# SIGINT: Airborne Manned & UAV & Future SIGINT Sys.

**Status: New Development**
**System Type: Airborne SIGINT**

## Program Briefing

The US Air Force's primary legacy manned SIGINT (Signals Intelligence) program is the ***RC-135***, with systems mounted on wide-body Boeing 707s. Versions include ***Rivet Joint*** (17 aircraft), ***Combat Sent*** (2 aircraft), and ***Cobra Ball*** (3 aircraft), with development and integration managed by the USAF Big Safari Systems Group. Some funding is publicly declared, but other funding and most program details are classified. In late 2010, the UK request for three new Rivet Joint aircraft was confirmed despite swingeing budget cuts to other major defense programs. Surprisingly, in August 2012 it was confirmed that in recent years the Royal Saudi Air Force has been operating two highly classified Boeing RE-3 ELINT aircraft, broadly equivalent to the RC-135 Rivet Joint.

The US Navy's primary legacy manned SIGINT program is the ***EP-3E Aries II***, based on the P-3 Orion platform and in service for more than 30 years. In early 2007, the Navy had 12 EP-3Es operational at any one time, but they were scheduled for retirement from 2014-2017. Service life has now been extended, with substantial upgrades, following the 2006 (and again in 2010) cancellation of the follow-on ACS/EP-X airborne SIGINT aircraft. Conversion of four more P-3Cs to EP-3Es was completed in 2007, giving the Navy a total of 16 EP-3Es.

Then, in early 2011, the Navy announced plans to retire 4 of its 16 EP-3Es and its 2 classified P-3 Special Projects Aircraft in 2012, retaining only 12 EP-3Es. And in late 2011, the Navy announced an $8 billion investment over the next five years in a family of UAV ISR platforms, which would replace all manned SIGINT platforms (including the EP-3E) by the end of the decade.

In February 2018, Navy budget documents showed that major public, unclassified procurement funding for the EP-3 continued through FY16 – worth about $100 million in FY16. But beginning in FY17 funding dropped significantly, by about half in FY17 and to a quarter in FY18. However, all funding lines were not available in the FY19 budget in February 2018, so these numbers are estimated.

The Air Force's primary future UAV SIGINT program is the ***Airborne Signals Intelligence Payload (ASIP)***. Development of a pod-mounted ASIP began in FY03, for the U-2 Dragon Lady and Global Hawk. By August 2007, Global Hawk was to be the primary platform, and the USAF also planned to equip all Predator and Predator-B UAVs with the wiring necessary to receive the ASIP-1C (MQ-1 Predator – one electronics "box") or ASIP-2C (MQ-9 Predator-B – two "boxes"), beginning with air vehicles leaving the production line in 2010. Plans called for Global Hawk ASIP deployment and IOC in 2012.

By 2018, USAF ASIP procurement for Global Hawk has continued, but ASIP-1C for Predator was cancelled in October 2009 and ASIP-2C for Reaper was to be cancelled after FY14. Instead, Quick Reaction Capability (QRC) systems already installed on Predator and Reaper would be upgraded.

In February 2018, the USAF FY19 procurement budget discussed ***ASIP Increment I***, which will incorporate additional signals and integrate advanced collection algorithms to provide increased mission capability. It is a follow-on effort to the ASIP baseline program, with retrofits to be implemented using the rotatable spares concept, with fielding estimated to start in July 2018. The ASIP Increment I program will retrofit fifteen Block 30 aircraft as well as twelve spare chassis.

In February 2018, the USAF FY19 budget also outlined ***ASIP Increment II*** – a new start program in CY18 (Calendar Year), with RDT&E funding scheduled for Northrop Grumman.

The Army's manned Guardrail aircraft has also received a version of ASIP for the RC-12X Guardrail Modernization System Integration (GMSI) upgrade, with 14 systems reportedly installed by the end of 2013.

The airborne element of the US Army's billion dollar Prophet SIGINT program was designated the ***Tactical SIGINT Payload (TSP)*** [was Division TUAV SIGINT Program (DTSP)], with three component advanced development contracts awarded to Applied Signals Technology (AST), BAE Systems, and Raytheon in July 2001. A down-select left BAE Systems and AST competing in late 2003, with BAE Systems winning the $27 million, 36 month SDD contract in June 2004. Then, TSP development shifted away from Prophet (primarily a ground-based program), and was instead planned for the Army's Fire Scout FCS Class IV tactical UAV (now cancelled) and Airborne Reconnaissance Low (ARL) aircraft.

In mid-2009, however, the US Army planned to issue an RFP for the ***Enhanced Tactical SIGINT Payload (ETSP)***, which could replace BAE Systems' TSP with another system entirely before major production. In October 2010, the Army released a "sources sought" solicitation for the Grey Eagle UAV, with the program name back to TSP.

In October 2011, the Army awarded BAE Systems a reported $27.7 million, 18-month contract to fund engineering and manufacturing services for EMD of TSP systems. But this was presumably not the anticipated "big decision" for Army Grey Eagle TSP/ETSP, because in

December 2011 the US Army was planning yet another renamed (but essentially the same) Grey Eagle SIGINT system, known, at least initially, as the ***Traveler Pod (T-Pod)***, a Quick Reaction Capability (QRC) to deliver SIGINT pod hardware/software no later than April 2012.

Then, in August 2013 the Army solicited contractor bids for ***Tactical SIGINT Payload (TSP) Block 1*** low-rate initial production, before announcing it will negotiate a sole-source two-year ID/IQ contract with BAE Systems for up to 30 LRIP podded TSP systems, including airborne pods for Gray Eagle UAVs and other platforms and ground workstations.

In February 2016, the Army provided funding for completing development of the TSP, perhaps continuing some stability at least for the Army Gray Eagle, with the final substantial RDT&E development funding to BAE Systems in FY15 and FY16. The FY17 procurement budget "reinstated" the BAE Systems TSP, with the initial twelve (12) production systems already paid for with FY13 funding of $18.7 million, and the other six initial systems funded with $9.4 million in FY15 funding. Initial TSP production deliveries were due in February 2017.

In February 2018, the Army again apparently truncated BAE's TSP, ending the TSP PoR (Program of Record) in support of (preference for) an acquisition strategy of QRCs towards a Family of Systems for Grey Eagle, with BAE's TSP production ending after the initial 30 LRIP systems. These QRCs for Grey Eagle are in our forecast as ***Future (TSP) QRC Systems***.

Northrop Grumman's ASIP, possibly a BAE Systems follow-on to TSP, and other systems will undoubtedly be offered for future endurance and tactical UAV competitions for the US Army and other customers – worth hundreds of millions of dollars – as we speculatively forecast in new undetermined ***Future MALE UAV SIGINT System*** forecast lines.

In February 2016, the ***AN/ZLQ-1 ESM*** system for the US Navy's MQ-4C Triton UAV was to enter Low Rate Initial Production (LRIP) soon, with LRIP Lot 1 deliveries (4 systems) planned from 2QFY18-1QFY19. Follow-on Operational Test and Evaluation was scheduled for 3QFY20 and Multi-INT IOC was scheduled for 2QFY21.

In July 2018, the Navy announced a $19.3 million order to Northrop Grumman to purchase unique materials necessary to integrate the Triton Integrated Functional Capability (IFC) 4.0. The IFC 4.0 will upgrade Triton with multi-intelligence ("multi-int") capabilities that include SIGINT (from Boeing Argon ST and Sierra Nevada Corp.), with initial IFC 4.0 deliveries scheduled for 2021.

We also discuss a speculative ***Follow-On Triton SIGINT Sensor***, as well as a more major program for a ***Future Triton SIGINT Suite***.

This report also covers ***various airborne SIGINT programs*** not covered in other *Military Electronics Briefing* reports. SIGINT includes ELINT (Electronic Intelligence), COMINT (Communications Intelligence), and MASINT (Measurement and Signature Intelligence).

