



Billing Code: 5001-06

DEPARTMENT OF DEFENSE

Office of the Secretary

[Transmittal No. 16-59]

Arms Sales Notification

AGENCY: Defense Security Cooperation Agency, Department of Defense.

ACTION: Arms sales notice.

SUMMARY: The Department of Defense is publishing the unclassified text of an arms sales notification.

FOR FURTHER INFORMATION CONTACT: Pamela Young, (703) 697-9107, pamela.a.young14.civ@mail.mil or Kathy Valadez, (703) 697-9217, kathy.a.valadez.civ@mail.mil; DSCA/DSA-RAN.

SUPPLEMENTARY INFORMATION: This 36(b)(1) arms sales notification is published to fulfill the requirements of section 155 of Public Law 104-164 dated July 21, 1996. The following is a copy of a letter to the Speaker of the House of Representatives, Transmittal 16-59 with attached Policy Justification.

Dated: September 22, 2017.

Aaron Siegel,

Alternate OSD Federal Register Liaison Officer,

Department of Defense.



DEFENSE SECURITY COOPERATION AGENCY

201 12TH STREET SOUTH, STE 203
ARLINGTON, VA 22202-5408

SEP 08 2017

The Honorable Paul D. Ryan
Speaker of the House
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Speaker:

Pursuant to the reporting requirements of Section 36(b)(1) of the Arms Export Control Act, as amended, we are forwarding herewith Transmittal No. 16-59, concerning the Department of the Air Force's proposed Letter(s) of Offer and Acceptance to the Government of Bahrain for defense articles and services estimated to cost \$1.082 billion. After this letter is delivered to your office, we plan to issue a news release to notify the public of this proposed sale.

Sincerely,

A handwritten signature in black ink, appearing to read "C. W. Hooper", written over a large, stylized, circular flourish.

Charles W. Hooper
Lieutenant General, USA
Director

Enclosures:

1. Transmittal
2. Policy Justification
3. Sensitivity of Technology
4. Regional Balance (Classified Document Provided Under Separate Cover)



Transmittal No. 16-59

Notice of Proposed Issuance of Letter of Offer
Pursuant to Section 36(b)(1)
of the Arms Export Control Act, as amended

(i) Prospective Purchaser: Government of Bahrain

(ii) Total Estimated Value:

Major Defense Equipment*	\$ 406 million
Other	<u>\$ 676 million</u>
TOTAL	\$1.082 billion

(iii) Description and Quantity or Quantities of Articles or Services under Consideration for Purchase:

Major Defense Equipment (MDE):

Twenty-three (23) F-110-GE-129 engines (includes 3 spares)
 Twenty-three (23) APG-83 Active Electronically Scanned Array Radars
 (includes 3 spares)
 Twenty-three (23) Modular Mission Computers (includes 3 spares)
 Twenty-three (23) Embedded Global Navigation Systems/LN260 EGI
 (includes 3 spares)
 Forty (40) LAU-129 Launchers
 Twenty-three (23) Improved Programmable Display Generators (iPDG)
 Twenty-five (25) AN/AAQ-33 SNIPER Pods (MDE Determination Pending)
 Two (2) AIM-9X Sidewinder Missiles
 Two (2) AGM-88B/C High-Speed Anti-Radiation Missiles (HARM)
 Two (2) WGU-43 Guidance Control Unit (GCU) (for GBU-24 Paveway III)
 Two (2) BSU-84 Air Foil Group (AFG) (for GBU-24 Paveway III)
 Five (5) KMU-572 Joint Direct Attack Munition (JDAM) Tailkits (for GBU-38
 JDAM and GBU-54 Laser JDAMs)
 Two (2) GBU-39 Small Diameter Bombs (SDB) Guided Test Vehicles
 Two (2) AGM-84 Harpoon Missiles
 Three (3) MAU-210 ECCG (for GBU-50 Enhanced Paveway II)
 Three (3) BLU-109 Inert Bomb Bodies
 Four (4) MK-82/BLU 111 Inert Bomb Bodies
 Two (2) FMU 152 or FMU 139 Fuzes

Non-MDE includes:

One (1) Joint Mission Planning System, one (1) F-16V simulator, twenty (20) AN/ALQ-211 AIDEWS systems, one (1) avionics level test station, six (6) DB-110 Advanced Reconnaissance Systems, two (2) LAU-118A Launchers, forty-five (45) AN/ARC-238 SINGARS Radio or equivalent, twenty-three (23) AN/APX126 Advanced Identification Friend or Foe (AIFF) system or equivalent, twenty-three (23) cryptographic appliques, two (2) CATM-9L/M, two (2) AIM-120C-7 Advanced Medium Range Air-to-Air Missile

(AMRAAM) Captive Air Training Missiles (CATM), three (3) MXU-651 AFG (for GBU-50 Enhanced Paveway II), four (4) DSU-38 Precision Laser Guidance Sets (PLGS) (for GBU-54 Laser JDAM), four (4) AGM-154 Joint Standoff Weapon (JSOW) Captive Flight Vehicles (CFV), three (3) MK-84/BLU 117 Inert Bomb Bodies, two (2) FMU-152 D-1 Inert Fuzes, three (3) BRU-57 Bomb Racks, two (2) BRU-61 Bomb Racks for SDB, two (2) ADU-890 SDB adapter cable for CMBRE, two (2) ADU-891 AMRAAM/AIM 9X adapter cable for CMBRE, telemetry for all flight test assets, secure communications equipment, spares and repair parts, support equipment, personnel training and training equipment, publications and technical documentation, U.S. Government and contractor technical support services, containers, missile support and test equipment, integration test, site survey, design, construction studies/analyses/services, cybersecurity, critical computer resources support, force protection and other related elements of logistics and program support.

- (iv) Military Department: Air Force (X7-D-QAU)
- (v) Prior Related Cases, if any:
 FMS Case BA-D-SGA - \$330.9 million – 21 Apr 87
 FMS Case BA-D-SGG - \$234.9 million – 20 Feb 98
- (vi) Sales Commission, Fee, etc. Paid, Offered, or Agreed to be Paid: None
- (vii) Sensitivity of Technology Contained in the Defense Articles or Defense Services Proposed to be Sold: See Attached Annex
- (viii) Date Report Delivered to Congress: September 8, 2017

* As defined in Section 47(6) of the Arms Export Control Act.

POLICY JUSTIFICATION

Government of Bahrain – Upgrade of F-16 Block 40 Aircraft to F-16V Configuration

The Government of Bahrain requested to upgrade its existing twenty (20) F-16 Block 40 aircraft to the F-16V configuration. The requested sale comprises of twenty-three (23) F-110-GE-129 engines (includes 3 spares); twenty-three (23) APG-83 Active Electronically Scanned Array Radars (includes 3 spares); twenty-three (23) Modular Mission Computers (includes 3 spares); twenty-three (23) Embedded Global Navigation Systems/LN260 EGI (includes 3 spares); twenty-three (23) Improved Programmable Display Generators (iPDGs) (includes 3 spares); forty (40) LAU-129 launchers; twenty-five (25) AN/AAQ-33 SNIPER Pods; two (2) AIM-9X Sidewinder Missiles; two (2) AGM-88 High-speed Anti-Radiation Missiles (HARM); two (2) WGU-43 Guidance Control Unit (GBU) Guidance Control Unit (GCU) (for GBU-24 Paveway III); two (2) BSU-84 Air Foil Group (AFG) (for GBU-24 Paveway III); five (5) KMU-572 Joint Direct Attack Munition (JDAM) Tailkits (for GBU-38 JDAM and GBU-54 Laser JDAM); two (2) GBU-39 Small Diameter Bombs (SDB) Guided Test Vehicles (GTV); two (2) AGM-84 Harpoon Exercise Missiles; three (3) MAU-210 ECCG (for GBU-50 Enhanced Paveway II); three (3) BLU-109 Inert Bomb Bodies; four (4) MK-82/BLU-111 Inert Bomb Bodies; and two (2) GMU-152 or FMU-139 Fuzes.

