United Technologies Corporation
1101 Pennsylvania Avenue, N.W.
10th Floor
Washington, D.C. 20004-2545

United Technologies

Submitted Via Email

April 4, 2016

Hillary Hess
Regulatory Policy Division
Bureau of Industry and Security
Room 2099B
U.S. Department of Commerce
Washington, D.C. 20230

Attn: RIN 0694–AF75

Re: Revisions to the Export Administration Regulations (EAR): Control of Fire Control, Laser, Imaging, and Guidance and Control Equipment the President Determines No Longer Warrant Control Under the United States Munitions List (USML) (81 Fed. Reg. 8421, February 19, 2016)

Dear Ms. Hess:

United Technologies Corporation ("UTC")[1] appreciates the opportunity to submit these comments on the implementation of Export Control Reform ("ECR") with respect to fire control, laser, imaging, and guidance and control equipment. UTC strongly supports the Administration's goals of creating a positive, transparent and predictable structure within the categories of the Commerce Control List ("CCL"), and believes that the revisions in the Bureau of Industry and Security ("BIS") February 19, 2016 proposed rule ("Proposed Rule") largely accomplish this goal.

UTC offers the following comments below with regards to the revisions announced in the Proposed Rule and current CCL Export Control Classification Numbers ("ECCNs").

I. Proposed Licensing Requirements for 9 Hz Thermal Camera in § 744.9

The Proposed Rule, if adopted, will subject thermal cameras classified under ECCN 6A993.a and meeting the criteria in Note 3.a to ECCN 6A003.b.4.b (i.e., having a maximum frame rate equal to or less than 9 Hz) to the increased licensing requirements found in Section 744.9 of the Export Administration Regulations ("EAR"). As explained in the Proposed Rule, a

[1] UTC is a global, diversified corporation based in Farmington, Connecticut, supplying high technology products and services to the aerospace and building systems industries. UTC's companies are industry leaders, among them Pratt & Whitney, Otis, UTC Aerospace Systems, UTC Climate, Controls & Security, and United Technologies Research Center.

U.S. interagency review concluded that these 9 Hz cameras are being incorporated into foreign military commodities and, therefore, the licensing requirement in EAR §744.9 is warranted. As a result of this determination, the Proposed Rule will require exporters and re-exporters to obtain license authorization if, at the time of export, re-export or transfer, the exporter or re-exporter knows, or is informed, that the item will be, or is intended to be, used by a military end-user or incorporated into a military commodity controlled under ECCN 0A919.

UTC notes that the new license requirement may put U.S. industry at a disadvantage. As illustrated in **Appendix A**, thermal cameras and other infrared technology are available worldwide. Also, the Wassenaar Arrangement's ("WA") Lists of Dual-Use Goods and Technologies and the European Union's ("EU") dual use control regulations[2] do not control these cameras in the same manner as recommended in this Proposed Rule. As such, UTC believes that imposing additional licensing requirements above and beyond previously accepted international controls will hinder U.S. manufacturers' ability to compete internationally.

UTC recommends that the BIS reconsider subjecting thermal cameras classified in ECCN9A663.a and having a maximum frame rate equal to or less than 9 Hz, to licensing requirements in EAR §744.9. If BIS determines that the additional license requirements are necessary to protect national security, UTC requests that the BIS work to ensure that all WA member states are subject to similar licensing requirements.

II. Category 6 – Sensors and Lasers

A. Revise ECCN 6A002 One-Dimensional Focal Plane Array Controls

ECCN 6A002.a.3.d.2.a currently controls non-space-qualified linear (1-dimensional) focal plane arrays ("FPAs") that have individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm and a ratio of scan direction dimension of the detector element to the cross-scan direction dimension of the detector element of less than 3.8 ("Square Pixel FPAs"). Non-space qualified linear FPAs with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm that do not have a ratio of scan direction dimension of the detector element to the cross-scan direction dimension of the detector element of less than 3.8 ("Tall Pixel FPAs") are not captured by this ECCN and are instead classified as EAR99.

Square and Tall Pixel FPAs are used almost exclusively for commercial applications, including near infrared ("NIR") interferometry, NIR spectroscopy, biomedical analysis, plastic recycling, and industrial process control. UTC sells Tall and Square Pixel FPAs for incorporation into commercial systems and into UTC's own linescan camera product line, as discussed in Section B below.[3] Square Pixel FPAs, like Tall Pixel FPAs, are commercial items incorporated into higher level commercial assemblies (e.g., linescan cameras) and commercial

[2] Please see the following site for the EU dual use export control regulations: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:134:0001:0269:en:PDF

[3] Supporting sales data is UTC Aerospace Systems' Proprietary and can be provided to the U.S. Government upon request.

systems (e.g., solar cell ingot and hot bottle inspection machines). Further, due to their limited sensitivity and imaging capability, UTC is not aware of any fielded military system using Square or Tall Pixel FPAs.