# Executive

US Air Force
Aeronautical Systems Center (ASC)
Wright Patterson AFB, OH 45433-6503
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# Manufacturers

### Primes

Northrop Grumman
Mission Systems
San Jose, CA
*(was TRW)*
*(ASIP)*

BAE Systems
Information & Electronic Warfare Sys
Nashua, NH 03061-0868
tel: (603) 885-6065
*(TSP)*

L-3 Communications
L-3 Integrated Systems
Greenville, TX

*(Rivet Joint)*

Sierra Nevada Corp.
Beaver Creek, OH
*(Triton SIGINT High Band)*

Boeing Argon ST
Fairfax, VA
*(Triton SIGINT Low Band)*

### Subcontractors

- AAI Corp., Hunt Valley, MD: Shadow 200 TUAV for TSP Prophet UAV
- CACI, Eatontown, NJ: Prophet & TSP engineering and support (2005)
- L-3 Communications: ASIP data link

 

- Lockheed Martin: ASIP U-2 integration
- MITRE, McLean, VA: TSP engineering support (2005)
- Raytheon: ASIP sensor support (LBS) and ground station interface

# Functional Description

### TSP Description (February 2016)

The ***Tactical Signals Intelligence (SIGINT) Payload (TSP)*** is a SIGINT sensor for the US Army Gray Eagle that detects radio frequency (RF) emitters in order to provide a SIGINT capability to the tactical commander. The TSP system will be a modular, scalable payload using an architecture that is software reconfigurable to allow for growth and flexibility as technology, and as the adversaries' use of technology, changes. The TSP's flexible architecture will allow for third party software applications to be integrated into the TSP system.

TSP processing, control, and data dissemination will be integrated into the Distributed Common Ground System-Army (DCGS-A) via the Operational Ground Station. It will support Manned/Unmanned (MUM) teaming with Brigade Combat Team ground SIGINT Terminal Guidance (STG) teams and manned airborne assets. The TSP system will improve situational awareness and shorten the targeting cycle by detecting and identifying emitters associated with high value targets (HVTs). The TSP system will be capable of processing conventional signals, standard military signals, and modern signals of interest, including detection, recognition, identification, direction finding, and high confidence geo-location.

### TSP Description (March 2014)

In March 2014, the Army's FY15 budget included plans for TSP in PE# 0305204A, Tactical Unmanned Aerial Vehicles, Project 11B: The ***Tactical Signals Intelligence (SIGINT) Payload (TSP)*** is a SIGINT sensor, currently under development for the Gray Eagle UAV, that detects radio frequency (RF) emitters. The TSP system will provide a SIGINT capability to the tactical commander. The TSP system will be a modular, scalable payload using an architecture that is software reconfigurable to allow for growth and flexibility as technology, and as the adversaries use of technology, changes. This flexible architecture allows for Tactical Unmanned Aerial Vehicles third party software applications to be integrated into the TSP system.

TSP system processing, control, and data dissemination is integrated into the Distributed Common Ground System-Army (DCGS-A) via the Operational Ground Station. It supports Manned/Unmanned (MUM) teaming with Brigade Combat Team ground SIGINT Terminal Guidance (STG) teams and manned airborne assets.

The TSP system improves situational awareness and shortens the targeting cycle by detecting and identifying emitters associated with high value targets (HVTs). The TSP system is capable of processing conventional signals, standard military signals, and modern signals of interest. This includes detection, recognition, identification, direction finding, and high confidence geo-location. The TSP system operates in two modes, passive and active, to provide an enhanced Aerial Precision Geolocation (APG) capability.

### Original ASIP Description

The High Band System (HBS) is being developed by Northrop Grumman Mission Systems (San Jose, CA) (was TRW), as part of the ***Airborne Signals Intelligence Payload (ASIP)***, development of which began in FY03 for use on the U-2 and Global Hawk. Initial HBS flight tests were conducted in 2006. ASIP is a modular and scalable open architecture system, capable of detecting, identifying, and locating radars and other electronic and communications signals. The HBS Production Configuration Unit (HBS PCU) for the Global Hawk will incorporate Mercury Computer Systems RACE++(R) series multi-computers based on VME cards. The ASIP will also include a new Low Band System (LBS), also being developed by Northrop Grumman (and Raytheon). The Joint SIGINT Avionics Family (JSAF) low band system was cancelled in 2002, after continuing technical problems with the BAE Systems development program. ASIP tasking, processing, exploitation, and dissemination is integrated into the Distributed Common Ground System (DCGS) multi-source intelligence handling and distribution architecture's Deployable Ground Intercept Facility.

### Original TSP Description

The ***Tactical SIGINT Payload (TSP)*** is an Unmanned Aerial Vehicle (UAV) mounted SIGINT sensor that detects radio frequency (RF) emitters. TSP initially developed sensors to detect low-power COMINT radio emitters and provide directed Electronic Attack (EA). Today, TSP is a key FCS component, capable of providing the Brigade Combat Team (BCT) Land Commander with an overwatch and penetrating SIGINT system capable of detecting, identifying, locating, and providing geolocation information on RF emitters throughout the Area of Operations (AO). The BCT commander will deploy TSP to provide sensor coverage where FCS ground vehicles cannot perform the SIGINT mission due to radio line of sight blockage. TSP is developing sensors for BCT applications to detect low-power radio emitters. The SIGINT payload is scalable and designed to provide maximum flexibility for the BCT mission profile. TSP will provide near real time (NRT) actionable intelligence that can immediately be used in the commanders' decision cycle. The TSP electronic emitter information will be correlated

with data from other systems, e.g. Prophet and Aerial Common Sensor (ACS), to provide precise targeting information for immediate engagement. The TSP sensors are critical to providing full coverage Intelligence, Surveillance and Reconnaissance (ISR) information for Future Force capabilities for FCS and contributing to the Joint ISR net.

# Funding History

| *RDT&E ($ Millions)* | FY12* | FY13 | FY14* | FY15 | FY16 | FY17* | FY18 | FY19* | FY20** | FY21** |
|---|---|---|---|---|---|---|---|---|---|---|
| **PE# 0304260F** Airborne SIGINT Enterprise (JMIP) | | | | | | | | | | |
| Proj. #675180 RC-135 | 34.7 | 33.8 | 29.3 | 15.0 | 43.0 | 39.8 | 60.4 | 50.6 | 33.4 | 42.2 |
| Rivet Joint | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Combat Sent | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Cobra Ball | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| Proj. #675181 High Altitude SIGINT Development# | — | — | 4.0 | 5.9 | — | — | — | — | — | — |
| Proj. #675182 MQ-1/MQ-9 (Airborne SIGINT Development – Predator)# | 25.9 | 35.3 | 5.9[37.7*]## | | — | — | — | — | — | — |
| Proj. #675183 Common Development# | | | | | | | | | | |
| ASIP | 38.9 | 29.4 | 53.5 | 37.7 | 54.2 | 38.8 | 19.5 | 54.4 | 38.6 | 55.6 |
| Proj. #675184 RQ-4 Global Hawk# | 2.1 | 0.9 | — | — | — | — | — | — | — | — |
| Proj. #675185 Non-Traditional SIGINT (was Compass Bright) | 6.2 | 6.3 | 7.4 | 12.0 | 11.0 | 8.9 | 11.7 | — | 23.3 | 20.5 |
| Proj. #675186 Special Programs | 0.5 | — | — | 2.2 | 2.9 | 3.4 | 24.7 | 4.9 | 7.4 | 7.5 |
| **Total PE# 0304260F** | **108.3** | **105.7** | **100.1** | **72.8** | **111.1** | **90.9** | **116.2** | **109.9** | **102.7** | **125.8** |

*#Primarily funding for ASIP; ##Proj. line disappeared in February 2016/FY17 budget*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **PE# 0305204A** Tactical Unmanned Aerial Vehicles | | | | | | | | | | |
| Proj. #11B TSP Development (MIP) | 5.3 | 17.9 | 24.7 | 10.3 | 9.3 | 1.4 | 1.5 | — | — | — |
| **PE# 0305421N** RQ-4 Modernization | | | | | | | | | | |
| Proj. #2939 RQ-4 Modernization | — | — | — | 30.0 | 119.9 | 181.3 | 224.2 | 219.4 | 202.3 | 72.0 |
| RQ-4 SIGINT | n/a | n/a | n/a | — | 16.9* | 4.0** | n/a | n/a | n/a | n/a |
| **PE# 0305242M** Unmanned Aerial Systems (UAS) Payloads | | | | | | | | | | |
| Proj. #5501 Signals Intelligence (SIGINT) | — | — | — | — | 3.6 | 6.1 | 5.6 | — | — | — |

| *RDT&E ($ Millions)* | FY10 | FY11 | FY12* | FY13 | FY14* | FY15 | FY16 | FY17* | FY18** | FY19** |
|---|---|---|---|---|---|---|---|---|---|---|
| **PE# 0305207F** Manned Reconnaissance Systems (Classified) | n/a | 161.5 | 149.6 | 202.1** | n/a | n/a | n/a | n/a | n/a | n/a |
| **PE# 0305206N** Airborne Reconnaissance Systems | | | | | | | | | | |
| EP-3 Advanced Digital Sensors | 55.7 | 55.1 | — | — | — | — | — | — | — | — |
| **PE# 0305220F Global Hawk Development/Fielding** | | | | | | | | | | |
| Global Hawk ASIP | 142.3 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| **Military Intelligence Program (MIP)** | | | | | | | | | | |
| TSP SIGINT Integration | 6.9 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