This sale also includes one (1) Joint Mission Planning System, one (1) F-16V simulator, twenty (20) AN/ALQ-211 AIDEWS Systems, one (1) avionics level test station, six (6) DB-110 Advanced Reconnaissance Systems, two (2) LAU-118A Launchers, forty-five (45) AN/ARC-238 SINCGARS Radio or equivalent, twenty-three (23) Advanced Identification Friend or Foe (AIFF) systems or equivalent; twenty-three (23) cryptographic appliques; two (2) CATM-9L/M, two (2) AIM-120C-7 Advanced Medium Range Air-to-Air Missile (AMRAAM) Captive Air Training Missiles (CATM), three (3) MXU-651 AFG (for GBU-50 Enhanced Paveway II), four (4) DSU-38 Precision Laser Guidance sets (PLGS) (for GBU-54 Laser JDAM), four (4) AGM-154 Joint Stand-Off Waeapon (JSOW) Captive Flight Vehicles (CFV), three (3) MK-84/BLU-117 Inert Bomb Bodies, two (2) FMU-152 D-1 Inert Fuzes, three (3) BRU-57 Bomb Racks, two (2) BRU-61 Bomb Racks for SDB, two (2) ADU-890 SDB adapter cable for CMBRE, two (2) ADU-891 AMRAAM/AIM-9X adapter cable for CMBRE, Telemetry for all flight test assets secure communication equipment, spares and repair parts, support equipment, personnel training and training equipment, publications and technical documentation, U.S. Government and contractor technical support services, containers, missile support and test equipment, integration test, site survey, design, construction studies/analyses/services, associate operations, maintenance, training, support facilities, cybersecurity, critical computer resources support, force protection, and other related elements of logistics and program support. The total estimated program cost is \$1.082 billion.

This proposed sale will contribute to the foreign policy and national security of the United States by helping to improve the security of a major Non-NATO ally which has been and continues to be an important security partner in the region. Our mutual defense interests anchor our relationship and the Royal Bahraini Air Force (RBAF) plays a significant role in Bahrain's defense.

The proposed sale improves Bahrain's capability to meet current and future threats. Bahrain will use this capability as a deterrent to regional threats and to strengthen its homeland

defense. The upgraded F-16Vs will provide an increase in the capability of existing aircraft to sustain operations, meet training requirements, and support transition training for pilots to the upgraded aircraft. This upgrade will improve interoperability with U.S. forces and other regional allies. Bahrain will have no difficulty absorbing this upgrade into its armed forces.

The proposed sale will not affect the basic military balance in the region.

The prime contractor will be Lockheed Martin. There are no known offset agreements proposed in connection with this potential sale.

Implementation of this proposed sale will require the assignment of at least five (5) additional U.S. Government representatives to Bahrain.

There will be no adverse impact on U.S. defense readiness as a result of this proposed sale.

Transmittal No. 16-59

Notice of Proposed Issuance of Letter of Offer
Pursuant to Section 36(b)(1)
of the Arms Export Control Act

Annex Item No. vii

(vii) Sensitivity of Technology:

1. This sale will involve the release of sensitive technology to Bahrain. The F-16V weapon system is UNCLASSIFIED, except as noted below. The aircraft utilizes the F-16C/D airframe and features advanced avionics and systems. It contains the General Electric F-110-GE-129 engine, AN/APG-83 Active Electronically Scanned Array Radars, digital flight control system, internal and external electronic warfare equipment, AN/APX126 Advanced Identification Friend of Foe (AIFF), LN260 Embedded GPS/INS (EGI), Modular Mission Computers (MMC), improved Programmable Display Generators (iPDG), AN/AAQ-33 SNIPER Pods, Multifunction Information Distribution System Joint Tactical Radio System (MIDS-JTRS), operational flight trainer, and software computer programs.
2. Sensitive and/or classified (up to SECRET) elements of the proposed F-16V include hardware, accessories, components, and associated software: AN/APX126 Advanced Identification Friend or Foe (AIFF), cryptographic appliques, Secure communication equipment, Joint Mission Planning System, F-16V Simulator, AN/ALQ-211 AIDEWS Pods, Avionics Level Test Station, DB-110 Advanced Reconnaissance Systems, LAU-118A Launchers, and F-110-GE-129 engine. Additional sensitive areas include operating manuals and maintenance technical orders containing performance information, operating and test procedures, and other information related to support operations and repair. The hardware, software, and data identified are classified to protect vulnerabilities, design and performance parameters and other similar critical information.
3. The AN/APG-83 is an Active Electronically Scanned Array (AESA) radar upgrade for the

F-16. It includes higher processor power, higher transmission power, more sensitive receiver electronics, infrared signature and Advanced Interference Blanking Units, and Synthetic Aperture Radar (SAR), which creates higher-resolution ground maps from a greater distance than existing mechanically scanned array radars (e.g., APG-68). The upgrade features an increase in detection range of air targets, increases in processing speed and memory, as well as significant improvements in all modes. The highest classification of the radar is SECRET.

