

# L3Harris WESCAM EO/IR Systems

**Status: In Production**

**System Type: Airborne FLIR (helicopter/slow-flying) & Naval (surface ship) & Ground Electro-Optical System**

**September 2022**

## Program Briefing

L3Harris' WESCAM develops and manufactures several types of surveillance EO/IR systems – primarily gimballed “FLIR balls” – for numerous US and international programs, including the MX-20 for US Navy and international P-3 variants and the P-8A Poseidon (was Multi-mission Maritime Aircraft [MMA]), the MX-15 (AN/AAQ-35) for numerous US and international platforms, and the smaller MX-10 sensor for UAVs as well as ground and naval applications.

Beginning in 2015, the US Army and Marine Corps began rebuilding/upgrading their entire fleets of RQ-7 Shadow tactical UAVs into the V2 version – more than 400 UAVs – with an undetermined number to receive new MX-10 sensors (but

initially not many MX-10s were acquired).

In July 2016, L3 WESCAM reported that more than 500 MX-Series designating systems operated from more than 40 different airframes across 15 countries – which sounded reasonable to Teal Group. Earlier, in October 2012, L3 WESCAM had claimed as many as 2,500 WESCAM MX-Series units had been successfully deployed worldwide. Later, in July 2020, L3Harris Technologies claimed to have completed delivery of its 5,000<sup>th</sup> WESCAM MX-Series imaging system since launching the product line in 1997.

But in 2017, the previous moderate flow of new orders for MX-series systems and support were reported to have become a torrential flow, based

on press releases under L3 WESCAM's new President, Mike Greenley. See below for Teal Group's Evaluation (below) of these new claims.

By late 2020, the only truly large new MX- contract reported in the past several years had been the US Army's ID/IQ contract reported in September 2018 for MX-10D systems for the [small] RQ-7Bv2 Shadow UAV (which had been previously reported, following initial testing in 2013). L3 WESCAM reported this contract could be worth \$454 million over five years, with an additional five-year option.

Then in 2021/22, WESCAM's fortunes suddenly charged up again – see our Teal Group Evaluation below.

## Manufacturers

### Prime

L3Harris Technologies  
L3Harris WESCAM  
50 Leavitt Blvd.  
Waterdown, Ontario L9H 0C5  
Canada  
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fax: (905) 689-6627  
(was WESCAM, was L-3 WESCAM)

### Subcontractors

- Boeing: Integration for USCG HC-130H
- California Microwave Systems (Northrop Grumman ESSS),
- Airborne Systems, Belcamp, MD: Model 20 ARL-M integration, Model 16D HU-25A/C Falcon integration.
- Lockheed Martin: Workstation modifications for USCG HC-130H

## Functional Description

### Configuration

Configuration varies by system, but most L3 WESCAM EO/IR

systems are gimballed EO/IR sensor balls with gyro-stabilization. The smallest is the new the **MX-10** (the

earlier **MX-12** weighed 12 kg and could accommodate up to four sensors).

The **MX-15 (AN/AAQ-35)**, probably the biggest seller, has a 39.4 cm diameter gimbal and weighs about 45 kg with all sensors (up to six). Standard sensors are a high-magnification MWIR third generation indium antimonide FLIR and a color CCD TV camera with zoom lens. Optional sensors are another CCD camera with a spotter lens, eye-safe laser rangefinder, laser pointer. Standard is an on-board inertial measurement unit for target geo-location; optional is geo-pointing, geo-steering, geo-focusing, auto-tracking, and moving map functions. Line-of-sight jitter is reported to be less than 10 micro-rad (root mean square). The MX-15D has a laser designator.

The larger **MX-20** is primarily mounted aboard maritime and overland patrol P-3 Orions.

Several L3 WESCAM systems can broadcast imagery directly to L3

WESCAM Wireless Information for Situation Awareness and Real-time Decisions (**WISARD**) hand-held digital receivers, permitting reception in real-time at ranges greater than 50 km. WISARD operates from 1.9-2.7 GHz, and incorporates a receiver and MPEG II (DVD-quality) video decoder.

**Platforms**

**MX-15 (AAQ-35):** US Navy Critical Obsolescence Program P-3C, US Coast Guard HU-25A/C Falcon maritime patrol aircraft, US Customs Service aircraft (Cheyenne, Citation, Dash 8, PC-12), US Department of Homeland Security Dash 8Q-200, Columbian navy CN-235, UK RAF Nimrod MR.2P MPA, other.

**MX-20 (ASX-4):** US Navy P-3C AIP, US Customs Service P-3, Canadian CP-140 (P-3C), New Zealand P-3K, other.

Various systems: Pioneer and Predator UAVs, BK-117 helicopters, US Army Airborne Reconnaissance Low-Multifunction (ARL-M) aircraft, US Coast Guard HC-130H, and others.

**Variants/Related Systems**

**Model 12DS**—Pioneer UAV.

**Model 14TS**—USAF Predator UAV and BK-117 helicopters.

**MX-15 (AN/AAQ-35)**—Coast Guard HU-25A/C Falcon aircraft, UK RAF Nimrod MR.2P, several other platforms.

**Model 20**—US Army Airborne Reconnaissance Low-Multifunction (ARL-M) aircraft.

**Funding History**

RDT&E (\$ Millions)	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04*	FY05**
<b>PE# 0604221N P-3 Modernization Program</b>									
Proj.H1152 P-3 Sensor Integration	—	—	—	—	—	—	—	1.0	2.0

\*Appropriation

\*\*Budget Request

NOTE: Funding is estimated.

**Costs**

Unit cost for most early systems was under \$800,000, with perhaps a \$600,000 average for the systems treated in this report last decade (through 2009).

The Model 16D cost \$800,000 per system.

The test systems for the Army I-Gnat (ER/MP) probably cost about \$800,000.

Earlier unit cost of the MX-15 could have been about \$600,000, with about \$700,000 for the MX-20, though funding awarded seems to have gone up across the board in the past couple of years (since 2010). P-8 MMA systems will likely cost even

more, well, “because we can” (and to fund additional C4I links, etc.). We estimate at least another \$500,000 each for MMA systems for the USN, and more than that for eventual FMS aircraft.

In May 2009, the FY10 Army budget provided funding for replacement sensors for two Airborne Reconnaissance Low (ARL) aircraft. Two MX-20 HD sensors and one MX-15 HD sensor for each aircraft cost \$1.475 million per MX-20 and \$1.25 million per MX-15. These costs were higher than a large procurement, however, due to the custom nature of the order.

Unit cost for each of the US Army’s PTDS airship sensor suites – including two MX/MC-20 sensors and one spare sensor each, as well as associated suite electronics and systems and spares – was about \$6 million in mid-2011. We assume this includes installation as well.

Our original unit cost estimate of the new MX-10 was between \$150-250,000, primarily for small UAVs. But the version for the US Army’s V2 Shadow upgrade must be more expensive, as L3 WESCAM is stating high costs for its contracts. Our unit cost estimate for the Shadow V2 version in 2018 is \$250-350,000.

## Program Overview

### History

#### WESCAM FLIR Development

In June 1998, WESCAM won an award to provide EO/IR sensor systems for US Coast Guard HC-130H Hercules aircraft, with a \$15.6 million contract for 15 aircraft. Options for a further 15 HC-130Hs would bring the total contract value to \$37 million. The Model 14TS FLIR buy for the USAF Predator UAV was a direct commercial sale to General Atomics.

#### Early Sales

In April 2000, WESCAM received a \$12.7 million order for Model 16D FLIRs for upgrades on 15 US Coast Guard HU-25A/C Falcon aircraft, with options for 15 more. This was WESCAM's first sale for jet aircraft. California Microwave Systems will perform integration. In May 2000, the Model 12DS was ordered to replace the separate TV and FLIR cameras in the Pioneer UAV. In mid-2000, California Microwave Systems selected the Model 20 FLIR for upgrades to the US Army's ARLM aircraft, under a \$3 million contract for 3 systems and datalinks. In September 2000, WESCAM received a follow-on order from Lockheed Martin for additional Wescam-20 systems for the US Navy P-3C upgrade program, as well as a Lockheed Martin order for Wescam-20s for an undisclosed user for drug interdiction missions.

#### SEOSS for Canadian Navy

In October 2001, the Canadian Navy ordered WESCAM's Shipboard Electro-Optic Surveillance System (SEOSS) for 17 Halifax and *Iroquois* class destroyers, under a C\$20 million (\$12.8 million) contract. SEOSS includes 5 sensors in the WESCAM 14-MAR turret. Deliveries will occur between 2002 and 2004.

#### WESCAM Seeks Buyer

In May 2002, WESCAM announced it was potentially seeking a US buyer, in part to take better advantage of increased US defense budgets, and in part due to lower-than-expected revenues in 2002 (due to delays in several key programs, such as the Target Sight System, for which WESCAM produces the MX-20 gimbal assembly). FY02 revenues are now anticipated at about \$135 million with net earnings in the \$2.9 million range, versus earlier-anticipated \$155-160 million revenues and net earnings of \$8.3-8.8 million.

#### WESCAM on I-GNAT?

In July 2002, General Atomics was marketing several UAV solutions for protecting high-level US officials, crowd control, and Homeland Defense. The I-GNAT UAV, a smaller Predator with line-of-sight rather than satellite-linked control, is being proposed with a WESCAM sensor ball.

#### L3 Acquires WESCAM

In September 2002, WESCAM was acquired by L3 Communications for \$118 million, a 45% increase over WESCAM's stock value at the time.

#### WESCAM for ER/MP Test Vehicles

In May 2003, the US Army awarded a contract for three General Atomics I-Gnat UAVs based on the Predator, to help define its UAV requirements (in particular, the Extended Range/Multi-Purpose [ER/MP] UAV). These I-Gnats are basically the same as the Predator except they lack the satellite datalink (production ER/MPs will have a satellite datalink). The Army has bought L3 WESCAM EO turrets and General Atomics-Sandia AN/APY-8 Lynx SAR radars as test sensors.

#### P-3 AIP Status (MX-20)

As of 2003, the Navy had funded 54 AIP packages, and as of early 2003 most had been delivered. Another 30 are funded in the 2004 POM, and the requirement is for 147. The current AIP includes a real-time imagery transmission capability for the new EO/IR system, and higher resolution radar displays.