| *Procurement ($ Millions)* | FY12** | FY13 | FY14* | FY15 | FY16 | FY17* | FY18 | FY19* | FY20** | FY21** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Army Aircraft Procurement** | | | | | | | | | | |
| SIGINT (MIP): TSP | n/a | n/a | n/a | 13.2 | 49.7 | 37.7 | 1.5 | — | — | — |
| (Number) | n/a | n/a | n/a | (6) | (15)* | (17)** | n/a | n/a | n/a | n/a |
| TSP Theater Net-Centric Geolocation (TNG) | n/a | n/a | 1.4 | 1.5* | — | — | n/a | n/a | n/a | n/a |

| *Procurement ($ Millions)* | FY10 | FY11* | FY12** | FY13 | FY14* | FY15 | FY16 | FY17* | FY18** | FY19** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Air Force Aircraft Procurement (BA05)** | | | | | | | | | | |
| RC-135 Procurement | 117.8 | 105.5 | 162.2 | 163.6 | 174.5 | 163.3 | 217.7 | 259.2 | 280.7 | 234.7 |
| **Navy Procurement** | | | | | | | | | | |
| EP-3E | 92.2 | 90.3 | 104.0 | n/a | n/a | n/a | 48.1 | 22.2 | 14.5 | 6.8 |
| EP-3E JCC | n/a | n/a | n/a | 63.4 | 71.3 | 32.9 | 41.8* | 14.7** | 7.3** | n/a |
| EP-3E Info Operations | n/a | n/a | n/a | 13.0 | 2.7 | 35.0 | 6.3* | 7.5** | —** | n/a |
| EP-3 SPA | 12.3 | 20.8 | 23.4 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Appropriation*
***Request*

# Costs

In 2006, Northrop Grumman claimed ASIP unit cost was $15.4 million (for Global Hawk Block 30). But judging from funds already spent and planned, we suspect the cost is higher, perhaps $24 million for Global Hawk and Guardrail.

MQ-9 Reaper ASIP-2C unit cost was listed as $5 million for FY14 in the April 2013 DoD budget. ASIP-2C could cost $5-7 million if it eventually reaches production.

The MQ-1 Predator ASIP-1C would have cost much less, perhaps as little as $2 million in full rate production.

TSP for the Predator-derived Gray Eagle should cost about the same as ASIP-1C. In February 2010, hardware unit cost was listed by the Army as $1.35 million in FY10 (for 8 systems) and $1.1 million in FY11 (for 12 systems). In February 2016, the Army FY17 budget showed a TSP unit cost of about $1.6 million, with $2.2-3.3 million budgeted when including initial spares and fielding.

Future MALE UAV SIGINT Systems will likely be more expensive, as capabilities grow and systems miniaturize. We estimate between a $3-5 million typical unit cost, which will probably increase with time.

In 2016, our forecast Future MALE UAV SIGINT System (TSP-scale) has a unit cost of about $3 million, including initial spares and fielding.

We estimate the Sierra Nevada/Boeing Argon ST SIGINT system for the HALE Triton UAV may have a unit cost in limited production of about $6 million, including initial spares and fielding. Our forecast Follow-On Triton SIGINT Sensor could have a somewhat higher unit cost, perhaps $7-9 million.

Our forecast Future Triton SIGINT Suite would be a much larger-scale system, maybe with a unit cost higher than today's ASIP. We estimate about $40 million in limited production.

# Program Overview

## ASIP History

### ASIP Development

The High Band System (HBS) being developed by Northrop Grumman Mission Systems (San Jose, CA) (was TRW), is part of the Airborne Signals Intelligence Payload (ASIP) pod, development of which began in FY03 for use on the U-2 and Global Hawk. HBS flight tests were conducted in 2006.

The ASIP will also include a new Low Band System (LBS), also being developed by Northrop Grumman (and Raytheon). The Joint SIGINT Avionics Family (JSAF) low band system was cancelled in 2002, after continuing technical problems with the BAE Systems development program. Due to these delays, the HBS was ready earlier, so Northrop conducted bench testing of the system for about a month, then took it to Edwards AFB in 2006 for test flights authorized by Congress as a risk-reduction measure to make sure that the SIGINT package would work on Global Hawk. "We have to wait for the Low Band System to catch up, which should be in 2007," according George Guerra, Northrop Grumman USAF Global Hawk program manager.

Development of an all-new ASIP for the Global Hawk represents an extension of earlier USAF plans for the UAV, which called for equipping the Global Hawk with the LR-100 receiver as a high-band SIGINT system, along with an undetermined low-band system and the Hyperwide receiver for communications intelligence (COMINT). Despite limited Hyperwide system and LR-100 production, the Air Force decided to go ahead with the development and production of the ASIP – a completely new system.

Northrop Grumman has also been asked to look into the possibility of integrating a COMINT system onboard the Global Hawk, but the studies in this area are only in the very early stages.

### ASIP Program Costs

In 2006, the Air Force was budgeting about $400 million for the ASIP production program, which would buy about 25 systems for Global Hawk at $15.4 million per system, with full rate production from 2009 through 2015.

### ASIP Full System Flight Testing Begins

In January 2007, ASIP flight testing began aboard a USAF U-2, scheduled to run through late 2007. Northrop Grumman is under contract to provide five developmental ASIP systems, with two more planned for the U-2. The fourth system will begin testing on a Global Hawk in late 2007, and the fifth is designed for ASIP sustainment activities.

The three U-2s have been expected to be available for operational missions from late 2008, but in August 2007 the Air Force claimed that they had no plans for operational deployment of U-2 with ASIP. Current U-2s carry Raytheon's RAS-1R SIGINT system.

### ASIP for Army ACS?

In January 2007, Northrop Grumman officials stated they are seeking other applications for ASIP, and one of the most obvious would be as an interim solution for the Army's cancelled Aerial Common Sensor (ACS) program.

### U-2 ASIP Spares Contract

In May 2007, The Air Force Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH, issued Northrop Grumman's Mission Systems a $26.1 million FFP contract to purchase U-2 ASIP support equipment, including depot level spares, test equipment, High band System (HBS) refurbished equipment, and back shop support equipment, in support of ASIP U-2 fielding.

### ASIP 1C/2C Development Contract

In May 2007, the ASC announced it intends to award a contract to Northrop Grumman Space and Mission Systems for the rapid development, integration, and testing of a fieldable, scaled, communication intelligence system based on the ASIP architecture, for the MQ-1, MQ-1X, MQ-9 and RQ-4B (Block 30 I) Unmanned Aerial Systems. The Air Force Distributed Common Ground System (DCGS) will command and control the ASIP 1C/2C sensors using interface standards established on the baseline ASIP program.

### ASIP/1C/2C Production Plans

In August 2007, the USAF planned to equip all Predator and Predator-B UAVs with the wiring necessary to receive the ASIP 1C (MQ-1 Predator – one electronics "box") or ASIP 2C (MQ-9 Predator-B – two "boxes"), beginning with air vehicles leaving the production line in 2010. The full-up ASIP system for U-2 and Global Hawk requires seven or eight electronics "boxes".

In August 2007, the Air Force was also considering whether to recompete the integration/installation contract, or award the contract to General Atomics as planned. A decision is expected by the end of 2007.

In August 2007, plans called for Global Hawk ASIP deployment and IOC in 2012.

### Predator ASIP-1C Production Contract

In December 2007, the ASC awarded Northrop Grumman a $54.9 million contract to procure the MQ-1 Predator ASIP-1C scaled sensor.

### ASIP for Guardrail

In late 2007, the new Enhanced Situational Awareness (ESA) capability for the US Army's manned airborne Guardrail Modernization System Integration (GMSI) program would reportedly be a two-chassis derivative of ASIP (Airborne Signals Intelligence Payload).

### Predator ASIP Schedule

In December 2007, the Air Force awarded Northrop Grumman a $54.9 million contract to develop and flight test the ASIP-1C for Predator.

In early 2008, LRIP of 7 ASIP-1C systems for Predator was scheduled to begin in 3QFY09. FRP of 69 systems was planned for 1QFY10, following ASIP IOT&E in December 2008, with FRP to be completed by FY11. In mid-2008, ASIP-1C flight tests were scheduled to begin in May 2009, with operational fielding in 2010.

In early 2008, funding was not yet in place to complete ASIP-2C development, but Teal Group believes it will eventually be approved, along with production funding, and we have included speculative funding in our forecast (government plans only included MQ-1 procurement funding, from FY09-FY11).