UTC requests BIS re-evaluate whether Square Pixel one-dimensional FPAs, with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 3,000 nm, continue to warrant control in ECCN 6A002.a.3.d, as this creates a seemingly arbitrary difference in the level of control between Tall Pixel FPAs and Square Pixel FPAs (i.e., Anti-Terrorism "AT" controls vs. National Security "NS" controls).

If BIS determines Square Pixel FPAs warrant higher-level control than Tall Pixel FPAs, UTC recommends the following changes in ECCN 6A003.

B. Revise ECCN 6A003 Linescan Camera Controls

In general, linescan cameras are intended for regular commercial use. Linescan cameras are not generally used for military applications because they require machine-vision interfaces (e.g., Camera Link), external computers with displays, and civil oriented spectroscopy and/or machine vision software. Additionally, linescan cameras require remote control and data acquisition, object movement and image processing in order to make images or evaluate the results, making them unsuitable for military applications.

As discussed above, UTC manufactures linescan cameras that incorporate short wave infrared ("SWIR") (1-dimensional) Square or Tall Pixel FPAs.[4] For example, UTC manufactures the GL2048L linescan camera ("GL2048L"), which incorporates a SWIR one-dimensional Square Pixel FPA controlled in ECCN 6A002.a.3.d.2.a. The GL2048L is specially designed for biomedical and industrial machine vision applications and <u>cannot</u> create, view or store a two-dimensional image without external software and hardware (e.g., computer). These limitations make the GL2048L unsuitable for military applications. Further, the GL2048L <u>is not</u> field-portable or sealed for outdoor use and, therefore, is not suitable for military applications due to its limited sensitivity. Despite limited military applicability, the GL2048L, as a result of incorporating a one-dimensional Square Pixel FPA, is currently classified under ECCN 6A003.b.4.a.[5]

A SWIR imaging camera with inherent two-dimensional imaging capabilities has both military and commercial applicability (i.e., dual-use applicability). Currently, a SWIR imaging camera incorporating two-dimensional FPAs, with dual-use applicability, is classified under ECCN 6A003.b.4.a, alongside the GL2048L, which, as mentioned above, has limited military applicability.

---

[4] See http://www.sensorsinc.com/products/linescan-cameras/

[5] In addition to incorporating the one-dimensional Square Pixel FPA, the GL2048L linescan camera is also classified in ECCN 6A003.b.4.a. because (1) there is no definition of 'scanning camera' associated with ECCN 6A003.b.2; (2) the broad definition of 'imaging camera' in Note 1 to ECCN 6A003.b.4 does not exclude linescan cameras; and (3) limited exclusions for imaging cameras incorporating linear FPAs in Note 2 to ECCN 6A003.b.4.

UTC believes that SWIR imaging cameras incorporating two-dimensional FPAs, because of their inherent dual-use applicability, warrant the level of control associated with ECCN 6A003.b.4.a. (i.e., NS controls). UTC believes that linescan cameras incorporating SWIR one-dimensional Square Pixel FPAs, with limited military applicability, do not warrant the level of control associated with ECCN 6A003.b.4.a.

UTC requests BIS revise ECCN 6A002.a.3.d.2.a to release linescan cameras incorporating one-dimensional Square Pixel FPAs. As such, UTC recommends the following revisions:

- Add a note to ECCN 6A003.b.2 clarifying the term 'scanning camera';

- Revise the control text for ECCN 6A003.b.2.b to read:

  "*Linear detector arrays controlled by ECCN 6A002.a.3.d or 6A002.a.3.e with more than 8,192 elements per array.*";

- Revise Note 1 to ECCN 6A003.b.4 to read:

  "*Imaging cameras described in 6A003.b.4 include "focal plane arrays" combined with sufficient "signal processing" electronics, beyond the read out integrated circuit, to enable as a minimum the output of an analog or digital signal once power is supplied. Linescan cameras incorporating "focal plane arrays" in ECCN 6A002.a.3.d.2.a. are not imaging cameras.*"; and

- Revise Note 2 to ECCN 6A003.b.4 to read:

  "*6A003.b.4.a does not control imaging cameras incorporating linear "focal plane arrays" with 8,192 elements or fewer, not employing time-delay-and-integration within the element and designed for any of the following:*
  a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;
  b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;
  c. Industrial equipment used for inspection, sorting of commercial products, or analysis of the properties of materials;
  d. Equipment "specially designed" for laboratory use; or
  e. Medical equipment.".