As of May 2004, the Navy had received, or had plans to receive, only 71 P-3C AIP aircraft, out of the 288-aircraft Orion inventory (which is now being reduced).

By the end of 2004, L3 WESCAM's MX-20 Advanced Imaging Multispectral Sensor (AIMS) system (AN/ASX-4) had been supplied for more than 60 P-3C AIP upgrades.

#### MX-15 for P-3C COP

In May 2004, NAVAIR awarded L3 WESCAM a contract to supply AAQ-35s (MX-15) for P-3Cs under the Critical Obsolescence Program. The AAQ-35 will replace the current Infra-Red Detection System (IRDS). Up to six systems will be supplied in 2004, with a potential total of more than 65 over five years.

#### Multi-Sensors for Navy Ships

As of late 2004, an undisclosed number of L3 WESCAM multi-sensor surveillance systems had been installed on US Navy ships by the Technology Services Corporation (TSC), for the "Night Vision/Chemical/Biological Department".

#### MX-20 for New Zealand P-3K

In October 2004, New Zealand signed a NZ\$352 million (\$238 million) contract with L3 Communications Integrated Systems to upgrade six P-3K Orions with maritime and overland surveillance capabilities. Work is expected to begin in 2005 with installation of L3 WESCAM MX-20 FLIRs, although the fully upgraded aircraft will not be delivered

until 2008-2010. Other offerors for the program were Lockheed Martin Tactical Defense Systems, EADS CASA of Spain and Thales Airborne Systems of France.

### **MX-20 for Canadian CP-140**

In early 2003, Canada launched the CP-140 AIM (Aurora Incremental Modernization) program, to cover 22 separate upgrades to convert 16 of Canada's 18 Lockheed Martin CP-140s (essentially P-3s) for long range patrol and strategic reconnaissance. The total AIM program will be worth \$1 billion. The new systems are planned to begin entering service in 2006-2007.

In November 2004, a \$14.5 million contract was awarded to Lockheed Martin Canada and L3 WESCAM for integration and support of MX-20 systems on five CP-140s, with options for 10 more. Initial contracts for MX-20 procurement were awarded in 2003.

### **P-3 AIP Trickle Continues**

In March 2005, the USA Navy accepted the 64th P-3 AIP aircraft, with a total of five conversions planned for 2005.

In May 2005, NAVAIR awarded Lockheed Martin a \$55.9 million option for more AIP updates, to be completed by December 2007.

### **Auroras Get MX-20s**

In mid-2005, the first Canadian CP-140 Aurora was equipped with its new MX-20 under the AIM program. Instead of holding the sensors in storage until full Block III upgrades are ready, all aircraft are getting their MX-20s now, with Block I upgrades. The 18th and final system was to be mounted by mid-2006.

### **Continuing P-3C COP Production**

In May 2006, L3 WESCAM was awarded a production order from NAVAIR to provide 19 MX-15 systems for the P-3C Critical Obsolescence Program (COP). The MX-15 is replacing the current Infra-Red

Detection Systems (IRDS) on non-AIP Orions.

### **Increased AIP Rate**

In November 2006, Lockheed Martin was awarded a \$68.9 million contract for more P-3C AIP upgrades, to be completed by September 2007. Presumably, this reflects an increased rate, and total, as overland surveillance missions have increased for the Orions.

### **International Contracts**

In April 2007, L3 WESCAM was contracted to supply 56 MX-15Di systems for AgustaWestland Future Lynx helicopters on order for the British Army and Royal Navy, with deliveries between 2009 and 2014.

In June 2007, the Iraqi Air Force announced a \$53 million contract to buy General Atomics Lynx II SARs, L3 WESCAM MX-15 EO/IR sensors, and a high bandwidth data link, for five Beechcraft King Air 350ER ISR aircraft (with one spare sensor fit). Iraq could eventually buy 24 ISR aircraft and an equal number of transport aircraft, worth up to \$900 million. By late 2008, only the first five aircraft (and one transport) were contracted.

In July 2007, the UK RAF decided to procure another 8 MX-15 systems for its MR.2 Nimrod MPAs by the end of the year.

### **Taiwan to Buy 12 P-3Cs & AIP Upgrades**

In June 2007, Taiwan approved \$1.96 billion in funding for 12 surplus US Navy P-3C aircraft, full AIP upgrades, and three non-operational TP-3A aircraft. If approved by Congress, the P-3Cs will receive the APS-137, L3 WESCAM EO/IR sensors, and EDO Condor Systems ESM systems.

In December 2007, Taiwan's legislature upheld the funding.

### **WESCAM Takes MMA Away from Northrop**

In March 2008, L3 WESCAM was selected by Boeing to provide MX-20HD (MX-20 True HD)

sensors for the Navy's P-8A Poseidon MMA, essentially replacing the expected Northrop Grumman sensor. This is a very big win for WESCAM, with deliveries beginning in mid-2008, and the possibility of more than a hundred sensors for the US Navy and international MMA buyers.

### **ARL and PTDS Upgrades**

In June 2008, the Air Force Research Laboratory (AFRL), Directed Energy Directorate, Kirtland AFB, NM, acting for its Detachment 8, awarded a \$34 million (maximum) ID/IQ contract to L3 Communications' EO/IR in Santa Rosa, CA, for the procurement of services and equipment required to deliver airborne ISR turrets for the Persistent Threat Detection System (PTDS) and Airborne Reconnaissance Low (ARL) aircraft. L3 will propose maintenance for three 20-inch and five 15-inch diameter turrets and provide spare parts kits. In addition, L3 will propose upgrades to the turrets requiring approximately 10,000 engineering and manufacturing hours. Technology areas to be added during upgrades include High-Definition TV (HDTV) sensors, improved MWIR sensors, fiber optic or other high bandwidth slip-ring capabilities, larger or more versatile apertures for any classes of turrets produced, SWIR and laser technology additions to sensor suites, and upgraded pointing, tracking, operator, interfaces, turret stabilization, image processing, and communications. The work is to be performed in Santa Rosa, CA. Contract funding will come from the Air Force Electronic Combat Technology element (PE# 0603270F) (FA4951-08-D-0242).

### **Canadian MX-20 Repair Services**

In October 2008, NIPC-Philadelphia awarded Canadian Commercial Corps. a \$12.4 million FFP, ID/IQ long-term contract to fund repair of the Advanced Imaging Multi-spectral Sensor used on the P-3 aircraft.

The contract contains a two-year base period and three one-year option periods, which if all is exercised, will total \$32.9 million. The work is to be conducted by subcontractor WESCAM in Ontario, Canada, and is to be completed by September 2010 (base period). Contract funding, to come from Navy O&M accounts, is to be apportioned as follows: FY09—\$6 million; FY10—\$6.4 million; FY11—\$6.6 million; FY12—\$6.8 million; and FY13—\$7.1 million.

### **Boeing Offers Former ARH Competitor; Claims Sales**

In October 2008, as ARH was being cancelled, Boeing was reviving its own (losing) ARH competitor for international sales, as well as any potential future US Army program. Boeing's AH-6 "Little Bird" is being offered with a six-bladed prop and L3 WESCAM's export-approved MX-15 EO/IR sensor with laser tracker, according to Boeing director of business development, Mike Burke. Boeing also announced it expects to receive an 18-24 aircraft launch order from an international buyer in early 2009.

Boeing said it was prepared to modify the AH-6 with a more advanced sensor, for the Army's future ARH requirements.

### **USAF/USN Consider Light Attack Aircraft**

In late 2008, the USAF was considering a propeller-driven light attack plane, dubbed OA-X, that would cost no more than \$10 million and be available for missions not requiring the speed or protection of F-16s and A-10s. Potential platforms are Raytheon's AT-6 Texan and the Swiss Pilatus PC-21. Although at an early stage of planning, these aircraft would require some form of ISR/targeting EO/IR sensor.

In early 2009, the Navy leased, tested, and armed at least one Embraer EMB-314 Super Tucano aircraft to test the idea of a light manned ISR/attack aircraft for Special

Operations Forces (SOF) and Marines, under the classified Imminent Fury program. The Navy claims it would lease, not buy, any aircraft used, to make the idea more palatable to the carrier-based aviation community. Captain Mark Mullins, deputy director of the Navy Irregular Warfare Office at the Pentagon, believes an organic two-man close air support aircraft would be extremely valuable, if procurement hurdles can be cleared.

In a more bizarre turn, at the Paris Air Show in June 2009, the US firm Air Tractor displayed a weaponized crop-duster. No kidding. The AT-802U single turboprop aircraft was modified with 15 hardpoints, each capable of carrying 600 lbs. (though perhaps not all at the same time), and a full weapons, sensor, and electronic defense suite. Air Tractor's hope is to gain US support for international sales of this inexpensive, easy-to-maintain, fuel efficient light attack aircraft. But it sure does look silly (Green Acres Goes to War, or Belarus' first indigenous fighter...).

### **India Chooses MMA**

In January 2009, India signed an agreement with Boeing to deliver eight P-8I MMA aircraft to India between 2013 and 2015, at a cost of \$2.1 billion. India requested the same Raytheon AN/APY-10 radar as the US Navy's P-8A, and likely the same L3 WESCAM MX-20 EO/IR system, as mission equipment will be more integrated on the MMA than on the earlier maritime patrol aircraft, making swapping in a different EO/IR sensor difficult and expensive.

### **MMA Flies**

In April 2009, the first P-8A MMA, called T-1, flew. Formal flight tests are to begin in August or September 2009. A second test plane will be equipped with the AN/APY-10 radar, and SIGINT and other mission equipment, to begin flight tests in early 2010. More than two million lines of software code are expected to

enable all mission systems to work together.

### **North Sea SAR Service**

In early 2009, L3 WESCAM reported several users of its MX series gimballed turrets, though which applications also include WESCAM's EO/IR sensors was not announced. For North Sea search and rescue (SAR), MX turrets are found on the Icelandic and Swedish Coast Guard's Dash-9 Q300s, Norway's P-3s, and the UK's Sikorsky S-92 and Agusta-Westland AW139. The full MX-15 system is used by the UK's MR.2 Nimrod and most recently on a Eurocopter EC225 (MX-15 True HD).