### U-2 to Get First ASIP Systems

As of early 2008, five ASIP development systems were to be quickly mounted aboard U-2 aircraft for immediate operational service, beginning in 2008, and should serve until U-2 retirement. The first production versions will not see service until 2012, aboard Global Hawk. The Air Force still plans to buy 24 ASIPs for its 54 Global Hawks.

### Global Hawk ASIP Flight Tests

In February 2008, ASIP flight tests began at Edwards Air Force Base aboard the first RQ-4B Global Hawk. An operational assessment was due at the end of 2008.

### ASIP Long-Lead Procurement

In April 2008, the Air Force Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH, awarded Northrop Grumman Systems, San Diego, CA a $21.3 million FPIF add-on to provide the long lead associated with the manufacture and delivery of five ASIP sensors to be procured in conjunction with Global Hawk Lot 8 UAV air vehicles. The action continued a current year (FY08) fixed-price-incentive-firm (FPIF) contract. The work is to be conducted in San Diego, CA. Contract funding is coming from Air Force Aircraft Procurement (APF) (FA8620-08-C-3001/PO1).

### Global Hawk Schedules

In June 2009, the first Block 40 Global Hawk was rolled out, with three others in various stages of production; MP-RTIP was 9 months behind schedule by late 2009.

Flight testing of the Block 20/30 Global Hawk only restarted in September 2009, after being put on hold in May following a spoiler malfunction; the first Block 30, carrying ASIP, is planned to enter service in 2010 or 2011.

### ASIP-1C Follow-On Contract

In June 2009, the Air Force Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH, acting for the Reconnaissance Systems Wing (RSW), issued the Electromagnetic System Laboratory of Northrop Grumman's Mission Systems in San Jose, CA, a $71 million cost-plus-incentive, fee (CPIF) contract for procurement of ASIP-1C scaled sensors for the MQ-1 Predator. The action continued an FY08 award. The work is to be performed in San Jose, CA. Contract funding will come from Air Force Aircraft Procurement (APF) (FA8620-08-C-3004).

### ASIP Development Plans

In FY09, U-2 ASIP development testing was completed, with an operational assessment on the U-2.

In FY10, ASIP development and testing on the Global Hawk was completed.

In FY11, ASIP is to complete Global Hawk Initial Operational and Test Evaluation (IOT&E).

### ASIP Upgrades

In January 2010, Northrop Grumman received an $8.2 million contract to provide Phase II data rate communications upgrades for ASIP.

### Predator ASIP-1C Cancelled

In FY10, Factory Acceptance Test (FAT) for the ASIP-1C program was completed, followed by transfer of ASIP-1C assets to the ASIP-2C program. The decision to stop ASIP-1C was approved by OSD in October 2009.

### Global Hawk ASIP Flight Testing

In July 2010, the Air Force awarded Northrop Grumman a $14.5 million contract to extend the ASIP baseline contract to support the flight testing on Global Hawk (F33657-03-C-4318).

In early 2011, the USAF 452nd Flight Test Squadron was scheduled to begin developmental flight tests on the first ASIP-equipped Block 30 Global Hawk aircraft in February 2011.

### Reaper ASIP-2C Contracts

In November 2010, the USAF ASC awarded Northrop Grumman a $23 million contract for the design and build of a pod-mounted ASIP-2C prototype for Reaper.

In November 2010, Northrop also won a $5 million contract modification to provide a pod-mounted prototype ASIP-2C sensor for Reaper, to support a limited flight demonstration.

### Guardrail ASIP Production Cut

As of the FY11 budget in February 2010, Northrop was to supply 33 RC-12X Guardrail aircraft with 29 installed ASIP/ESA sensor packages. All were to be delivered by the end of 2014. Another 12 older Guardrail aircraft were to be retired.

But in November 2010, the GRCS Modernization Program was reduced, planned to end after the completion of 14 systems. "This change is to assist the funding, force structure and manning for the EMARSS program, without losing necessary capability to the force."

### FY12 TSP/ASIP Funding Cuts

In December 2011, the FY12 defense spending bill was signed into law by President Obama, after being agreed by the House and Senate. Due to contract award delays and a change to acquisition strategy, TSP RDT&E was cut by nearly $17.7 million in the Army's Tactical UAV funding line (PE# 0305204A), almost zeroing the program in FY13.

In the same bill, ASIP also received cuts: $12 million was removed from the Air Force's Airborne SIGINT Enterprise RDT&E line due to ASIP-2C contract delays. ASIP for Global Hawk was also cut $1.5 million due to program delays. In Overseas Contingency Operations (OCO) funding, the Air Force procurement line for Reaper was cut $29.5 million because its request for ASIP-2C sensors was "early to need."

### Block 30 Global Hawk Finally Cancelled

In February 2012, the FY13 budget cancelled future USAF Block 30 Global Hawk production after the 18 air vehicles already contracted (14 delivered, 4 on order). I guess we should have seen this coming, considering the continuing problems and cost increases, as well as last year's truncation of Block 40 production.

On the other hand, nothing is set in stone and the Air Force could always restart production in the next presidential term (just as for the Block 40), perhaps after JSF funding is more secure following budget reductions. Certainly, its claim that it will simply warehouse the billion dollars of Block 30s already ordered is highly suspect.

### ASIP-2C Development Continues

In February 2012, the FY13 budget funded increased ASIP-2C RDT&E, but no production milestones were listed. We forecast development will continue for several years before a Reaper system enters production.

### Guardrail ASIP Production Complete in 2013?

In July 2012, Northrop Grumman reported its RC-12X Guardrail system had completed its 1,000th mission since going into theater in 2011, providing rapid precision geolocation of high-value targets. The RC-12X is able to fly single-ship missions in an overwatch capacity and detect a large quantity of diverse signals simultaneously. Northrop reported the RC-12X program was on track to deliver seven

additional systems in 2012 and 2013, bringing the RC-12X fleet to a total of 14 systems.

### U-2 ASIP RDT&E Continues

In the April 2013 budget, USAF U-2 projects funded in FY14 included the Advanced Synthetic Aperture Radar System (ASARS) Next Generation, Generator Upgrade/Accessory Mounted Auxiliary Drive (AMAD), Avionics Processor/Airborne Recce Toolkit (ART) Analysis, Conformal Equipment Group, Airborne Signals Intelligence Payload (ASIP) Dual Pod Only, and Inertial Navigation System (INS) Upgrade/GPS Tech Refresh.

### ASIP Deliveries Continue for New and Retrofit Global Hawks

In April 2013, the US Air Force's Global Hawk Systems Program Office, Wright-Patterson AFB, Dayton, OH, awarded Northrop Grumman an undefinitized $71 million contract add-on to a previous Lot 10 Global Hawk production contract. The contract modification covers a 22-month period of performance from March 2013 through December 2014, to include two Block 30 Global Hawk systems (with EISS and ASIP sensors), two Block 40 systems (with MP-RTIP), and three ASIP retrofits (sensors installed and flight tested in aircraft purchased in previous lots).

### Block 30 Long-Lead Advance Procurement Contract

In November 2013, the USAF awarded Northrop Grumman a $114 million advance procurement contract for long-lead items for three Block 30 Global Hawks and associated sensors, including three EISS, three ASIP, and two ASIP retrofit kits for existing Global Hawks.

### Funding Transfer GH to Triton Discussed

In November 2013, the US Navy and Air Force were discussing a transfer of FY12 USAF Block 30 Global Hawk funding to Navy MQ-4C Tritons, according to government sources. About $300 million for three Global Hawks would be transferred to procure two Tritons. Reportedly, a transfer request could go to Congress in early 2014.

### New USAF High Altitude SIGINT (ASIP) RDT&E Project

In March 2014, the FY15 budget showed a new Project in PE# 0304260F, to fund SIGINT integration for high altitude ISR, beginning in FY14. This project supports sensor integration and test, flight test, design studies, engineering analysis, non-recurring engineering, and other efforts associated with the insertion of new capabilities integrated into the Airborne Signals Intelligence Payload (ASIP) or other SIGINT sensors and their associated air and ground components for the high altitude SIGINT platforms.

The project also identifies suitable replacements for components affected by diminishing manufacturing sources (DMS). This project provides the warfighter with a near-term, increased combat capability. Enhancements will be implemented as soon as technology and risk achieve satisfactory levels. Capability improvements will be inserted into the sensors through individual development efforts that exploit signals of interest identified as service priorities by the Air Force SIGINT Capabilities Working Group (SCWG).

Funding includes completion of developmental logistics tasks associated with the design, development, and integration of ASIP-B.