These changes would acknowledge that linescan cameras incorporating one-dimensional Square Pixel FPAs require a different level of control than SWIR imaging cameras incorporating two-dimensional FPAs.

Additionally, UTC request BIS address this issue with Wassenaar member states and seek a corresponding change to the WA dual use list.

C. ECCN 6D991 Software Controls

The Proposed Rule will consolidate existing unilateral software controls in ECCN 6D991. The Proposed Rule also will expand the scope of ECCN 6D991 to now control software, not elsewhere specified, that is specially designed for the development, production, or use of commodities controlled by ECCNs 6A002 or 6A003. This entry previously controlled software, not elsewhere specified, that is specially designed for the development, production, or use of commodities controlled by ECCNs 6A002.a.1.d, 6A990, 6A991, 6A996, 6A997, or 6A998.

UTC recognizes that software specially designed for the use of ECCN 6A002 or 6A003 commodities must include all six elements of the definition of "use," including operation, installation, maintenance, repair, overhaul, and refurbishing, to be controlled by ECCN 6D991. Although typical operational software may meet one or more of these elements, it most likely does not include all six. UTC believes the addition of 'use' to ECCN 6D991 may create confusion for U.S. manufacturers and exporters given that software, in most cases, does not meet all six elements of "use."

UTC recommends BIS eliminate the term "use" completely in ECCN 6D991 and limit the controls to software, not elsewhere specified, that is specially designed for the development or production of commodities controlled by ECCNs 6A002, 6A003, 6A990, 6A991, 6A996, 6A997, or 6A998.

* * *

For additional information, please contact the undersigned at (202) 336-7467, peter.jordan@utc.com, or Michael Wetzel at (609) 333-8331, michael.wetzel@utas.utc.com.

Sincerely,

Peter S. Jordan
Executive Director, Associate General Counsel, International Trade Compliance
United Technologies Corporation

Appendix A - Foreign IR Camera and FPA Sources

Country	Company	Technologies	Products	Formats	Website
Belgium	Xenics	InGaAs	1D and 2D Cameras, Cores, IRFPAs	320x256x20	http://www.xenics.com/en/products/cameras
			(31 InGaAs variations named Bobcat, Cheetah, Rufus, Cougar, Lynx, XTM, XSW core) - Also offers cooled MCT LWIR, InSb MWIR and T2SL SWIR	640x512x20	
				640x512x25	working on 1280x1024
				512x1x25	
				1024x1x12.5	
				2048x1x12.5	Presenting new high speed versions at DCS 2016
				3000x1x25	
		µBolometers	2D Cameras, Cores, IRFPAs and pan-tilt imaging systems	320x256x20	http://www.xenics.com/en/products/cameras
			(28 variations named Gobi, Raven, Meerkat, Serval, XTM core, XCO)	640x512x20	
				640x512x25	
				512x1x25	
				1024x1x12.5	
				2048x1x12.5	
		InGaAs	ROICs:		http://www.xenics.com/en/products/cameras
			2D LN2 XPA-1.7-640	640x512x20	
			1-D Xlin-1.7-512	512x1x25	
			Xlin-1.7-1024	1024x1x12.5	
			Xlin-1.7-2048	2048x1x12.5	
China	Shanxi Guohui Optoelectrnic Technology Co. (GHOPTO)	InGaAs	2-D Cameras	640x512x25	http://www.ghopto.com/en/index.php?m=content&c=index&a=show&catid=14&id=63
				320x256x30	http://www.ghopto.com/en/index.php?m=content&c=index&a=show&catid=14&id=64
			FPAs		http://www.ghopto.com/en/index.php?m=content&c=index&a=show&catid=14&id=65
	Debut Optoelectronic Sensors	QWIP	FPAs	640x512x25	http://www.wopuopto.com/en/about.asp?action=intro
				320x256x30	
France	Sofradir	InGaAs	IRFPAs Cactus 640 SW	640x512x25	http://www.sofradir.com/product/cactus-640-sw-2/
			Snake 640 SW	640x512x15	
		MCT for SWIR	IDCAs: Neptune SW/VISIR	500x256x30	http://www.sofradir.com/product/cactus-640-sw-2/
			Saturn SW/VISIR	1000x256x30	
		MCT for MWIR	IDCAs: Axir, Daphnia, Epsilon, Galatea, Inspir, Jupiter, Leo, Mars,	320x256x30/25	http://www.sofradir.com/products/?wavebands=mwir
				640x512x20/15	
				1024x768x10	
				1280x1024x15	