### **Australia Signs on to Develop MMA**

In May 2009, Australia signed a memorandum of understanding with the US Navy to jointly develop the initial "Spiral One" improvements to the MMA, effectively committing Australia to MMA development.

### **Armed Scout Helicopters for Iraqi Air Force**

In May 2009, Bell won a \$60.3 million US Army contract for 24 new Model 407-based armed scout helicopters for Iraq's Air Force, through FMS, with options for 26 more helicopters. The Model 407 was the basis for the Army's cancelled ARH. Sensors have not been announced, though we think it unlikely they would mount the high-end MTS-based Common Sensor from the US Army's ARH. Initial deliveries are expected to begin later in 2009, according to Bell, with production to run 27 months (with 13 more months if the options are exercised).

### **ARL Replacement Sensors**

In May 2009, the FY10 Army budget provided funding for replacement sensors for two Airborne Reconnaissance Low (ARL) aircraft. The buy was for 2 MX-20 HD sensors and one MX-15 HD sensor for each aircraft, with procurement costs of \$1.475 million per MX-20 and

\$1.25 million per MX-15, with fielding in 3QFY11 and 2QFY12.

### New ARH Plan: ASH Going Slow

In June 2009, the US Army had plans to restart the ARH competition, this time designated ASH (Armed Scout Helicopter), perhaps as soon as July 2009. An initial Analysis of Alternatives (AoA) will determine whether an unmanned aircraft can fulfill some or all the requirements. Boeing, EADS/Lockheed Martin/Eurocopter, AgustaWestland, Bell, and perhaps Sikorsky are all expected to participate for the potential 500-helicopter program.

However, an SDD program to follow the AoA is not expected for at least 18 months, pushing initial production several years in the future. The Army claims it wants to look seriously at UAV teaming and avoid the “the rush to failure again” that claimed both the ARH and its predecessor, the earlier cancelled Comanche scout helicopter program.

Several Army aviation planning documents are now in the works, including the Future Vertical Lift Capabilities-Based Assessment, the Joint Future Theater Lift Initial Capabilities Document, the Aviation Study II (a follow-up to the 2003 Aviation Study I which cancelled Comanche), and of course the new Quadrennial Defense Review (QDR). Thus, it is difficult to predict exactly what will replace the aged Kiowa Warrior. But whatever it is, a CSP-like sensor is a good possibility, whether for helicopters or UAVs.

### Kiowa MMS Replaced with Nose-Mounted Sensor?

In June 2009, the Army announced its leadership had approved an OH-58D Kiowa Warrior upgrade plan – the somewhat depressingly named “Life Support 2020” program – to prolong effectiveness in the face of ARH cancellation (presumably not involving saline drips or breathing apparatus). The plan includes adding an “improved nose-mounted

sensor”. Not only is the MMS aging, but the mast-mounted sensor was primarily designed to observe military targets such as artillery and tanks while hovering among and behind buildings and trees. Today’s uses are primarily to look down at and target often defenseless “non-combatant” personnel (admittedly sometimes placing IEDs, but not as threatening to a helicopter as a Soviet ZSU-23-4 *Shilka*). The Kiowa today has less need to hide from armed near-peer threats, and more need to look down and guide weapons, often released from stand-off unmanned aircraft such as the Air Force’s Reaper or the Army’s less-aptly-named unmanned Warrior.

In June 2009, Colonel Frank Tate, deputy director of Army aviation, said installing the ARH’s planned Common Sensor Payload (CSP) on the Kiowa is “certainly a possibility; it’s something we’re looking at heavily since we already have a lot of data and information.” The Army chose the CSP to provide commonality between the ARH and the Warrior, but acquisition requirements would no doubt demand a competition, and delays before a sensor could be fielded. On the other hand, the ARH’s originally planned BRITE Star II FLIR was dropped in preference for CSP commonality, and this would again be an obvious choice.

ASH sensor competition would likely come again from FLIR Systems, Inc., as well as from L3 WESCAM, which has integrated its MX-15 with a laser tracker on Boeing’s AH-6 helicopter, the losing platform in the 2004 ARH competition. But the MX-15 would be a cheaper and presumably less effective alternative sensor than the CSP, not something the US Army typically opts for these days. Teal Group considers Raytheon’s CSP the favorite, especially if a manned ASH program gets off the ground soon.

### USAF Project Liberty Deliveries

In June 2009, the fourth of 37 planned MC-12W Project Liberty multi-role, medium altitude ISR/TA (Target Acquisition) aircraft was delivered to the US Air Force, during the Paris Air Show. Project Liberty prime contractor L3 Communications has based the MC-12W on Hawker Beechcraft King Air 350ER twin-turboprop aircraft, the same platform as the Iraqi Air Force’s new King Air ISR aircraft. Early USAF versions will mount L3 WESCAM’s MX-15i sensor (with a laser pointer), while later versions will receive the MX-15Di (with a laser designator), both providing full motion video (FMV) capability, and both carried in a “canoe” pod on the underside of the aircraft. The other primary sensor is a “limited SIGINT collection capability”, according to the USAF; Iraq’s aircraft instead mount a General Atomics Lynx II synthetic aperture radar (SAR) along with the MX-15. The USAF program is funded with \$460 million in FY08 and FY09, with 23 aircraft under contract and due to be delivered in 2009. Full program funding for all 37 aircraft is expected to be almost \$1 billion.

In June 2009, the first MC-12W flew its first combat sortie in Iraq, but 22 more aircraft were due to deploy later in 2009, needed for immediate combat operations, and deliveries had fallen as much as four months behind schedule. Clearly, the Air Force and SecDef Gates were serious when Project Liberty was begun as an immediate needs program in July 2008 (the first seven aircraft were bought used on the open market to speed delivery). Project Liberty is managed by the USAF BIG SAFARI Program Office.

The four-man crew includes two pilots, one sensor operator (MX-15 FMV), and one SIGINT specialist. The “Pennant Race” SIGINT package is reportedly an advanced version of the SIGINT package found on Predator and Reaper UAVs – not Northrop Grumman’s ASIP, which is

not yet ready for deployment. Other capabilities include a FMV line-of-sight (LOS) data link for Remote Operations Video Enhanced Receiver (ROVER) and One System Remote Video Terminal (OSRVT) receivers, and a narrowband INMARSAT data link for beyond line-of-sight (BLOS) connectivity.

Phase 2 aircraft (new-build aircraft, #8-#31) will have an enhanced FMV MX-15Di with laser designator capability, a more robust SIGINT capability, and a Ku-band data link for BLOS connectivity. Initial FY08 funding was provided via the SECDEF mandated ISR Reprogramming Initiative. FY09 funding was requested through the Bridge Supplemental and ended up in the program base funding to take the program of record to 31 aircraft. The program of record is planned for 37 aircraft so funding for the additional six aircraft is currently being pursued via an Overseas Contingency Operations (OCO) Request for \$45 million.

Also, at the Paris Air Show, Hawker Beechcraft officials stated they expect a \$1.3 billion US market for the ISR King Air, including sales to the Customs and Border Patrol and other agencies besides the USAF. They expect 150 international sales, worth up to \$2.5 billion. Teal Group forecasts these are optimistic estimates.

#### **MX-15 HD Tested for Predator**

In July 2009, the MX-15 HD was being tested for Predator UAVs, at the annual Empire Challenge ISR demonstration at the Naval Air Weapons Station at China Lake, CA. The sensor is owned by the Air Force Research Lab (AFRL), one of the first MX-15 HDs produced, and was flown on a manned Beechcraft King Air as a Predator surrogate. The idea is to provide Predator with an encrypted, high definition, full motion video capability, though the MX-15 HD has no contracts for Predator production.

#### **Northrop Wins LEMV Airship**

In June 2010, the US Army Space and Missile Defense Command/Army Forces Strategic Command awarded Northrop Grumman a \$517 million contract to develop up to 3 LEMV hybrid airships. LEMV will be designed, developed, and tested with their payloads within an aggressive 18-month schedule, then transported to Afghanistan for immediate assessment and use by the Army.

#### **LEMV Sensors: L3 WESCAM**

In September 2010, L3 WESCAM announced an order from Quantum Research International Inc., at the direction of the US Army, to supply LEMV EO/IR ISR and targeting sensors, to include two MX-15HDi and two MX-20D turrets per LEMV.

These turrets are dual-mode, offering rangefinding and targeting on top of their surveillance functions. Each turret will be fully equipped with 1080-pixel imaging cameras and will have multiple HD feeds streaming from the cameras within each turret. They will also be equipped with L3 WESCAM's Enhanced Local Area Processing (ELAP) to improve clarity, increase their effective range, and improve feature detection & recognition.

Deliveries of the initial set of 4 will begin in late 2010 and be complete by January 2011.

#### **Saudi Arabia Requests Massive F-15/Helicopter Buy**

In August 2010, Saudi Arabia requested a package of aircraft and helicopters potentially worth \$30-60 billion over 15-20 years, including 84 new F-15SA aircraft (with an additional 12 for training) to replace existing F-15C/Ds, and upgrades to bring Saudi Arabia's 70 existing F-15Ss to SA configuration. Included in the request are AN/APG-63(V)3 AESA radars, Sniper pods and AAS-42 IRSTs, DB-110 EO/IR reconnaissance pods (their first application on

F-15s), and JHMCS (Joint Helmet Mounted Cueing Systems).

Also sought are 36 Block III AH-64D Apache helicopters, 36 AH-6i light attack helicopters, and 72 UH-60M Blackhawk helicopters for the Saudi Arabian National Guard. Finally, another 34 Block III Apaches are sought for the Royal Saudi Land Forces.

In October 2010, the Pentagon confirmed the request was being addressed, and in November 2010 said the deal would not be blocked, despite fears of the potential impact on Israeli security. Rather, the sale is seen as a strengthening of capabilities in the region to oppose Iran.

In January 2011, the *Saudi Gazette* reported the kingdom's assistant defense minister had confirmed these plans.