4. AN/ALQ-211 Airborne Integrated Defensive Electronic Warfare Suite (AIDEWS) provides passive radar warning, wide spectrum RF jamming, and control and management of the entire Electronic Warfare (EW) system. The commercially developed system software and hardware is UNCLASSIFIED. The system is classified SECRET when loaded with a U.S. derived EW database, which will be provided.

5. AN/ARC-238 SINCGARS Radio or equivalent is considered UNCLASSIFIED, but employs cryptographic technology that is classified SECRET. Classified elements include operating characteristics, parameters, technical data, and keying material.

6. AN/APX-126 Advanced Identification Friend or Foe (AIFF) is a system capable of transmitting and interrogating Mode V and is supported by cryptographic appliques. It is UNCLASSIFIED unless/until Mode IV and/or Mode V operational evaluator parameters are loaded into the equipment. Classified elements of the AIFF system include software object code, operating characteristics, parameters, and technical data are SECRET.

7. The Embedded GPS-INS (EGI) LN-260 is a sensor that combines GPS and inertial sensor inputs to provide accurate location information for navigation and targeting. The EGI LN-260 is UNCLASSIFIED. The GPS crypto variable keys needed for highest GPS accuracy are classified up to SECRET.

8. The Modular Mission Computer (MMC) is the central computer for the F-16. As such it serves as the hub for all aircraft subsystems, avionics, and weapons. The hardware and software (Operational Flight Program – OFP) are classified up to SECRET.

9. An Improved Programmable Display Generator (iPDG) will support the two color MFD's, allowing the pilot to set up to twelve display programs. One of them includes a color Horizontal Situation Display, which will be, provide the pilot with a God's eye view of the tactical situation. Inside is a 20MHz, 32-bit Intel 80960 Display Processor and a 256K battery-backed RAM system memory. The color graphics controller is based on the T.I. TMS34020 Raster Graphics Chipset. The IPDG also contains substantial growth capabilities including a high-speed Ethernet interface (10/100BaseT) and all the hardware necessary to support digital moving maps. The digital map function can be enabled by the addition of software. The hardware and software are UNCLASSIFIED.

10. Joint Mission Planning System (JMPS) is a multi-platform PC-based mission planning system. JMPS hardware is UNCLASSIFIED, but the software is classified up to SECRET.

11. DB-110 is a tactical airborne reconnaissance system. This capability permits reconnaissance missions to be conducted from very short range to long range by day or night. It is an under-the-weather, podded system that produces high resolution, dual-band electro-

optical and infrared imagery. The DB-110 system is UNCLASSIFIED.

12. The SNIPER (AN/AAQ-33) targeting system is UNCLASSIFIED and contains technology representing the latest state-of-the-art in in electro-optical clarity and haze, and low light targeting capability. Information on performance and inherent vulnerabilities is classified SECRET. Software (object code) is classified CONFIDENTIAL. Overall system classification is SECRET.

13. The AIM-120C-7 Advanced Medium Range Air-to-Air Missile (AMRAAM) Captive Air Training Missiles (CATM) is a supersonic, air launched, aerial intercept, guided missile featuring digital technology and micro-miniature solid-state electronics. The missile employs active radar target tacking, proportional navigation guidance, and active Radio Frequency target detection. It can be launched day or night, in any weather and increases pilot survivability by allowing the pilot to disengage after missile launch and engage other targets. AMRAAM capabilities include lookdown/shootdown, multiple launches against multiple targets, resistance to electronic countermeasures, and interception of high- and low-flying maneuvering targets. The AMRAAM AUR is classified CONFIDENTIAL, major components and subsystems range from UNCLASSIFIED to CONFIDENTIAL, and technical data and other documentation are classified up to SECRET.

14. AIM-9X Sidewinder missile is an air-to-air guided missile that employs a passive infrared (IR) target acquisition system that features digital technology and micro- miniature solid-state electronics. The AIM-9X tactical and CATM guidance units are subsets of the overall missile and were recently designated as MDE. The AIM-9X is CONFIDENTIAL, Major components and subsystems range from UNCLASSIFIED to CONFIDENTIAL, and technical data and other documentation are classified up to SECRET. The overall system classification is SECRET.

