an O&M services, non-programs-of record and special-access programs perspective it looks pretty steady.

RQ-4 Global Hawk

Source: Ron Stearns, G2Solutions

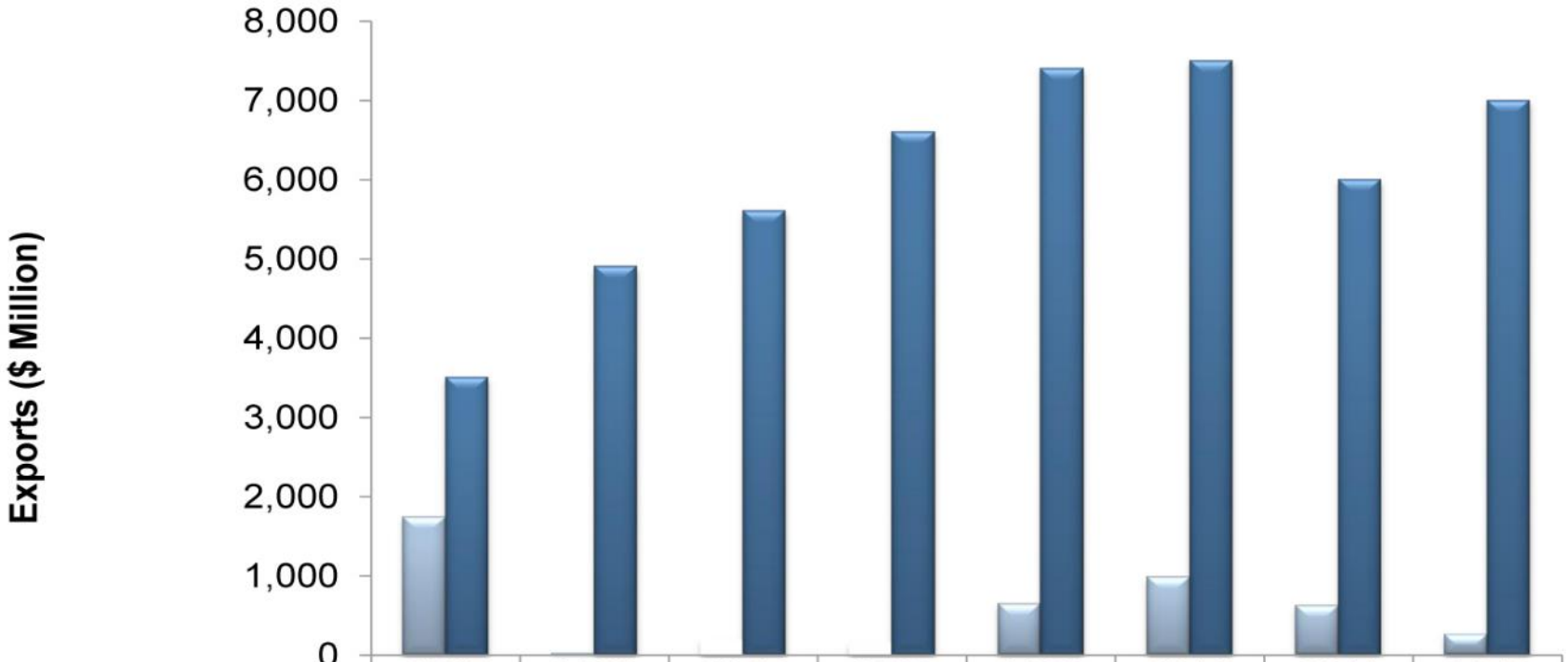
Unmanned Aircraft Systems Outlook

- Israel is the largest UAS exporter, but the U.S. still makes the most by far.
- UAS exports have accounted for nearly 10 percent of the country's total defense export industry, and this is expected to increase.
- 2005 to 2012 Israel exported about $4.6 billion USD in unmanned aircraft while the U.S. did about $3 billion USD.

Source: Mike Blades, Frost & Sullivan

Unmanned Aircraft Systems Outlook

Israeli Total Defense Exports vs. UAS Exports, Global, 2005–2012



	2005	2006	2007	2008	2009	2010	2011	2012
UAS Exports*	1,744	24	189	150	650	979	627	260
Total Defense Exports	3,500	4,900	5,600	6,600	7,400	7,500	6,000	7,000

*Note: UAS exports include platforms, platform leases, and manufacturing license agreements. All figures are rounded. The base year is 2012. Source: Frost & Sullivan analysis.

Appendix III: F-35 JSF outlook

- The F-35 Joint Strike Fighter (JSF) is still on track for continued production. Recent LRIP 8 covers purchases of 29 U.S. aircraft, 2 F-35As for Israel, 4 F-35As for Japan, 2 F-35As for Norway, 2 F-35As for Italy., and 4 F-35Bs for the UK.
- The program will be stretched out a bit more than it already has been. By extending the time frame, we will see a slow stretch out of the Air Force version.
- Lockheed aims to cut F-35 price to that of a 4th gen fighters by 2020.
- F-35 production is expected to be 120 aircraft between 2011 and 2017.

Source: Wayne Plucker, Frost & Sullivan and Lockheed Martin

Regarding F-35 development challenges, it was complicated process trying to get an aircraft to do things that have never been done before. We will not be able to get a full verdict on the F-35 until it performs in combat."

Michel Merluzeau

Managing Partner of G2 Global Solutions

Appendix IV: Vetronics outlook

- The military [vehicle electronics] vetronics market has turned out to be a bit stagnant as retrenchment of American military in ground vehicles drives market place.
  - *[It] is worse than flat," Frost's Wayne Plucker says. "I see it having -3.5 CAGR over five years, which is flat to less than flat."*
- The Army is planning to reduce tank rebuild to minimum sustainment levels and is about done building new ground vehicle platforms.
- The Ground Combat Vehicle (GCV) and Joint Light Tactical Vehicle (JLTV) will be delayed or stretched out. There will be some spending on refits, but not much.
- Last year the vetronics market was valued at less than $900 million. Any growth here will be in RDT&E budget, not procurement.

Source: Wayne Plucker, Frost & Sullivan