#### **MX-20/MC-20 for Army PTDS**

In February 2011, Army CECOM obligated \$85.3 million to Lockheed Martin's Mission Systems & Sensors in Akron, OH, under an FFP contract to provide additional sensors and ground control systems for its Persistent Threat Detection System (PTDS) tethered aerostat, including 42 MC-20 lite sensor B-kits; 21 MX-20 lite installation A-kits; five upgraded ground control stations and associated gondolas, to include required software upgrades; and 10 Starlite installation A-kits for use in Afghanistan. There was one bid solicited and one proposal received. Work will be done in Akron, Ohio, with an anticipated November 2011 delivery date. Contract funding is to come from Army Other Procurement (W15P7T-11-C-S002).

#### **MX-15Di for Iraqi Armed Helicopters**

In May 2011, Army AMCOM obligated \$21.2 million to L3 Communications in Santa Rosa, CA, as part of a FFP contract to procure 22 MX-15Di sensors with laser designator for installation on Iraqi armed Bell 407 helicopters. There was one bid solicited and one offer received.

Work will be performed in Santa Rosa, CA, and in Burlington, Ontario, Canada, and be completed by December 2011. Contract funding will come through the FMS (W58RGZ-11-C-0114).

### **MX-10 Sales to Middle East**

In late 2011, L3 WESCAM received an order from Abu Dhabi for eight MX-10 systems, for the 200 kg Camcopter S-100 rotary-wing UAV, with deliveries expected from December 2011 through March 2012.

This order follows an earlier reported eight-unit MX-10 order in 2011 from an undisclosed Middle Eastern customer.

### **PTDS Procurement Complete**

In May 2012, Lockheed Martin delivered the last PTDS aerostat to the US Army. Since its original introduction as a quick reaction capability, the Army has procured 66 systems that have been used in both Iraq and Afghanistan. The system operates 24 hours a day at an altitude out of the range of most enemy threats, with a crew of five operators working 12-hour shifts.

PTDS has seen numerous upgrades, including the addition of a second sensor and improvements to the aerostat itself, better weather effects survivability and weather forecasting, increased lift and payload capability, and improved network and equipment connectivity.

### **L3 WESCAM MX-10 for Australian Patrol Boats**

In July 2012, L3 WESCAM announced it had received an order from Austal for 10 shipborne versions of the MX-10 for new Cape class patrol boats for the Australian Customs and Border Protection Service (CBPS), with deliveries in 2012 and 2013. The MX-10 will be used for surveillance duties such as border incursions, illegal immigration and fishing, smuggling, and quarantine control. WESCAM MX-15 systems already serve on CBPS DASH-8 aircraft.

Like the air and ground variants of the MX-10, the shipborne system can incorporate up to six payloads, according to WESCAM. Infrared, color, and electron-multiplied imaging sensors can be combined with a laser rangefinder and illuminator for enhanced mission performance. Real-time image enhancement is accomplished simultaneously across all sensors, including haze penetration and imaging blending for improved target detection and recognition.

According to WESCAM, MX-10 systems are operational on air, ground, and naval platforms in 17 countries.

### **2,500 MX- Sensors Worldwide**

In October 2012, L3 WESCAM claimed as many as 2,500 WESCAM MX-Series units have been successfully deployed worldwide.

### **Army Security & Support LUH Gains MX-15i Sensor**

In November 2012, the US Army awarded a \$181 million contract for 34 UH-72A Lakota Light Utility Helicopters (LUH), to be delivered from September 2013. This brings the total contracted number to 312 Lakotas, out of 347 planned by 2016, with the 200th aircraft delivered in March 2012. Five aircraft per month are being produced at the American Eurocopter (EADS North America) plant in Columbus, OH. The Lakota is the replacement for both the UH-1 "Huey" and OH-58 in Army service. EADS won the five-competitor LUH contest in June 2006, with the initial delivery in December 2006 and the 100th in March 2010.

Of the most recent 34-aircraft contract, 24 Lakotas will be delivered in a new Security and Support (S&S) battalion Mission Equipment Package (MEP) configuration for the Army National Guard, which includes a gimballed centerline EO/IR sensor, a 30-million-candlepower search light, analog/digital video downlink, rear observer's console with 15-inch display, enhanced tactical communications suite, onboard

digital video recorder, 10.4-inch auxiliary displays for the pilot and copilot, and a video management system.

The S&S is intended for emergency response to natural or man-made crises, such as hurricanes or terrorist attacks. S&S was developed to "Homeland Security standards", according to EADS, with the ability to communicate with civilian agencies such as law enforcement and EMS operators.

A total of 99 S&S variants are planned, with the first delivered in 2012, mounting an L3 WESCAM MX-15i FLIR ball with a laser pointer and auto-tracking/geo-pointing capability.

### **LEMV Cancelled**

By April 2013, the Army had decided that due to technical and performance challenges, and the limitations imposed by constrained resources, the Army had determined to discontinue the LEMV development effort. Future funding is allotted for completion of testing, and apparently nearly \$60 million for the "disassembly and disposal of" the airship!

*FY12 Accomplishments*—Completed fabrication of support equipment; integrated all major subsystems; completed interoperability certification; continued to monitor information assurance accreditation baseline.

*FY13 Plans*—Complete developmental testing, to include flight tests and endurance demonstration; prepare and conduct Joint Military Utility Assessment (JMUA), to include training and transportation to the JMUA location; provide initial JMUA report and recommended Tactics, Techniques, and Procedures.

*FY14 Plans*—Perform an orderly disassembly and disposal of the airship and associated items.

### **WESCAM for UAE Air Tractors**

The UAE has received about 20-30 IOMAX-supplied light attack Air Tractor AT-802 and Thrush 710 Archangel Border Patrol Aircraft since late 2010, with deliveries



through 2013. At least some of these are believed to mount L3 WESCAM EO/IR sensor turrets.

### **AH-6i Scout Helicopter Sale to Saudis?**

In November 2013, Boeing announced its first AH-6i FMS contract. This is believed to be for 36 helicopters for Saudi Arabia, probably with 40 L3 WESCAM MX-15Di (AN/AAQ-35) sensors.

### **MX-10 for UK Police**

In December 2013, the UK National Police Air Service (NPAS) awarded Austria's Airborne Technologies a contract for a Vulcanair P68R twin-engine light manned ISR aircraft, to mount an L3 WESCAM MX-10 sensor and Churchill Navigation "Augmented Reality System" for a six-month operational trial in 2014. If successful, the NPAS plans to buy about six operational aircraft.

### **AAI Tests WESCAM MX-10 on Shadow M2**

The AAI RQ-7 Shadow M2 tactical UAV (the US Army is upgrading many of its hundreds of earlier-version Shadow UAVs to this new configuration) can fly at altitudes typical for MALE UAVs such as the MQ-1 Predator (18,000 to 20,000 feet). AAI is now marketing the Shadow M2 as the budget-conscious alternative to medium-altitude Group 4 UAVs. In 2013, AAI tested the M2 with an L3 WESCAM MX-10 EO/IR sensor, with higher-altitude capabilities.

### **Eight Saudi UH-60Ms to get EO/IR Turrets**

In January 2014, Sikorsky was awarded a \$105.3 million contract to modify eight UH-60M Black Hawk helicopters to a "General Service Configuration" for the Saudi Arabian National Guard (SANG). Eight UH-60Ms (possibly other than these eight) will be fitted with External Stores Support System stub-wings for a variety of sensors, fuel tanks, and equipment, including a turreted EO/IR system.

### **India Still Plans Major Aircraft Procurement Increases**

In early 2014, despite the devalued rupee, India planned to spend an estimated \$15 billion on new aircraft for the air force and navy in the next two years. Long-term plans include an increase in air squadrons from 34 to 42, including replacing much obsolete equipment. By 2022, total spending on new air force equipment is expected to meet or exceed \$37 billion.

However, the Indian government is also strongly pushing growth of the domestic defense industry, with a tiered acquisition priority system making outright purchase a very last resort.

### **28 MX-15Ds Ordered for UAE Turboprop Close Air Support**

In February 2015, L3 WESCAM announced that it has received an order from IOMAX USA, Inc. for 28 MX-15D "imaging and designating turrets" to be fitted to a fleet of IO-MAX Archangel turboprop aircraft to support close air support and armed border patrol missions carried out by a customer within the United Arab Emirates (UAE).

Deliveries will begin in May 2015 and are scheduled to be completed in 2016. Support services for the systems will be conducted in-country through an L3 WESCAM authorized service center.

### **Tunisia Trials MX-10 Aboard Camcopter**

In mid-2015, the Tunisian Army conducted trials of Schiebel's Camcopter S-100 UAV with L3 WESCAM's MX-10 gimballed EO/IR sensor.

### **Guardrail EO/IR and SIGINT Upgrades Funded**

In February 2016, the FY17 budget provided procurement funding for the production and upgrade of EO/IR/Full Motion Video (FMV) systems – upgrading Guardrail L3 WESCAM MX-20HD sensors and MX-20D SWIR sensors – and

communications intelligence (COMINT) and electronic intelligence (ELINT) sensor systems.

FY17 Base procurement dollars of \$7.0 million will also support Guardrail sensor procurement, integration, testing, engineering, and program management to reset one (1) MX-15HDi camera, integrate two (2) FMV cameras, and field two (2) FMV capable aircraft.

### **Predator XP Deliveries to UAE**

In November 2015, General Atomics planned to begin deliveries of its Predator XP to the United Arab Emirates in mid-2016 and take about four months to complete. General Atomics is a subcontractor to International Golden Group of Abu Dhabi, through a direct foreign sale. One system, typically consisting of four aircraft and two Block 30 ground control stations, will be delivered. The UAE is the first international customer for the unarmed export Predator XP.

Frank Pace, president of the aircraft systems group of General Atomics Aeronautical Systems, said the UAE sale "is very important because it's the first of that aircraft and it's the first to the Gulf states for us. We're trying to sell that aircraft to a lot of different countries right now—Saudi Arabia, Kuwait, Qatar. We're not very far along in that process. I think people are very interested, but we're not in negotiations or anything."