The AIM-9X is launched from the aircraft using a LAU-129 guided missile launcher (currently in country inventory). The LAU-129 provides mechanical and electrical interface between missile and aircraft. The LAU-129 system is UNCLASSIFIED.

15. AGM-88B/C HARM is an air-to-ground missile designed to destroy or suppress enemy radars used for air defense. HARM has wide frequency coverage, is target reprogrammable in flight, and has a reprogrammable threat library. Hardware and software for the system is classified SECRET and ballistics data is CONFIDENTIAL. The overall system classification is SECRET.

The AGM-88 is launched from the aircraft using a LAU-118A guided missile launcher. The LAU-118A provides mechanical and electrical interface between missile and aircraft. The LAU-118A system is UNCLASSIFIED.

16. GBU-10/12: 2,000-lb (GBU-10) and 500-lb (GBU-12) laser-guided bombs (LGBs). The LGB is a maneuverable, free-fall weapon that guides on laser energy reflected off of the target. The LGB is delivered like a normal general purpose warhead and the laser guidance guides the weapon into the target. Laser designation for the weapon can be provided by a variety of laser target designators. The LGB consists of a laser guidance kit, a computer control group and a warhead specific air foil group, that attach to the nose and tail of Mk 84,

Mk 82 bomb bodies.

a. The GBU-10: This is a 2,000lb (BLU-117 B/B or Mk 84) General Purpose (GP) guided bomb fitted with the MXU-651 airfoil and the MAU-169 or MAU-209 computer control group to guide to its laser designated target.

b. The GBU-12: This is a 500lb (BLU-111/B or Mk-82) guided bomb fitted with the MXU-650 airfoil and the MAU-169 or MAU 209 computer control group to guide to its laser designated target. The weapon components are UNCLASSIFIED. Some technical data and vulnerabilities/countermeasures are SECRET. The overall weapons classification is SECRET.

17. GBU-31 and GBU-38 are 2000lb/500lb Joint Direct Attack Munitions (JDAM)

JDAM is a guidance kit that converts existing unguided free-fall bombs into precision-guided "smart" munitions. By adding a new tail section containing Inertial Navigation System (INS) guidance/Global Positioning System (GPS) guidance to existing inventories of BLU-109, BLU-111 and BLU-117 or Mk-84 and Mk-82 bombs, the cost effective JDAM provides highly accurate weapon delivery in any "flyable" weather. The INS, using updates from the GPS, helps guide the bomb to the target via the use of movable tail fins. The JDAM and all of its components are UNCLASSIFIED, technical data for JDAM is classified up to SECRET.

JDAMs use the Global Positioning System (GPS) Precise Positioning System (PPS), which provides for a more accurate capability than the commercial version of GPS.

18. GBU-49 and GBU-50 are 500lb/2000lb dual mode laser and GPS guided munitions respectively. The GBU-49/50 use airfoil groups similar to those used on the GBU-12 and GBU-10 for inflight maneuverability. Weapons components are UNCLASSIFIED. Technical data and countermeasures/vulnerabilities are SECRET. The overall system classification is SECRET.

GBU-49/50s use the GPS PPS, which provides for a more accurate capability than the commercial version of GPS.

19. GBU-54/56 are the 500lb/2000lb Laser JDAM (Joint Direct Attack Munitions): These weapons use the DSU-38/B/DSU-40 laser Sensor respectively and use both Global Position System aided inertial navigations and/or laser guidance to execute threat targets. The laser sensor enhances standard JDAM's reactive target capability by allowing rapid prosecution of fixed targets with large initial target location errors (TLE). The DSU-38/B Laser sensor also provides the additional capability to engage mobile targets. The addition of the DSU-38 laser sensor combined with additional cabling and mounting hardware turns a GBU-38 JDAM into a GBU-54 Laser JDAM. The addition of the DSU-40 laser sensor combined with additional cabling and mounting hardware turns a GBU-31 JDAM into a GBU-56 Laser JDAM. Weapons components are UNCLASSIFIED. Technical data and countermeasures/vulnerabilities are SECRET. The overall system classification is SECRET.