Appendix A - Foreign IR Camera and FPA Sources

Country	Company	Technologies	Products	Formats	Website
			Scorpio, Uranus MW		
	New Imaging Technologies	InGaAs	2-D ROICs, Camera modules	320x256x25	http://www.new-imaging-technologies.com/ingaas-products.html
				640x512x15	
Germany	AIM INFRAROT-MODULE GmbH	MCT for SWIR	IDCAs: ActIR-1024	1024x256	http://www.aim-ir.com/en/main/products/modules.html
			ActIR-384	384x288x24	
			MW/LW	384x288x24	
			MW/LW	640x512x24/15	
			MW/LW	288x6 / 576x7	
	Allied Vision	InGaAs	Cameras G-033	640x512x15	http://www.alliedvision.com/en/products/cameras.html#spectrum/-1/maxFrameRate/-1/resolutionCalc/-1/color/-1/sensorSize/-1/sensor/-1/series/59/text//intf/-1/interfacefilter/-1/legacy//
			G-032	640x512x25	
			G-008	320x256x30	
	EHD Imaging GmbH	InGaAs	SWIR 1" format Lenses	8, 16, 25, 35, 50 mm focal lengths	http://ehd.de/products/specialapplications/NIR_Enhanced_Cameras.html
Ireland	Raptor Photonics	InGaAs	2-D Cameras – OWL	320x256x30	http://www.raptorphotonics.com/products/category/swir-vis-swir-cameras-4
				640x512x15	
Israel	SCD	InGaAs	IRFPAs, modular cores	640x512x15	http://www.scdusa-ir.com/gi-scd15-swir/
					delivering 1280x1024x10
		HOT MCT, InSb, XbN	IRFPAs, modular cores named Sebastian, Kinglet, Pelican, Hercules, Blackbird	320x256x20	http://www.scdusa-ir.com/ir-sensors/
				640x512x15	
				640x512x20	
				640x512x25	
				1280x1024x15	
				1920x1536x10	
Japan	Hamamatsu	InGaAs	1-D IRFPAs (28 versions)	128x1x50	http://www.hamamatsu.com/us/en/product/alpha/l/4005/4208/4121/index.html
				256x1x50/25	
				512x1x25	
				1024x1x25 sq&tall	
			2-D IRFPAs (4 versions)	64x64x50	http://www.hamamatsu.com/us/en/product/alpha/l/4005/4208/4121/index.html
				128x128x50/20	
			2-D Cameras C10633-13, -23, 034, -50	320x256x30	http://www.hamamatsu.com/us/en/product/category/5000/5005/index.html#camera_type=0&wavelength=3
				640x512x20	
	Artray Co., LTD.	InGaAs	2-D cameras	320x256x30	http://www.artray.us/ingaas.html
				640x512x25	
				128x128x20	
Spain	New Infrared Technologies	PbSe	1-D & 2-D IRFPAs and Cores for 1 to 5 um	64x1	http://www.niteurope.com/en/tachyon-series-fpa-roic-2g.html
				32x32	
				80x80	
Taiwan	Chunghwa LeadingLight Photonics	InGaAs	IRFPAs	320x256x30	http://www.leadinglight.com.tw/
				640x512x25	

Appendix A - Foreign IR Camera and FPA Sources

Country	Company	Technologies	Products	Formats	Website
	Technology				
Turkey			2-D ROICs:		http://www.mikro-tasarim.com.tr/products
		Si, InGaAs, MCT	MT6425CA	640x512x25	
			MT6415CA	640x512x15	
			MT12815CA	1280x1024x15	
			MT20415SA	2048x2048x15	
			MT40915SA	4096x4096x15	
			MT40910SA	4096x4096x10	
		µBolometer	MT3825BA	384x288x25	
			MT3817BA	384x288x17	
			MT6417BA	640x480x17	
			MT10217BA	1024x768x17	
			MT6412BA	640x480x12	
		InSb, QWIP, MCT,T2SL (DDA designates dual direct injection array)	MT6425DA	640x512x25	
			MT6415DA	640x512x15	
			MT6410DA	640x512x10	
			MT12810DA	1280x720x10	
			MT6420DDA	640x512x20	
			MT6425DDA	640x512x25	
			MT10225DDA	1024x768x25	
		InGaAs	2-D Cameras		
			MT-USB-CAM-6415	640x512x15	
			NanoCAM-6415	640x512x15	
United Kingdom	**Defense Vision Systems Inc.**	InGaAs	2-D cameras	Same as Photonic Science	http://www.dvsmil.com/index.html
	Photonic Science	InGaAs (also offers Vis-InGaAs & >2.2um cutoff)	2-D Cameras	320x256x25	http://www.photonic-science.com/products/swir-ingaas-cameras.html#
				640x512x15	