The UAE Predator XPs will be fitted with General Atomics' Lynx multi-mode radar, a high-definition EO/IR system (not specified but likely either the FLIR Systems, Inc. Star SAFIRE 380HD or the L3 WESCAM MX-15), and an automatic identification system (AIS) for tracking ships. It is not known whether the UAE's Predator XP will be equipped with a laser designator and laser range finder – which L3 claims its recent Predator XP sale did include – which could illuminate targets for the UAE's Lockheed Martin Block 60 F-16s for precision strikes.

### **L3 WESCAM Reports MX-15 Bought for Predator XP**

In July 2016, L3 WESCAM announced it has “received multiple orders” from General Atomics for its MX-15D EO/IR designator systems for an international military customer, to support the Predator XP. Deliveries to General Atomics in California began earlier in 2016. Once fielded, the systems will be maintained by one of L3 WESCAM’s 14 authorized service centers. According to L3 WESCAM, the systems will be “Configured with high-definition IR and precise laser designation capabilities; these systems are fully equipped with the essential tools required to meet dynamic mission requirements.”

### **About Half of Shadow V2 Fleet Upgrade Completed: TCDL and MX-10**

In May 2016, Textron Systems had completed V1 to V2 conversions/upgrades to about half of the Shadow UAVs in service. The V2 conversion includes an upgraded engine and longer wingspan, migration from analog to digital systems, and integration of the Tactical Common Data Link (TCDL) and L3 WESCAM MX-10 EO/IR sensor. Textron will deliver 117 V2 systems – 104 to the Army and 13 to the Marine Corps – each one consisting of four aircraft and two ground stations.

Shadows undergoing the block upgrade are retrofitted at Textron Systems’ facility in Hunt Valley, MD, north of Baltimore, with a turnaround time to complete one system of about three months. According to a Textron source, “The aircraft really has all the guts taken out [and] all new guts put in.” The first Shadow V2 units were delivered to the Army in November 2014.

Included in the V2 upgrade is a high-bandwidth, encrypted tactical common data link (TCDL), which allows real-time streaming, full-motion video, which can be shared in a network with other platforms. The Shadow’s universal ground control

station is interoperable with the Army’s MQ-1C Gray Eagle UAV and AH-64E Apache attack helicopters.

The RQ-7BV2 Shadow also adds an extended wing (from 14 feet to 20 feet) and improved UEL AR741-1102 rotary engine with electronic fuel injection, which combined increase endurance of the 460-pound aircraft from six hours to nine hours.

A recent addition to the V2 upgrade, allowed by the increased 2000W of electrical power provided by the upgraded engine, is adding a new L3 WESCAM MX-10 HD EO/IR sensor ball, with the first MX-10s delivered to the Army in May 2016.

### **UK Approved for 26 CPB Reapers (\$1 Billion)**

In November 2016, the US State Department approved a \$1 billion sale of 26 Certifiable Predator B (CPB) MALE UAVs to the UK, with an initial purchase of 16 CPBs and an option for 10 more, to replace the 10 Block 1 Reapers the UK now operates.

### **Predator XP Deliveries to UAE Complete**

In February 2017, deliveries of the General Atomics Predator XP to the UAE were reported as complete. There have been no new sales.

### **Hammerhead to Resume Flying Soon; Italy Ducks Out of Program**

In July 2017, the Piaggio Hammerhead UAV was to begin flying again soon, following the crash of the first prototype into the Mediterranean Sea in May 2016.

Since the crash, the Italian Air Force has done just what we should have realized they would do and ducked out of buying any aircraft. It seemed unusual for them to buy a brand-new European MALE UAV, and now they have become “support partners” as Piaggio prepares the first of eight Hammerheads to be delivered to the UAE beginning in 2018.

Just as with numerous naval programs, the Italians presumably claimed to be buying systems solely as a lure to attract real foreign buyers. The Europeans have always tended to inflate claims regarding buying their own national systems, in an effort to drum up international sales.

### **L3 WESCAM Announces \$200 Million in MX- and In-Service Support Contracts**

In September 2017, L3 WESCAM announced that it had won a series of MX-series production and in-service support contracts worth more than \$200 million in the first half of 2017, from clients in the Americas, Europe, Asia, Africa and Oceania, for air, land, and maritime use. Mike Greenley, the new President of L3 WESCAM, cited, “a heightened demand for MX- systems on Unmanned Aircraft System (UAS) platforms, numerous orders from global Original Equipment Manufacturers (OEMs), and a surge in [logistics support] service contracts across the U.S. and United Kingdom.” Greenley also claimed, “The collective orders from our first half of the year reaffirm that we are not only creating and investing in the right products, but that we’re aligning our offerings for our customers’ much-valued support infrastructure, maintaining the full functionality of MX- products through their natural life cycle. We expect this demand to continue through the second half of the year.”

Greenley claimed the demand for UAVs grew, with more than 60 MX-units ordered for deployment across six countries and six different UAV types for defense and security, from the MX-10 to the MX-25.

L3 also experienced a steady growth of in-service support contracts from customers that operate military platforms equipped with MX-series systems fielded across the US and United Kingdom. One of the orders included a five-year in-service support plan (one base year and four option years) for the MX- systems

procured for the US Air Force's AC-130 gunship program. These systems will be maintained out of several L3 WESCAM Authorized Service Centers (WASCs) located in the US; the Eglin, Hurlburt, and Cannon Air Force Bases; and the Dahlgren System Integration Laboratory. This is the second five-year term option the Air Force has executed in support of the AC-130 gunship program.

### And Another \$250 Million Reported...

In February 2018, L3 WESCAM announced another \$250 million in new contracts in the second half of 2017 from military and law enforcement customers for the MX-series and in-service support products and services.

### UAE Predator XP Flight Demonstration

In February 2018, a UAE Predator XP/RQ-1E flew above the tarmac of Al Ain Airport in the United Arab Emirates (UAE) as part of a "Live-Fly" event focused on Unmanned Aerial Vehicles that support the defense and security sectors, part of the Unmanned Systems Exhibition (UMEX) held in Abu Dhabi.

### MX-25 Offered for Canadian SkyGuardian MALE RPAS

In May 2018, General Atomics announced the launch of Team SkyGuardian Canada, working with Canadian teammates CAE Canada, MDA, and L3 WESCAM to offer the MQ-9B SkyGuardian UAV for Canada's RPAS (Remotely Piloted Aircraft Systems) MALE program.

Cameron McKenzie, vice president, global sales, and business development for L3 WESCAM stated, "We are extremely pleased to have been selected by General Atomics to be a key team member of the SkyGuardian Canada program. Our innovative and mission-proven MX-25 EO/IR sensor system was designed, engineered, and built right here in Canada and has demonstrated its effectiveness in the extreme

environments and weather conditions experienced across much of Canada's 18 million square kilometers."

### L3 WESCAM Announces \$300 Million in First-Half 2018 New Business

In July 2018 at Farnborough, L3 WESCAM announced new business in the first half of 2018 valued at more than \$300 million. According to Christopher E. Kubasik, L3's Chairman, Chief Executive Officer and President, "L3 WESCAM has a growing pipeline of ISR opportunities and strong sales momentum on a global scale, and this has been the strongest orders period in its history."

According to Jeff Miller, Senior Vice President, and President of L3's Sensor Systems business segment, "The state-of-the-art ISR technologies incorporated into our air, land and maritime systems have resulted in the addition of 16 new customers and four new platforms during the first half of the year [2018]."

### New Claim of 4,300 MX-Systems Fielded

In July 2018, L3 WESCAM also reported that more than 4,300 MX-systems were fielded worldwide across 80 countries, operational on more than 200 different types of platforms, including fixed- and rotary-wing aircraft, UAVs and aerostats, land vehicles, and maritime platforms. See below for Teal Group's evaluation of this claim.

### Largest Ever ISR Contract: \$454 Million for Army Shadow UAV?

In October 2018, L3 WESCAM announced what it called the largest ISR contract in the history of WESCAM. In September 2018, the US Army reportedly awarded a \$454 million, five-year (with a five-year option) indefinite-delivery/indefinite-quantity (ID/IQ) contract for MX-10D EO/IR/laser designator sensors for the RQ-7Bv2 Shadow UAV. The MX-10D will be produced

in Pittsburgh, PA and Burlington, Ontario (Canada).

WESCAM also stated it would continue to invest in research and development as the Army evaluates options for the next-generation Future Tactical Unmanned Aircraft System (FTUAS) program, the replacement for Shadow, targeted for 2025.

### GBOSS-E RDT&E Plans

In February 2019, the US Army's PE# 0605033A Ground-Based Operational Surveillance System-Expeditionary (GBOSS-E) provided RDT&E funding to develop a replacement for the interim Persistent Surveillance System-Ground (PSS-G) Increment 1 towers, with improved persistent surveillance capabilities and providing network integration and better mobility utilizing modular configurations. GBOSS-E will replace obsolete, quick reaction capability (QRC) surveillance and force protection systems utilizing modular configurations in several variants: the Light variant (man transportable/detachable) for extra small base camps or small outpost/company camps; the Medium variant (mid sensor height) for small to medium size bases, and the Heavy variant (high level sensor height) for large contingency base camps.

GBOSS-E will operate in a stand-alone mode or as part of an integrated network utilizing government owned software. It will be easily operated and maintained and be rugged enough to support employment in expeditionary operations worldwide.

### Tactical Security System (TSS) RDT&E Plans

In February 2019, the US Army's PE# 0605034A Tactical Security System (TSS) provided RDT&E funding for development of a modular, scalable, lightweight, rapidly deployable, ground-based security and surveillance Family of Systems (FoS). The design of TSS allows for hasty emplacement and is tailorable to support short- and long-term security, surveillance, and detection

missions. The TSS and its components are designed to be employed as a stand-alone system, in a layered effort or integrated with additional force protection (FP) systems. Integration with additional sensors will be obtained through network communications and software in line with Net-Ready requirements.

TSS will address four of the five base camp core protection/security capabilities identified in the Integrated Base Defense (IBD) Concept of Operations (CONOPS): Perimeter security; Entry control; Persistent surveillance; Warning and alerting. The TSS will be compliant with the Common Operating Environment (COE) Architecture and Implementation Plan. TSS is designed to be employed as a stand-alone system in a layered effort, or integrated with additional force protection systems including motion, acoustic, seismic, surface, and detection technologies.