### ASIP-2C Development Ending

In March 2014 in PE# 0304260F, the USAF planned to end ASIP-2C development efforts in FY14: "We will work with our mission partners to instead begin upgrades to the already fielded QRC systems on the MQ-1 (Predator) and 9 (Reaper)."

### Block 30 EISS/ASIP Plans

In February 2015, PE# 0305220F in the FY16 budget planned for Global Hawk Block 30 EISS and ASIP mission planning development and testing, enhanced weather capability development and testing, airspace and interoperability enhancements and updates, airframe upgrades, sensor upgrades, risk reduction and integration, ice protection system development and testing, and resolution of issues with Diminishing Manufacturing Sources (DMS).

Specific sensor development plans include mission planning development and testing, completion of Synthetic Aperture Radar-Complex Imagery development testing, the next gen sensor study, enhanced weather capability development and testing, airspace and interoperability enhancements and updates, airframe and software upgrades and deficiency report resolution across RQ-4 fleet, sensor interoperability enhancements and upgrades, upgrades to the ASIP SIGINT sensor, Mode 5/ADS-B development and testing, development and testing activities associated with enhancing sensor capability and sensor integration, development and testing of ice protection systems, program protection projects, and studies and analysis supporting future system enhancements.

### Northrop Awarded $3.2 Billion Global Hawk Contractor Logistics Support Contract

In September 2015, the USAF's Air Force Life Cycle Management Center, Robins Air Force Base, GA (www.robins.af.mil/units/aflcmc), awarded Northrop Grumman Corp. a $3.2 billion contract to conduct upgrades, technology insertion, and maintenance of Global Hawk over the next decade, including configuration management, data management, technical refresh, and component-obsolescence issues for all Air Force variants of the Global Hawk, as well as depot maintenance for airframes and engines and parts repair and replacement.

Note that this is a contractor logistics support contract – arguably much more expensive than if the Air Force conducted its own maintenance with Air Force personnel. Many believe today's increasingly complex military

 

technology benefits from contractor support and even operations. On the other hand, some believe this opens these programs to greater opportunities for corruption and waste – with a $3.2 billion bank account to play with – and that it blurs the line between the military legally entitled to prosecute a war, and private companies which in the United States have traditionally not been allowed to do this.

Northrop Grumman will conduct much of the work in San Diego, CA, continuing through September 2025.

### Global Hawk Block 30 RDT&E

In February 2016, USAF FY17 budget plans in PE# 0305220F RQ-4 UAV, Proj. #675145 Block 30, funded development activities including mission planning development and testing, Mode 5 Automatic Dependent Surveillance-Broadcast (ADS-B), enhanced weather capability development and testing, ice protection system development and testing, airspace and interoperability and communication enhancements and updates, airframe upgrades, sensor upgrades and integration of alternate sensors, risk reduction and integration, periodic Operation Flight Program updates and releases, and resolution of issues with Diminishing Manufacturing Sources (DMS). Work will include systems engineering/program management, configuration and data management, test and evaluation, management services, Deficiency Report/Materiel Improvement Project (DR/MIP) Investigations, studies and analysis and fielding support for Projects 675146 (Block 40), 675147 (Ground Segment/Comm System), and 675149 (Capability Enhancements).

FY15-17 will see continuing enhancement of the Enhanced Integrated Sensor Suite (EISS), including completion of Synthetic Aperture Radar (SAR)-Complex Imagery (CI) development, as well as Airborne Signals Intelligence Payload (ASIP) enhancements (Increment 1 development). Funding for these projects is substantial – perhaps half of totals of $140.3/$69.7/$93.4 million in FY15/16/17 (the USAF does not break out specific project funding).

### Global Hawk ASIP Increment 2 Upgrades Contract

In March 2016, the USAF's Air Force Life Cycle Management Center, Wright-Patterson Air Force Base, OH, awarded Northrop Grumman Information Systems, San Jose, CA, a not-to-exceed $54.5 million predominantly cost-plus-incentive-fee undefinitized contract action delivery order (0004) to previously awarded basic ordering agreement FA8620-13-G-3015 for the ASIP Increment 2-Build A program. Northrop will provide incremental software upgrades to the baseline ASIP capability as well as provide proof-of-concept for a modular open system architecture technique. Work will be performed at San Jose, CA, and is expected to be complete by May 2018. FY16 RDT&E funds of $16.0 million were obligated at the time of award.

### Eight Block 30M Upgrades for Global Hawks with ASIP

In March 2016, the USAF's Air Force Life Cycle Management Center, Wright-Patterson Air Force Base, OH, awarded Northrop Grumman Aerospace Systems, San Diego, CA, a $30.3 million contract modification to upgrade eight RQ-4 Block 30, Block I Global Hawks to the Block M (or "Block 30M") configuration, including upgrades to ASIP. The Block 30M carries ASIP along with the Raytheon EISS EO/IR and SAR/MTI sensor suite. Work will be conducted in San Die-go, CA, and should be finished by December 2017.

## TSP History

### IEWCS Becomes Prophet

Due to continuing development problems, and four failed attempts to enter IOT&E, the Army's billion dollar Intelligence and Electronic Warfare Common Sensor (IEWCS) SIGINT/electronic jamming program was cancelled in late 1998, and the Prophet program was created in its place. Prophet merges the three components of IEWCS (Advanced QUICKFIX, GBCS-L, and GBCS-H) under a new Operational Requirements Document (ORD). With the Army's current QUICKFIX SIGINT/jamming helicopters still fairly new, the revamped Prophet Air and Prophet Control programs will remain on the more extended development schedule of the Advanced Quickfix program they replace.

### Prophet Air now for TUAV

In early 2000, the Army's Prophet Air program, to include COMINT and jamming, was shifted from modified UH-60 helicopters to the Army's future Tactical UAV (TUAV), to be mounted aboard AAI Corp. Shadow 200 UAVs. The TUAV has a *much* smaller payload (65-100 lbs.), and power generation ability (50-100 Watts versus 500 Watts), than the big Blackhawks. Under the program definition and risk reduction phase, scheduled to begin in FY01-FY02, both COMINT and jamming variants of the TUAV will be demonstrated. Prophet Air should enter IOT&E by FY05, and be fielded by 2007. The Army's 66 current EH-60A Quickfix helicopters are scheduled to leave service by 2005, but it is likely some will remain in service until Prophet Air can replace them.

### Prophet Air Becomes TSP

The airborne element of Prophet is now called the Tactical SIGINT Payload (TSP), with three component advanced development contracts awarded to Applied Signals Technology (AST), BAE Systems, and Raytheon in July 2001. A downselect left BAE Systems and AST competing in late 2003. The Army hopes to buy 14 systems, although production is not expected until 2007 or 2008.

BAE Systems is offering its AJCN as the backbone of its TSP bid, and has begun field trials on a Hunter UAV.

### TSP RFP

In January 2004, CECOM, in support of the Research, Development and Engineering Command (RDECOM) and the Project Manager for Signals Warfare (PM SW), announced it plans to issue a Draft RFP for the TSP. TSP will be a Unit of Action level collection system. The platform for the TSP will be the Future Combat Systems Class III/IV UAV. The primary TSP mission is to electronically map radio frequency (RF) emitters that operate within the high frequency (HF) to super high frequency (SHF) ranges on the battlefield. TSP will include intercept, direction finding (DF), and geo-location capability. The TSP collection subsystem, mounted on the FCS UAV, will be remotely tasked and controlled from the Distributed Common Ground System, Army (DCGS-A). The payload (including antennas and cables) is to conform to the space, weight and power (SWAP) constraints of the FCS Class III/IV UAV. TSP to BAE

In June 2004, BAE Systems, Nashua, NH won the $27 million, 36 month TSP SDD contract. BAE Systems' TSP is based on its AJCN system.

### TSP for Fire Scout

The platform initially planned to carry TSP was the Shadow 200 TUAV, as the airborne element of the Army's Prophet EW system. But TSP is not currently small or light enough for the Shadow, and the initial platform is planned as the FCS Class IV UAV – Fire Scout. Production could begin in FY08.

### TSP Upgrades

Future versions of TSP will provide more COMINT and ELINT capabilities. BAE Systems is working on Sapphire, which may add a focal plane gate array (FPGA) to TSP. Communications jamming and weapons cueing are also likely upgrades.

### TSP for Warrior? Shadow?

As a scalable system, TSP could be enlarged for the Army's Sky Warrior ER/MP UAV. BAE Systems will also continue working to shrink TSP enough for the Shadow TUAV.

### TSP for ARL, Perhaps Sky Warrior

In mid-2008, the Army planned to install a scaled-up version of the TSP over the next three years, as the new COMINT sensor on its eight Airborne Reconnaissance Low (ARL) aircraft.