Laser JDAMs use the GPS PPS, which provides for a more accurate capability than the commercial version of GPS.

20. GBU-39 Small Diameter Bomb (SDB): The GBU-39 small diameter bomb (SDB) is a 250-lb class precision guided munition that allows aircraft with an ability to carry a high number of bombs. The weapon offers day or night, adverse weather, precision engagement capability against pre-planned fixed or stationary soft, non-hardened, and hardened targets, with a significant standoff range. Aircraft are able to carry four SDBs in place of one 2,000-lb bomb. The SDB is equipped with a GPS-aided inertial navigation system to attack fixed, stationary targets such as fuel depots and bunkers. The SDB and all of its components are UNCLASSIFIED; technical data is classified up to SECRET.

SDBs use the GPS PPS, which provides for a more accurate capability than the commercial version of GPS.

21. The GBU-24 Paveway III is a 2000lb class low level laser guided munition that can be employed at high, medium, and low altitudes. GBU-24 components are UNCLASSIFIED. Target designation tactics and associated aircraft maneuvers, the probability of destroying specific/peculiar targets, vulnerabilities regarding countermeasures, and the electromagnetic environment is classified SECRET.

22. The AGM-154 is a family of low-cost standoff weapons that are modular in design and incorporate either a sub-munition or a unitary warhead. Potential targets for Joint Standoff Weapon (JSOW) range from soft targets, such as troop concentration, to hardened point targets like bunkers. The AGM-154C is a penetrator weapon that carries a BROACH warhead and pay load. The AGM-154 hardware, software and maintenance data is UNCLASSIFIED. Vulnerabilities and countermeasures are classified up to SECRET. Overall system classification is SECRET.

The AGM-154 uses the GPS PPS, which provides for a more accurate capability than the commercial version of GPS.

23. The AGM-84L-1 Harpoon is a non-nuclear tactical weapon system currently in service in the U.S. Navy and in 28 other foreign nations. It provides a day, night, and adverse weather, standoff air-to-surface capability. Harpoon Block II is a follow on to the Harpoon missile that is no longer in production. Harpoon Block II is an effective Anti-Surface Warfare missile.

The AGM-84L-1 incorporates components, software, and technical design information that are considered sensitive. These elements are essential to the ability of the Harpoon missile to selectively engage hostile targets under a wide range of operational, tactical and environmental conditions. The following Harpoon components being conveyed by the proposed sale that are considered sensitive and are classified CONFIDENTIAL include: IIR seeker, INS, OPP software and, missile operational characteristics and performance data. The overall system classification is SECRET.

24. M61A1 20mm Vulcan Cannon: The 20mm Vulcan cannon is a six barreled automatic cannon chambered in 20x120mm with a cyclic rate of fire from 2,500-6,000 shots per minute. This weapon is a hydraulically powered air cooled Gatlin gun used to damage/destroy aerial targets, suppress/incapacitate personnel targets, and damage or destroy moving and stationary light materiel targets. The M61A1 and its components are UNCLASSIFIED.

25. Software, hardware, and other data/information, which is classified or sensitive, is reviewed prior to release to protect system vulnerabilities, design data, and performance parameters. Some end-item hardware, software, and other data identified above are classified at the CONFIDENTIAL and SECRET level. Potential compromise of these systems is controlled through management of the basic software programs of highly sensitive systems and software-controlled weapon systems on a case-by-case basis.

26. If a technologically advanced adversary were to obtain knowledge of the specific hardware or software source code in this proposed sale, the information could be used to develop countermeasures which might reduce weapon system effectiveness or be used in the development of systems with similar or advance capabilities.

27. This sale is necessary in furtherance of the U.S. foreign policy and national security objectives outlined in the Policy Justification. Moreover, the benefits to be derived from this sale, as outlined in the Policy Justification, outweigh the potential damage that could result if the sensitive technology were revealed to unauthorized persons.

28. A determination has been made that the recipient country can provide substantially the same degree of protection for the sensitive technology being released as the U.S. Government.

29. This sale is necessary in furtherance of the U.S. foreign policy and national security objectives outlined in the Policy Justification.

30. All defense articles and services listed in this transmittal are authorized for release and export to the Government of Bahrain.

[FR Doc. 2017-20707 Filed: 9/26/2017 8:45 am; Publication Date: 9/27/2017]