By early 2019, TSS design, prototypes, and integration had been conducted by Polaris Alpha in Fredericksburg, VA.

### TSS Acquisition Strategy

In February 2019, the US Army's plan was for TSS to eliminate the Non-Standard Equipment (NSE) currently used in the Force Protection Suite (FPS) under the Base Expeditionary Targeting and Surveillance System-Combined (BETSS-C) Quick Reaction Capability (QRC), with improved surveillance capabilities in modular configurations along with enhanced network integration across the command-and-control system and Common Operating Environment (COE).

The Tactical Security System (TSS) received Materiel Development Decision (MDD) approval on 6 January 2017. The acquisition concept and contracting strategy for TSS was approved on 30 April 2018 by the Milestone Decision Authority (MDA), to leverage an existing task order through the Night Vision and Electronic Sensors Directorate (NVESD), Fort Belvoir, Virginia to

provide engineering and developmental support for TSS design, development, and integration of an EDM, and to support Operational Assessments (OA). Key efforts include the development of the EDM, testing and evaluation for TSS Key Performance Parameters (KPPs)/Key System Attributes (KSAs)/Additional Performance Parameters (APAs), and Developmental and Operational Test and Evaluation (DOT&E).

MS B was achieved on 29 October 2018. Milestone C is planned for FY20.

### General Atomics Integrates L3 WESCAM MX-20 on Reapers

In May 2019, General Atomics and L3 WESCAM (a Canadian company) were integrating WESCAM's MX-20 EO/IR imaging system onto the MQ-9B SkyGuardian Remotely Piloted Aircraft System (RPAS), for Canada's RPAS Program. The MX-20 was also being integrated on the MQ-9 Reaper that is currently being operated by several NATO countries.

According to General Atomics, "Field-proven, with extensive deployment, WESCAM's MX-20 is equipped with high-sensitivity multi-spectral sensors for day, low-light, and nighttime missions, and offers low-risk "plug-and-play" installation. The MX-20 operates with detection and recognition capabilities at high altitudes in support of persistent surveillance missions."

According to Linden Blue, General Atomics CEO, "Integrating capabilities from L3 WESCAM and our other Team SkyGuardian partners – CAE and MDA – provides the most capable RPAS solution and the best economic value for Canada.... The MX-20 integration on MQ-9 builds on our successful integration of the WESCAM MX-15 onto our Predator XP aircraft. Taking advantage of our close North American relationship, our companies can cooperate to provide unprecedented levels of innovation and business opportunity with our RPAS."

According to Jacques Comtois, Vice President and General Manager of L3 WESCAM, "Team SkyGuardian is a significant benefit to L3 WESCAM and provides more opportunities for the modular growth path of the WESCAM MX-20 as mission portfolios evolve, and the battlespace continues to change on a global scale...MX systems are the eyes of customers across more than 80 countries worldwide."

L3's WESCAM MX-Series has reportedly been engineered to focus on the three factors that drive maximum range: resolution, magnification, and stabilization. As a result, each turret has outperformed its major competitor in every performance area, giving WESCAM the longest EO/IR target identification and designating ranges in the industry.

### First Major MX-10 Order for Army RQ-7Bv2 Shadow UAV?

In October 2019, the US Army reportedly ordered 65 L3 WESCAM MX-10D EO/IR/laser designator sensor suites for an undisclosed value as part of a production order to support the Army's Tactical Unmanned Air Systems Shadow UAV (RQ-7Bv2) program, as part of a reported (by L3 WESCAM) \$454 million, multi-year ID/IQ contract awarded to L3Harris WESCAM in 2018. The order reportedly follows the successful on-time delivery of eight MX-10D's for the program's First Article Testing/qualification milestone, which reportedly successfully transitioned to an approved Limited Rate in Production (LRIP) order.

According to Jacques Comtois, General Manager, L3Harris WESCAM, "These are the first of many systems the Army will receive over the next year in support of the Shadow program and its modernization strategy."

However, \$454 million just sounds like way more money than would be needed for MX-10s (small, inexpensive sensors for a tactical UAV) for the small US RQ-7Bv2 Shadow fleet. And the absence of an

actual value for the production order in 2019 is also suspicious and unusual. Unfortunately, this seems like yet more unsubstantiated information put forward in the past few years by L3 WESCAM. Frankly, we suspect there is trickery involved here and that these numbers are not accurate for the Shadow MX-10s (notice we now use “reportedly” for almost all info provided by L3 WESCAM). Finally, reports from 2016 that MX-10

production had already begun would not seem to align with the 2019 L3 WESCAM press release stating that the new production order, “follows the successful on-time delivery of eight MX-10D’s for the program’s First Article Testing/qualification milestone” – unless there have been major problems with the MX-10 program. Without any value for those 65 MX-10s in the October 2019 production order, Teal Group must presume

the reported \$454 million MX-10 Shadow contract is either inaccurate or includes additional, unreported information (such as, for example, the next 30 years of support...). Based on the past few years of L3 WESCAM press releases, we now question all information (numbers especially) provided by L3 WESCAM.

## Current Developments

### L3Harris Claims 5,000<sup>th</sup> WESCAM MX- System Delivered

In July 2020, L3Harris Technologies made an unsubstantiated claim to have completed delivery of its 5,000<sup>th</sup> WESCAM MX-Series imaging system since launching the product line in 1997. The milestone was reportedly celebrated when a WESCAM MX-20 turret was delivered to the US Navy for deployment on its P-8A maritime patrol aircraft.

L3Harris reports it has delivered more than 500 WESCAM MX systems in support of US Navy airborne programs, with the Navy’s P-3C Orion maritime patrol aircraft being the first platform to ever fly a WESCAM MX-Series turret. In the 20 years since, the Navy has reportedly employed both WESCAM MX-20 and WESCAM MX-15 systems on US Navy and US Marine Corps platforms such as the P-3C, P-8A, King Air, OV-10, A-29, C-130J, and various aerostats.

L3Harris also claimed its WESCAM MX systems are active in over 80 countries, operating across air, land, and maritime domains, and “support[ing] more than 200 different platforms.”

### \$380 Million MX- Contract for US Army? Or Same Shadow MX-10 Contract, Claimed Again?

Also in July 2020, L3 Harris claimed in a press release that the Canadian Commercial Corporation

(CCC) (Canada’s government-to-government contracting organization for sales of defense and security technology and expertise from Canada) had awarded L3Harris Technologies an eight-year, \$380 million indefinite delivery, indefinite quantity (IDIQ) contract to procure WESCAM MX-Series products and services in support of global US Army surveillance and targeting operations, enabling continued upgrades and support for the US Army’s installed base of fixed-wing, aerostat, and unmanned platforms, while supporting expanding Foreign Military Sales (FMS) requirements.

But is this yet another repetition of L3Harris’s claim of a \$454 million MX-10 RQ-7Bv2 Shadow UAV contract for the US Army? IDIQ means “Indefinite” or possibly, “ain’t gonna happen.” With continuing large, unsubstantiated claims, we really don’t know....

L3Harris also claimed WESCAM MX-Series systems have logged over 4 million hours of combat operations with the US Army.

### USAF Market Research (Again) for Multi-INT ISR Business Jet Aircraft

In November 2020, the Air Force Life Cycle Management Center (AFLCMC), Intelligence, Surveillance, and Reconnaissance (ISR) and Special Operations Forces (SOF) Sensors, Foreign Military Sales (FMS) New Business and Advanced ISR Systems Branch, (AFLCMC/

WINN) announced it was conducting Market Research (with no program or funding commitment) for Aircraft Special Mission System Integrators to deliver an ISR aircraft with the Multi-INT sensor payload described below. AFLCMC/WINN was exploring the market for sources to provide technically sound and economical non-developmental qualified solutions, including the utilization of an established a Commercial off the Shelf (COTS) system-of-systems, consisting of integrated non-developmental items to the maximum extent possible. The US Government will use this Market Research information to determine the best future acquisition strategy for this procurement to meet the customer requirements and delivery schedule.

Aircraft Platform: Gulfstream G550 class performance or equivalent; Ability to operate and loiter at FLT level 40,000+; Baseline Type existing in the USAF inventory (if possible); Federated ISR integration possessing Military Type Certificates/FAA Supplemental Type Certificates.

Mission Systems:

Synthetic Aperture Radar/Ground Moving Target Indication (SAR/GMTI) based on state-of-the-art AESA technology and open systems architecture, high resolution SAR imaging and GMTI target detection at standoff ranges.

Electronic Intelligence (ELINT) capability up to 40 GHz including multi-platform Time Difference of

Arrival (TDOA), INTRA pulse analysis.

Communication Intelligence (COMINT) including SATPHONE capability and multi-platform TDOA Image Intelligence (IMINT).

**Electro-Optical/Infra-Red (EO/IR) camera (20")** including SWIR spotter, Laser Target Designator and Laser Rangefinder.

Datalink: Link-16 Tactical Data Link (TDL) to share Command/Control (C2) data with C2 and non-C2 entities (ASOC, F16s, Attack Helicopters).

Communications Security (COMSEC): secure Type 1 military communication UHF/VHF, HF, Navigation, IFF and C2 capabilities, including LOS data link, SATCOM data link, TDL (L-16, MIDS, JTRS), IFF Mode 5, SASSM, TACAN, and US system encryption.

Aircraft Survivability Equipment: AN/AAR-47 Missile Warning System (MWS) and AN/ALE-47 Countermeasures Dispenser System (CMDS).

### **100 MX-RSTA Systems Contracted for Swiss TASY EAGLE 6x6 Vehicles**

In December 2020, L3Harris reported an award from the Swiss federal office for defense procurement, Armasuisse, for EO/IR sighting systems in support of the Swiss Armed Forces' TASY tactical reconnaissance system. L3Harris will provide approximately 100 WESCAM MX-RSTA systems to be installed on General Dynamics' European Land Systems fleet of EAGLE 6x6 vehicles.

L3Harris was selected as the EO/IR system of choice for the TASY program in March 2020. Deliveries of the WESCAM MX-RSTA systems are to be complete by the end of 2024. The TASY Program is part of the armaments program 2019.