The Army also planned a "competitive procurement" to buy TSP for its MQ-1C Sky Warrior UAV, with installations to begin in FY10.

### Enhanced Tactical SIGINT Payload (ETSP) (US Army)

In mid-2009, the US Army planned to issue an RFP for the Enhanced Tactical SIGINT Payload (ETSP) for UAVs. The Army plans to award a $22 million non-developmental item engineering contract in 1QFY10, which will include a $94.5 million production option, potentially to be awarded in late 2010. Technical point of contact is Michael Schwartz, tel: (732) 427-1915.

ETSP has been suggested as a replacement for the TSP, currently planned for the Sky Warrior ER/MP, to allow a competition between Northrop Grumman's reduced-size ASIP-1C/2C system (USAF) and BAE Systems' TSP (Army).

The Office of the Secretary of Defense (OSD) has questioned the need to develop two separate SIGINT systems for Predator, for the USAF and Army, and ETSP could potentially resolve this issue.

Our forecast is for the ETSP competition to choose either a version of ASIP or TSP for Sky Warrior.

### TSP Plans

In February 2010, the FY11 budget showed that TSP will be integrated onto the ER/MP UAV in FY11-FY12, to reach an Initial Operational Test and Evaluation in early FY13. Following the IOT&E, a Full-Rate Production decision will be made in FY13.

### TSP Funded, Not Contracted

In February 2010, the Army allotted funding for TSP procurement, but with prime contractor listed as "To Be Determined" — hardware unit cost was listed by the Army as $1.35 million in FY10 (for 8 systems) and $1.1 million in FY11 (for 12 systems).

### TSP Not Ready?

In mid-2010, the SASC suggested cutting $20 million from Army ER/MP procurement due to "TSP schedule adjustment".

### New TSP Solicitation

In October 2010, the Army released a "sources sought" solicitation to identify companies for TSP EMD and production, for a podded system for Grey Eagle UAVs. The TSP cannot exceed 200 lbs. and 3 cu. ft. in size, and must require no more than 1,200W power.

The Army plans to award a single EMD contract and procure 12 production-representative systems for testing aboard RC-12 manned aircraft. The contract will contain options for up to 97 full-rate production systems. The TSP program is managed by the Army's Project Manager for Aerial Common Sensors at Aberdeen Proving Ground, MD. Technical point of contact is Kahraman Koseoglu at Ft. Monmouth, NJ, email: kahraman.koseoglu@us.army.mil.

### BAE Receives TSP EMD Funding

In October 2011, Army CECOM, Aberdeen Proving Ground, MD, awarded BAE Systems a reported $27.7 million, 18-month FFP/CPIF contract to fund engineering and manufacturing services for EMD of Tactical SIGINT Payload systems. The work will be conducted in Nashua, NH; Tucson, AZ; and Austin, TX; and is to be completed by April 2013. Contract funding is expected to come from Army RDT&E (PE# 0604818A) (W15P7T-11-C-S802).

### FY12 TSP/ASIP Funding Cuts

In December 2011, the FY12 defense spending bill was signed into law by President Obama, after being agreed by the House and Senate. Due to contract award delays and a change to acquisition strategy, TSP RDT&E was cut by nearly $17.7 million in the Army's Tactical UAV funding line (PE# 0305204A), almost zeroing the program in FY13.

In the same bill, ASIP also received cuts: $12 million was removed from the Air Force's Airborne SIGINT Enterprise RDT&E line due to ASIP-2C contract delays. ASIP for Global Hawk was also cut $1.5 million due to program delays. In Overseas Contingency Operations (OCO) funding, the Air Force procurement line for Reaper was cut $29.5 million because its request for ASIP-2C sensors was "early to need."

### T-Pod Contract to BAE Systems

In January 2012, the Army Contracting Command, Aberdeen Proving Ground, MD, awarded BAE Systems, Nashua, NH, a $12.3 million FFP/CPFF contract for Quick Reaction Program T-Pod Systems for the MQ-1C Gray Eagle. Deliveries will be completed by December 2012 (W15P7T-12-R-C009).

### TSP Production RFI

In April 2012, the Army's Program Manager for Airborne Reconnaissance and Exploitation Systems (PM ARES), Aberdeen Proving Ground, MD, issued an RFI to help determine the acquisition approach for the production phase of the TSP, currently being developed under a contract to BAE Systems. The Army wants to buy up to 95 TSP systems across five production lots at a price of approximately $950,000 per unit. Point of Contact is Mr. Kahraman Koseoglu; tel: (443) 861-0722; email: kahraman.koseglu@us.army.mil.

### TSP LRIP to BAE Systems

In August 2013, the Army Contracting Command, Aberdeen Proving Ground, MD, announced it will negotiate a sole-source two-year ID/IQ contract with BAE Systems for up to 30 low-rate initial production podded TSP systems, including airborne pods for Gray Eagle UAVs and other platforms and ground workstations.

The award followed an online solicitation earlier in August, requesting bids from contractors. Thus, it seems the Army is maintaining the theoretical availability of current and future TSP production.

### TSP Block Acquisition Strategy

In March 2014, the Army's FY15 budget listed TSP as a threshold requirement for the MQ-1C Gray Eagle UAV. The TSP program entered the Engineering and Manufacturing Development (EMD) phase with a Milestone B decision in September 2011. The TSP Program EMD contract award was based on full-and-open competition and was focused on integration and test onto the Gray Eagle platform and integration and test of TSP software into the Operational Ground Station.

The TSP EMD program is a derivative of systems that were fielded as a Quick Reaction Capability (QRC) on the Gray Eagle and a variety of other manned platforms. The demonstrated scalability of these fielded materiel solutions allows the TSP EMD program to leverage efforts that directly support the TSP EMD program.

The TSP program Acquisition Strategy was modified to accommodate the FY12 appropriation that reduced the Proj. 11B funding line by $14.1 million. The modified TSP program followed an incremental Acquisition Strategy with a TSP Block 0, Block 1, and Block 2. The schedule was adjusted in accordance with the TSP Acquisition Decision Memorandum (March 2012).

TSP Block 0 was to be the QRC system, to provide an early operational capability for the Gray Eagle. TSP Block 1 is the current Program of Record that entered EMD in FY11 to meet all the threshold requirements in the approved Capability Production Document (CPD). Block 2 was to address future objective needs.

Based on (reduced) available funding, the TSP acquisition strategy has now been revised to merge Block 0 and current Block 1 capabilities into a single Block of capability. Current capabilities that have not been integrated into the Block 1 are deferred and included in the Block 2 suite of requirements.

Block 1 is the initial production capability, with Block 2 being a continuation of the TSP Program of Record, which will integrate the remaining CPD threshold requirements.

### TSP Milestones

In March 2014, the Army's FY15 budget listed TSP Milestones.

- TSP Block 1 EMD 4QFY11-2QFY14
- TSP Block 1 (LRIP) Milestone C 2QFY14
- TSP Block 1 (LRIP) Contract Award 2QFY14
- TSP Block 1 Integration and Test 2QFY14-3QFY16
- TSP Block 1 LRIP Engineering Changes 2QFY14-4QFY14
- Gov't. Development Test and Evaluation 4QFY14
- Operational Assessment Report 1QFY15
- Gray Eagle Integration and Test 2QFY14-1QFY15
- TSP/Gray Eagle Air Worthiness Release 1QFY15-3QFY15
- Contractor/Gov't. Development Test and Evaluation 3QFY15-1QFY16
- TSP Initial Operational Test and Evaluation 1QFY16
- TSP Block 1 Full Production Decision 3QFY16
- Block 2 Preparation 2QFY15-4QFY16

### TSP Acquisition Plan History (February 2015)

TSP is a threshold requirement for the MQ-1C Gray Eagle UAS. The TSP program entered the Engineering and Manufacturing Development (EMD) phase with a Milestone B de-

cision in September 2011. The TSP Program EMD contract award was based on full-and-open competition and was focused on integration and test onto the Gray Eagle platform and integration and test of TSP software into the Operational Ground Station. The TSP EMD program is a derivative of systems that were fielded as a Quick Reaction Capability on the MQ-1C UAS and a variety of other manned platforms. The demonstrated scalability of these fielded materiel solutions allows the TSP EMD program to leverage effort that directly supports the TSP EMD program.

The TSP program Acquisition Strategy was modified to accommodate the FY12 Appropriation that reduced funding by $14.1 million. The modified TSP program followed an incremental Acquisition Strategy with a TSP Block 0, Block 1 and Block 2, adjusted in accordance with the TSP Acquisition Decision Memorandum in March 2012. Block 0 was to be the QRC system to provide an early operational capability for the MQ-1C. The TSP Block 1 is the current Program of Record that entered EMD in FY11 to meet all the threshold requirements in the approved Capability Production Document (CPD). Block 2 was to address future objective needs.