### **5-Year, \$96 Million US SOCOM Contract for MX-10/15 Claimed**

In August 2021, L3Harris reported the US Special Operations

Command awarded L3Harris Technologies a 5-year, \$96 million IDIQ contract to procure WESCAM MX-10D and MX-15D sensor systems for various Army SOCOM aircraft.

According to L3Harris, this contract marked the *second* airborne sensor program win with the US Army in three years. L3Harris claims the first was the \$454 million, multi-year IDIQ contract that included WESCAM MX-10D sensors for Shadow UAV (RQ-7Bv2).

But if so, what was the \$380 million contract claimed in July 2020?

### **US Navy Requests More MX-20s for P-8A Poseidon**

Also in August 2021, L3Harris reported that the US Navy had agreed to acquire nineteen (19) WESCAM MX-20 sensor systems for the P-8A Poseidon, with deliveries to be complete by the end of 2022.

### **Almost 600 MX- Systems Delivered to US Navy**

In August 2021, according to Kristin Houston, President, Electro-Optic Sector, L3Harris, over more than 20 years L3Harris has delivered more than 570 WESCAM MX- systems to the US Navy, including the WESCAM MX-8, MX-10, MX-15, and MX-20.

### **Germany Buys P-8A Poseidon**

In October 2021, the US Navy placed an order with Boeing for five P-8A Poseidon aircraft for the German Navy, with the first deliveries scheduled for 2024, to replace Germany's P-3C Orion fleet and take over long-range reconnaissance and surveillance, submarine hunting, and search & rescue missions. The P-8A is in service worldwide with more than 135 aircraft delivered. Following the US, Australia, India, Great Britain, Norway, Korea and New Zealand, Germany is the eighth nation to buy the P-8A.

German P-8As will mount the WESCAM MX-20.

### **L3Harris Opens New Facility in Canada for WESCAM MX-Series Production**

In November 2021, L3Harris Technologies opened its new \$110 million facility in Waterdown, Ontario, Canada, "to address the growing demand for its WESCAM MX-Series electro-optical and infrared imaging technologies." The new 330,000-square-foot facility is designed to create cross-functional efficiencies across research and development, engineering, assembly, service and office space. Currently 1,250 employees work either remotely or out of this new facility. By the end of 2025, L3Harris anticipates more than 1,500 employees will report into this location. L3Harris reports that the purpose-built facility has been designed to maximize efficiency and sustainability – increasing overall manufacturing over its previous capacity by 80%.

### **Canadian MALE RPAS RfP**

In February 2022, Canada's Department of National Defence (DND) finally issued the RfP for the optionally armed Remotely Piloted Aircraft System (RPAS) program (after nearly 20 years of UAV program planning...). A formal contract is not expected for another year or two, with the first UAV air vehicle not scheduled for delivery until at least 2025 and the last not to be delivered until the early 2030s.

L3Harris Technologies and General Atomics each lead rival teams to compete for a contract award expected in 2024.

General Atomics' Team Guardian and is offering the MQ-9B Reaper/SkyGuardian, with Team Artemis proposing its "Artemis" UAV based on the Heron TP aircraft from Israel Aerospace Industries.

### **RQ-7B Block III Improved Shadow with MX-10 (?) Guides Hellfire Missile at Army EDGE 22**

In May 2022 at the US Army's Experimental Demonstration

Gateway Exercise 2022 (EDGE 22), according to a Textron press release, a new Textron Systems' RQ-7B Block III Improved Shadow Tactical Unmanned Aircraft System (TUAS) with enhanced optics (MX-10?) terminally guided a Hellfire missile to

assist in qualifying the US Army's Future Attack Reconnaissance Aircraft (FARA) Modular Effects Launcher (MEL). The Hellfire was launched by a UH-60 helicopter acting as a FARA surrogate. EDGE 22 is a risk mitigation event focused on

assessing new tactics and evaluating new technologies and architectures.

Also employed was Textron Systems' One System Remote Video Terminal (OSRVT) technology to provide critical geospatial data needed throughout the event.

## Teal Group Evaluation

### Up and Down History

L3Harris' WESCAM develops and manufactures several types of surveillance EO/IR systems – primarily gimbaled “FLIR balls” – for numerous US and international programs, including the MX-20 for US Navy and international P-3 variants and the P-8A Poseidon (was Multi-mission Maritime Aircraft [MMA]), the MX-15 (AN/AAQ-35) for numerous US and international platforms, and the smaller MX-10 sensor for UAVs as well as ground and naval applications.

Before its acquisition by L-3 Communications in September 2002, WESCAM was not successful in gaining market share from the top-tier FLIR manufacturers such as Raytheon. And unlike FLIR Systems, Inc., they had not secured any big US government contracts which would make them a solid second-tier supplier. WESCAM's acquisition initially helped their order book, and a new surge of activity and US government contracts came with L-3's presence in several important markets – but especially for P-3 Orion upgrades.

Teal Group was initially optimistic that L-3 would build WESCAM into a successful supplier on the level of FLIR Systems, Inc., if not Raytheon, especially with the overall growth forecast for the electro-optics market. However, new sales lagged, with the only announcements for small international sales – the type of low profit margin orders FLIR Systems relied on *before* they moved up to major US DoD procurements. Northrop Grumman then also entered the FLIR sensor ball market in force,

with Raven Eye and Night Hunter, and quickly grabbed the P-3 follow-on P-8 Multimission Maritime Aircraft (MMA) sensor contract. This gave much of L3 WESCAM's strongest market – maritime patrol – to a developer with greater resources than WESCAM.

But then in 2007, L3 WESCAM won a few more moderate contracts – for more USN P-3s and for the British Army and Navy – and they again had a healthy backlog. Better still, in early 2008 they stole the MMA procurement away from Northrop Grumman, basically killing Night Hunter and Raven Eye, and eliminating a strong potential competitor from the ISR FLIR ball market. In 2009 they began providing a surge of 37 MX-15i and MX-15Di sensors for the USAF's urgent requirement Project Liberty manned ISR aircraft. And in September 2010, L3 WESCAM announced it would supply EO/IR ISR and targeting sensors for the US Army's LEMV hybrid airship, to include two MX-15HDi and two MX-20D turrets per airship.

But in early 2013, WESCAM suffered another shock to its near and medium-term order book when the Army's four-sensor-per-airship LEMV program was cancelled. Additionally, with the end of the major PTDS aerostat procurement in 2012, WESCAM's second-biggest program after P-3s had ended, causing an immediate drop in total production.

The next two years seemed to have been place-holders for L3 WESCAM, with no big wins but also no devastating losses.

Then, in 2015 the market seemed to turn up again, potentially in a big way. Beginning in 2015, the US Army and Marine Corps began rebuilding/upgrading their entire fleets of RQ-7 Shadow tactical UAVs into the V2 version – more than 400 UAVs – with an undetermined number to receive new MX-10 sensors.

A number of substantial new contracts were awarded – such as the February 2015 order for 28 MX-15Ds for IOMAX Archangel turbo-prop aircraft for a customer within the United Arab Emirates (UAE). And the existence of past production for the US Army became clearer – in February 2016, the US Army planned production and upgrade of EO/IR/Full Motion Video (FMV) systems, upgrading MX-20HD sensors and MX-20D SWIR sensors on manned Guardrail ISR aircraft. And in July 2016, L3 WESCAM announced it had “received multiple orders” for MX-15Ds for “an international military customer,” to support the General Atomics Predator XP UAV – likely for the UAE (but only for five UAVs).

### Whoa! New President = New Press Releases!

Then, in 2017 the previous moderate flow of new orders for MX-series systems appeared to become a torrential flood, if new, more generalized, and vague press releases under L3 WESCAM's new President, Mike Greenley were to be believed. In September 2017, L3 WESCAM announced that it had won a series of MX-series production and in-service support contracts worth more than \$200 million in the first half of 2017,

from clients in the Americas, Europe, Asia, Africa, and Oceania.

In the second half of 2017, the number of new contracts was reported as \$250 million, and in July 2018, L3 WESCAM reported \$300 million of new business in the first half of 2018.

In 2018's L3 WESCAM report, Teal Group was cautious about the first of these claims – we stated, “This very large amount [\$200 million] might turn our forecast on its head somewhat, but it is difficult to analyze without being itemized, and *much of the in-service support funding could actually be going to L3 businesses which we have not traditionally included in our 'EO/IR' forecasts.*”

By late 2018, Teal Group could only assume the counting method had changed under new President Mike Greenley, and that many of these MX- systems may only have been *tested* on new platforms? MXs *operational* on 200 different types of platforms, worldwide? Really? Clearly, small ground vehicle and small boat systems (non-MX-?) were counted in this new accounting, because only 500 airborne MXs were claimed in 2016, and by late 2018, 4,300 MX-s *fielded* worldwide across 80 countries were claimed – only two years later (up to 5,000 claimed – totally without evidence – in July 2020; 700 new systems in 1.5 years? Very, very unlikely...). On the other hand, rival FLIR Systems, Inc. recently reported *one million* Lepton IR cameras had been delivered. So clearly, how you do your count, and what you count, counts. We would like to know more.

But by late 2020, aside from the potentially large order of MX-10s for the US Army Shadow, there had really *not* been *any* major reported new sales of airborne MX- systems for several years, and those that were known had been small orders for a few or a dozen systems. We feared L3 WESCAM may have been using the same wishful thinking or creative accounting in their press releases as

the Israelis and now-dead US firms like Litton did (or used to do before they disappeared).

It was also by then clear that L3 WESCAM press releases titled “New MX- System Contracts” included an undefined amount of support funding. Did this include internal administration funding back in Canada, rather than funding included in new system contracts themselves? We really didn't know, based on the new generalized claims.

### And Up Again (in 2021)?

But suddenly (again), L3Harris WESCAM's fortunes may have improved for 2021.

In December 2020, L3Harris reported an award from the Swiss federal office for defense procurement, Armasuisse, for EO/IR sighting systems in support of the Swiss Armed Forces' TASYs tactical reconnaissance system. L3Harris will provide approximately 100 WESCAM MX-RSTA systems to be installed on General Dynamics' European Land Systems fleet of EAGLE 6x6 vehicles.

In August 2021, L3Harris reported a 5-year, \$96 million IDIQ contract from the US Special Operations Command to procure WESCAM MX-10D and MX-15D sensor systems for various Army SOCOM aircraft.

Also in August 2021, L3Harris reported the US Navy had agreed to acquire nineteen (19) WESCAM MX-20 sensor systems for the P-8A Poseidon, with deliveries to be complete by the end of 2022.

And in November 2021, L3Harris Technologies opened its new 330,000-sq-ft, \$110 million facility in Waterdown, Ontario, Canada, “to address the growing demand for its WESCAM MX-Series electro-optical and infrared imaging technologies.” – reportedly increasing overall manufacturing capabilities over its previous capacity by 80%.

Which presumably you don't do if things are not going well....

### Changing Fortunes

So... L3Harris WESCAM has been subject to repeated, fairly drastic ups and downs over the past two decades, but not only have they remained a viable competitor for the off-the-shelf systems they have always provided (and which FLIR Systems, Inc. had been growing out of), they have more recently been winning an increasing number of moderate US procurement programs – especially the possibility of more than 400 inexpensive MX-10 systems (eventually) for US Army and USMC V2 RQ-7 Shadow Tactical UAVs.

A few years ago (2014), we reduced our near-term and out-years forecasts, largely because we were in a more bearish mood about the manned EO/IR gimbaled “FLIR ball” market in general, in addition to LEMV's cancellation and L3 WESCAM's reduced order book and less consistent history than FLIR Systems, Inc., and finally because of their lack of presence in fast-growing UAV markets.

L3 had begun a major push into the UAV market in 2009, with L3 WESCAM expected to tag along as the default EO/IR sensor supplier where possible. However, an initial success with about two dozen Viking 400 tactical UAVs for US SOCOM was not followed by subsequent new platforms, or sensors, until the potentially huge MX-10 buy for V2 Shadows.

But the MX-10 is an inexpensive system, and procurement rates and numbers have never been clear. In fact, in early 2018 it was reported that the Army had decided to wait and continue operating their existing Israeli IAI-Tamam POP 200/300 sensors. Earlier than this, we hesitated to forecast large numbers of MX-10 sensor buys until numbers were confirmed. By mid-2016, although nearly half of the 400+ Shadow UAVs had completed their V2 conversion, Army budgets seemed to indicate only 19 MX-10 buys in FY17. We speculated that MX-10s would



be bought at a slower rate than the overall V2 upgrade and be retrofitted over time.

By 2018, with the announcement by L3 WESCAM of a major ID/IQ contract for MX-10Ds for Army Shadow upgrades... well, we were still uncertain. This contract could play out slowly over the next ten years. And at a \$250,000 unit cost (inexpensive – that’s why they sell for small UAVs – these are not Reapers!), again, do the math. 400 systems at \$250,000 is only \$100 million. We really didn’t see how an *initial* \$454 million “contract” computes. Clearly there were unanswered questions here.

Other than Shadow, WESCAM buys for other UAVs may or may not have ramped up – but by late 2020 Teal Group had seen no evidence that they had. Claims of \$200 million in MX-series contracts in the first half of 2017, \$250 million in the second half, and \$300 million in the first half of 2018 would seem to have pointed towards yes, but there were no data to support these numbers, or what they represented. Deliveries of the General Atomics Predator XP to the UAE were finally confirmed, almost certainly with the MX-15, but that was only five UAVs!

This could have been another round of up or down for L3 WESCAM, now obfuscated by big numbers in press releases without supporting evidence. FLIR Systems, Inc.’s Star SAFIRE 380HD and other systems are still comparable and competitive with MX- systems, also somewhat less expensive than Raytheon sensors and also somewhat more exportable (in part due to more company interest in small international orders than may exist for the large-order-sated Raytheon).

### Our Speculative Forecasts

Where did all this leave L3Harris WESCAM, going forward? If their claims were believed, they seemed to have taken over FLIR Systems, Inc.’s place as the go-to supplier for small and international military orders of

gimbaled EO/IR FLIR balls. And they may have also taken over the role as the US DoD’s alternate supplier to Raytheon for small procurements of EO/IR systems for ISR aircraft. But this may not be due to any real WESCAM superiority – FLIR Systems, Inc. has shifted more and more of its efforts to civil/commercial EO/IR markets, including totally new offerings, such as – rather amazingly – the Android-based Cat S60, the first smartphone to integrate a thermal camera.

So... L3 WESCAM had a couple of good years in their traditional markets, and our speculative forecasts had inched up again by 2016. By late 2017, the growth seemed to be continuing, but WESCAM’s new President, Mike Greenley, had also clearly begun pushing the press releases and claims of success. So much of both FLIR Systems, Inc. and L3 WESCAM’s business and contracts are “proprietary” that there have always been a lot of anonymous buyers... Overall, it is hard to see who is buying what, and in what numbers. Our forecasts inched up again in 2017, but we were waiting for more major programs to be definitized in DoD budgets.

Also, we were not sure if recent sales would ultimately be advantageous in the long term – and represent a consistent income – or if they were yet another boom cycle. The MX-10 is (was) inexpensive, and the Predator XP would never sell in large numbers (if at all) beyond the UAE, to buyers who are not allowed to buy Predator B Reapers with more-expensive Raytheon EO/IR sensors (or similar but cheaper Chinese MALE UAVs). Would L3Harris WESCAM be able to break into high-value DoD programs of record with a large RDT&E component – the most profitable market of the major defense primes discussed below?

By late 2018, our forecasts had not changed much versus 2017 – and were actually lower than 2017 due to the lack of large, proven new contracts since 2015-16 – despite the big

numbers claimed by L3 WESCAM. Our forecasts were and are still highly speculative. And note that our forecast does not include civil/commercial sales (and does not include law enforcement agencies).

### ...in 2020 and 2021...

Then in December 2020, we significantly *reduced* our forecasts – frankly, we just did not see any evidence that L3Harris WESCAM’s claims were legitimate, or comparable to everyone else’s claims of contracts for EO/IR sensors. L3 WESCAM’s numbers did not have enough support to make them credible.

But a banner year of significant sales occurred in 2021. And our forecasts were up again last year – significantly.

### Reaper/MALE UAV MX-20 Forecast

Given the status of the Canadian RPAS Program – still in the project definition phase, with the RfP planned for 2020/21 but not released until 2022, and a contract winner originally not expected until 2022/23 but now not until 2024, we will withhold a forecast for MX-20 sensors for Reaper or any other MALE UAVs.

So far, Raytheon retains a very important stamp of US/NATO approval with its AN/DAS-4 Reaper EO/IR sensor. The MX-20’s best chance to break the Raytheon MALE monopoly is certainly here – for Canada – since L3 WESCAM has always been based in Canada. But the only MX- sensors sold recently for Predator/Reaper were a few for the Predator XP – a system expressly developed as a below-NATO-standard international system.

It is too early to forecast MX-20 production, and very likely the Canadian RPAS program may just add one more production line to our Raytheon AN/DAS-4 forecast for Reaper (see AN/AAS-44 report).

**High-End Competitors:  
Lockheed, Northrop... and  
Raytheon**

In October 2014, Lockheed Martin Missiles and Fire Control, Orlando, FL introduced the INFIRNO 15-inch gimballed EO/IR sensor ball, developed with internal investment. In July 2016, INFIRNO completed its first flight on the nose of an H-60 Black Hawk helicopter – in a Lockheed Martin-funded test. Also, in July 2016, Lockheed reportedly conducted INFIRNO ground tests for an unspecified customer on a commercial ground vehicle with a telescopic mast. Lockheed Martin has previously offered the EO/IR Vehicle Optics Sensor System (VOSS) for mine-resistant ambush protected vehicles.

Much as Northrop Grumman attempted with its Night Hunter/Raven Eye systems a few years earlier, Lockheed Martin was attempting to break into the gimballed ISR FLIR ball market with INFIRNO. Both companies have a long legacy in

higher-capability EO/IR targeting systems for fighter planes and attack helicopters, especially Lockheed Martin (see reports for Northrop’s Litening pod and Lockheed’s LAN-TIRN and Sniper ATP pods, and gimballed M-TADS/PNVs/Target Sight System programs).

But Northrop Grumman failed to gain more than a temporary foothold in the “gimballed FLIR ball” EO/IR market, and by late 2021 Lockheed Martin had also failed to win a major production contract for INFIRNO, despite trying since at least since 2014 (and by 2021 it no longer seems to be trying).

Instead, Raytheon has dominated the US military gimballed FLIR ball market for decades, with only lower-cost systems from FLIR Systems, Inc., and WESCAM becoming really competitive with Raytheon, and more often only for smaller US programs and more cost-dependent international buys.

With much lower profit margins for smaller, more “off-the-shelf” EO/IR ISR systems, it may remain a tempting market but without the real financial benefits of major RDT&E programs – compared to the hundreds of millions of dollars Lockheed Martin and Northrop Grumman have both earned already for, for example, F-35 EO/IR systems. Lockheed, like Northrop, has likely already decided it is not worth it to compete with FLIR Systems, Inc. and L3Harris WESCAM for smaller systems and smaller orders.

Finally, when Raytheon merged with United Technologies Corporation (UTC) in April 2020, the new Raytheon Technologies Corporation acquired Goodrich’s DB-110/MS-110/MS-177/SYERS long-range and high-altitude reconnaissance sensors – all but shutting the door on any hopes of WESCAM (or FLIR System, Inc. – now Teledyne FLIR) growing *upward* into these more profitable high-end ISR markets.

**Funding Forecast**

<i>RDT&amp;E (FY22\$ Millions)</i>	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
<b>All RDT&amp;E</b>										
L3 WESCAM EO/IR	10.0	12.0	11.0	12.0	10.0	9.0	11.0	14.0	12.0	11.0
<i>Procurement (FY22\$ Millions)</i>	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31
<b>All Production and Upgrade &amp; Support</b>										
L3 WESCAM EO/IR	56.0	58.0	56.0	52.0	54.0	60.0	58.0	52.0	50.0	54.0