### TSP Blocks 0 and 1 Merged

By early 2015, the TSP acquisition strategy had been revised due to available funding limits, to merge Block 0 and current Block 1 capabilities into a single Block of capability. Current capabilities that have not been integrated into the Block 1 will be deferred and included in the Block 2 suite of requirements. Block 1 is the initial production capability, with Block 2 being a continuation of the TSP program of record which will integrate the remaining CPD threshold requirements.

### TSP LRIP Contract

Block 1 Low Rate Initial Production (LRIP) Milestone C was approved in March 2014. The TSP LRIP contract was awarded in June 2014, presumably to BAE Systems.

### TSP RDT&E Plans

In February 2015, FY16 funding of $7.1 million was planned to complete TSP engineering corrective actions, regression testing, Government Production Qualification Testing, Logistics Demonstration and Initial Operational Test and Evaluation (IOT&E).

### Army Gray Eagle TSP RDT&E

In February 2016, Army PE# 0305204A Tactical Unmanned Aerial Vehicles provided funding for completing development of the BAE Systems Tactical Signals Intelligence (SIGINT) Payload (TSP). The TSP program seems to have finally reached some stability, at least for the Army Gray Eagle, with the final substantial RDT&E development funding in FY15 and FY16, and initial TSP production deliveries due in February 2017.

TSP is a SIGINT sensor that detects radio frequency (RF) emitters to provide a SIGINT capability to the tactical commander. The TSP system is a modular, scalable payload using an architecture that is software reconfigurable to allow for growth and flexibility as technology, and as the adversaries' use of technology, changes. This flexible architecture allows for third party software applications to be integrated into the TSP system.

The TSP system improves situational awareness and shortens the targeting cycle by detecting and identifying emitters associated with high value targets (HVTs). The TSP system is capable of processing conventional signals, standard military signals, and modern signals of interest. This includes detection, recognition, identification, direction finding, and high confidence geo-location.

The TSP system processing, control and data dissemination is integrated into the Distributed Common Ground System-Army (DCGS-A) via the Operational Ground Station. It supports Manned/Unmanned (MUM) teaming with Brigade Combat Team ground SIGINT Terminal Guidance (STG) teams and manned airborne assets.

### TSP Initial Procurement: With FY13 Funding

In February 2016, the Army's FY17 procurement budget "reinstated" the BAE Systems TSP, with the initial twelve (12) production systems already paid for with FY13 funding of $18.7 million, and the other six initial systems funded with $9.4 million in FY15 funding. Initial TSP production deliveries are due in February 2017.

In February 2016, the Army FY17 budget showed a TSP unit cost of about $1.6 million, with $2.2-3.3 million budgeted when including initial spares and fielding.

### BAE TSP Support Contract

In August 2016, BAE Systems announced it had secured a potential seven-year, $38.2 million contract to provide logistics support for the US Army's TSP, with work to continue through August 2023. Performance location will be determined with each individual task order.

## Other Airborne SIGINT

### Predator SIGINT RDT&E Funding

PEDS PE# 0304260F (Airborne SIGINT Enterprise), Project #5182 (Predator) supports design studies, engineering analysis, non-recurring engineering, and other efforts associated with the integration and modification of Predator and Predator B SIGINT sensors and their associated air and ground components. Funding will begin efforts on antennas, receivers, processors, software development, aircraft integration and ground station upgrades to allow a persistent

 

reconnaissance, surveillance, targeting, and acquisition capability against mission specific threats. Development of a networked capability to other SIGINT platforms will also be initiated.

### Batfish Testes

In 2006, Raytheon's experimental Batfish ESM/SIGINT was tested aboard an early Predator B. The large system included two underwing pods and wingtip spiral antenna arrays.

### Army Adds EW Core Competency

In early 2007, the US Army added EW as a core competency for its soldiers, reflecting the increasingly ubiquitous nature of electronic warfare, from SIGINT to countering IEDs.

### Merlin SIGINT Tested for BAMS

In mid-2007, the Navy tested a Sierra Nevada Merlin SIGINT system on one or both of its RQ-4A Global Hawks. The Navy currently has no SIGINT requirement for BAMS.

### Canadian MALE Requirement

In August 2007, Canada announced an interim requirement for a Joint Airborne ISR Capability (JAIC), which would procure an undetermined number of MALE UAVs to serve on deployments in Afghanistan and elsewhere. The RFP is to be released in early 2008, with IOC planned for June 2009.

Mandatory JAIC sensor requirements are a color EO/IR/low light level system, a laser target designator, and a SIGINT package. Additional "rated" requirements are for a SAR/GMTI and a weapon delivery capability.

JAIC will essentially be an off-the-shelf procurement, to be followed by a longer-term UAV program with IOC in 2013-16, the Joint Unmanned Surveillance and Target Acquisition System (JUSTAS). The Predator-B with the MTS-B, ASIP variant, and Lynx SAR are the most obvious systems, though IAI will also reportedly offer a Heron/Heron TP system.

### USAF RC-135 Program Plans

In early 2008, planned RC-135 developments included the procurement, fielding, and logistical support for three distinct Rivet Joint baseline configurations [baseline 8, 9, 10] and two distinct baselines [baselines 3 & 4] for Combat Sent and Cobra Ball. Funding increased in FY08-FY10 to reflect new USAF SIGINT Capabilities Working Group (SCWG) priorities, and the accomplishment of other ASE initiatives. On the other hand, there will be extensive utilization of commercial-off-the-shelf (COTS) solutions, intended to reduce needed manufacturing sources integration efforts. Development and integration is managed by the Air Force's Big Safari Systems Group, which has long had its own classified funding, with upgrades focused on an evolutionary acquisition approach to field incremental capability improvements.

Rivet Joint will earn the majority of RC-135 funding (more than 80% in the near term), with ongoing development of a steerable beam antenna, aperture tiles, demodulator and compressive receiver, ultra wideband capability, and advanced HF capabilities and interferometry. Bistatic radar development is planned. Current Combat Sent/Cobra ball developments include improved low band capabilities, with Combat Sent antenna upgrades planned to begin in FY10.

The current Rivet Joint baseline 8 with NCCT (Network Centric Collaborative Targeting), operational since 2007, is able to support tactical and strategic operations and is able to monitor "devices as small as cellphones up to large emitting systems [such as] air-defence radars", according to the USAF.

### Rivet Joint Likely to Replace RAF Helix

In early 2008, the UK indicated it would likely retire its 3 Nimrod R.1 SIGINT aircraft early next decade, following the loss of a similar-vintage Nimrod MR.2 over Afghanistan in September 2006, probably due to a fuel fire. Project Helix had been planned as a £400 million upgrade to the R.1, to maintain capabilities until 2025, but Helix will now probably be cancelled. Instead, the UK was considering its options, the most likely of which was thought to be the lease or "joint-pool" operation of 2 Rivet Joint aircraft. Nimrods are currently operational in Afghanistan and Iraq, and over the Horn of Africa.

While there is some resistance to Rivet Joint within the RAF, due to the USAF's more automated SIGINT methods and the Nimrod's "finer grain" tactical SIGINT emphasis, Rivet Joint looks like the only affordable option. Also, the loss of the MR.2 may have the RAF concerned at Nimrod safety. The aircraft were built in the 1960s and 1970s, but are based the de Havilland Comet airframe, the world's first jetliner, flying for the first time in July 1949. Unlike most jetliners built since, the Comet's and Nimrod's four engines are housed in nacelles integrated into the inner wings. The last Comet in commercial service was retired in 1980. You gotta love British history. Too bad they're not still flying Spitfires.

In October 2008, according to the US Department of Defense's Defense Security Co-operation Agency (DSCA), the UK RAF "requested a possible sale to convert three US Air Force (USAF) KC135R aircraft into RC-135V/W Rivet Joint aircraft", at a cost of $1.07 billion if all options are exercised, with L-3 Communications of Greenville, Texas as prime contractor. L-3 has been under contract since April 2007 to upgrade the SIGINT suite on the Nimrod R.1. The new RC-135 request is believed to cover the "joint-pool" operation by the RAF of USAF-owned aircraft, which sources claim could be ready within 24 months of contracting (we doubt that). The RAF would like to replace its Nimrod R.1s in 2011-2013, about the same time as it retires the Nimrod MR.2 maritime patrol aircraft (though it is still totally re-building nine Nimrod MRA.4s to replace the MR.2s…). However, no final decision has been made, and with the

current recession, the UK may not have the money even for leased R.1 replacements.

### Navy EP-3 Upgrade Plans

All EP-3Es have recently completed the Sensor System Improvement Program (SSIP) upgrade, adding new tactical communications, automated ELINT/ESM, and special-signal processing and exploitation systems.

In late 2008, Spiral 1 of a further three-spiral upgrade – the Joint SIGINT avionics family modernization (JMOD) – was also completed. JMOD Spiral 3 upgrades will continue for another decade, to keep pace with changing threat signals for COMINT and ELINT. JMOD systems include the "Story Book" COMINT signal acquisition/processing/data fusion capability, the "Story Classic" low-band search/acquisition subsystem, the "Story Finder" radar-band digital server, the "Story maker" data fusion capability, and the "Story Teller" data manipulation/correlation/communications capability. Clever, eh?

### EP-3 JMOD Details

FY05 began the integration of the JMOD (Joint SIGINT avionics family modernization) Common Configuration (JCC) into all EP-3 aircraft. The JCC baseline program built on a common baseline with two spirals. Spiral 1 (ForceNet) includes high band and special collection subsystems (Story Finder and Multi-platform emitter geolocation [MPEG]) and data dissemination (Story Teller). Spiral 2 includes development of additional special collection signal capabilities and obsolescence upgrades.

In FY06 the JCC program was further restructured to add an obsolescence evolution and a JCC Spiral 3 upgrade to maintain EP-3E mission system viability through 2020. The program procured an Engineering Development Model (EDM) in FY06 for developmental testing of the Spiral 2 system in FY07, to support a LRIP decision in FY08.

Spiral 3 includes signal exploitation, low-band direction finding, remote tuning Receivers, and integrated information operations and environment control system upgrades. The program will procure two Spiral 3 Engineering Development Models (EDMs). The first EDM will be procured in FY08 for developmental testing (DT) of the system in FY09 and the LRIP decision and procurement in FY10. The second Spiral 3 EDM production representative asset will be procured in FY09 to support operational testing (OT) in FY10 and the Full Rate Production (FRP) decision and procurement in FY11. Obsolescence, quick response capabilities (QRCs), and technical refresh efforts will be accomplished in conjunction with the above JCC Spiral upgrades to sustain EP-3E capabilities and viability until recapitalization/replacement. Recapitalization Capabilities Migration (RCM) funds will ensure EP-3E relevance beyond FY20 and to develop follow-on capabilities to be migrated into the recap platform.

### Sierra Nevada to Provide BAMS ESM

In mid-2008, with Northrop Grumman's Global Hawk chosen for BAMS, Sierra Nevada Corp. was slated to provide its Merlin electronic support measures (ESM) suite.

### "Surge" EP-3s Delivered

In December 2008, L-3 Communications Integrated Systems delivered the first of eight "Surge Configuration" EP-3E aircraft to the Navy. This multi-intelligence version was reportedly designed and tested within three months by L-3. Exact changes are not known, but one major addition seems to be a new Raytheon MTS-A electro-optical/infrared (EO/IR) sensor ball, and likely also adds the AN/USQ-146 communications jammer that is a part of the Navy's Operational Suitability Improvement Program (OSIP) 014-05.

### Green Dart for Hunter

In December 2008, the Army had funded refurbishment of 12 MQ-5B Hunter UAVs, which will reportedly carry Northrop Grumman's new Green Dart SIGINT system.

### 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 L-3 Communications has based the MC-12W on Hawker Beechcraft KingAir 350ER twin-turboprop aircraft, the same platform as the Iraqi Air Force's new KingAir ISR aircraft. Early USAF versions will mount L-3 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 7 aircraft were actually 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 KingAir, 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.

### EuroHawk Wide Area SIGINT System

In mid-2009, plans were on schedule to hold a full-scale demonstration of the risk-reduction EuroHawk air vehicle in 2011, following air vehicle roll-out in October 2009 and first test at Edwards AFB by the end of 2009. Following six months of flights at Edwards to determine if the six new underwing SIGINT antenna domes pose significant aerodynamic challenges, the EuroHawk will fly to Germany for SIGINT integration and testing.

The EADS SIGINT payload will provide both high-band ELINT and low-band COMINT.

The German manned Atlantique aircraft will retire in 2010, with the four production EuroHawks not expected to enter service until at least 2016-17, leaving a considerable SIGINT gap for the next few years.

### Merlin-MC for BAMS

In late 2009, with Northrop Grumman's Global Hawk chosen for BAMS, Sierra Nevada Corp. was slated to provide its all-digital Merlin-MC electronic support measures (ESM) suite.

### Rivet Joint Likely for Project Helix

Project Helix had been planned as a £400 million upgrade to the Nimrod R.1, to maintain capabilities until 2025, but in late 2009 the UK said it will instead choose a replacement in early 2010, probably a purchase of 3 aircraft, unlikely to be an upgraded BAE Nimrod. Perhaps the most likely option would be lease or "joint-pool" operation of 2-3 Rivet Joint aircraft.

### UK Confirms Rivet Joint

In March 2010, UK defence secretary Bob Ainsworth announced that the UK had finalized its agreement to buy three Rivet Joint aircraft and related ground equipment.

Later in 2010, the UK RAF sent 51 Squadron's Nimrod R.1 SIGINT aircraft to Afghanistan, as their last mission before retirement in March 2011.

In October 2010, a new Strategic Defense and Security Review was unveiled by the UK government. Many big ticket programs were cancelled – including the entire Harrier fleet – or delayed, but Rivet Joint purchase plans were retained on schedule. The new Rivet Joint aircraft are not expected to arrive for entry into service before 2014.

### Green Dart Upgrades

In 2010, Green Dart was still in service and being upgraded, though little information is available.

### Navy Claims All-UAV SIGINT After 2020

In a debatable bit of budget-jockeying, in July 2011 the US Navy claimed it would retire the rest of its manned airborne EP-3E fleet in 2019-2020 and replace them with an all-unmanned fleet. However, no UAV in the air today (or planned) comes anywhere near the 20,000 lb. payload capacity of an EP-3E. Further, in Iraq and Afghanistan, all the services needed to urgently buy new manned SIGINT and ISR platforms when it was realized UAVs are just not up to the job by themselves. But for a few years at least, in order to retain UAV funding, the Navy may continue this all-UAV fiction.

At some point later this decade, Teal Group believes a P-8I SIGINT variant program will begin. Not only will the Poseidon provide much greater payload capacity, but in the event of enemy jamming of UAV control (or datalinks), an all-unmanned fleet would mean a total loss of capability – likely even losing the ability to detect and target enemy jamming emitters. Not reasonable at all.

### Navy BAMS SIGINT Capability by 2019; Maybe

By late 2012, the Navy was still considering options, but had announced plans for an upgraded BAMS SIGINT capability, expressing hopes a system would be deployed 2019.

### Saudi Arabia Operating Two RC-135 Rivet Joint Derivatives

In August 2012, it was confirmed that in recent years the RSAF has been operating two highly classified Boeing RE-3 ELINT aircraft, broadly equivalent to the RC-135 Rivet Joint. Only the US, Saudi Arabia and the UK operate the RC-135s.

The RE-3 fleet is currently undergoing depot maintenance at L-3 Communications' Mission Integration

Division, Greenville, TX, and will not be available until after 2015, during which time Saudi Arabia's new 350ER ISR aircraft will fulfill part of the RE-3 mission. One of the RS-3s, the older RS-3A, is believed to be receiving an extensive 5-year overhaul and major upgrade.

### Reaper for South Korea?

In October 2013 at the Seoul air show (ADEX), General Atomics representatives discussed the likelihood of Korea requesting Reaper UAVs in the near future. A formal request must be made by the Korean government before an offer can be made of a Category 1 system like Reaper. General Atomics believed delays may occur because of difficulties with offsets and domestic production. The representative claimed Korean UAVs lag some 10 years behind US systems.

### Dutch to Buy 4 Unarmed Reapers with SIGINT Package

In November 2013, the Dutch MoD announced it would buy four Reaper UAVs, unarmed (unlike all other users), with all to become fully operational in 2016 and 2017. Sensors will include the standard EO/IR fit (MTS-B), but with a requirement for "a ground and surface radar with a larger coverage" than standard (the General Atomics Lynx), including GMTI. The Dutch also want a specialized SIGINT package. These Reapers could later be armed, "with a minimum of modification", according the Dutch MoD.

### BAMS Schedule Delays: One+ Year

In March 2014, the Navy's FY15 budget outlined technical challenges in the BAMS development program, combined with "sequestration-driven resourcing constraints", which led to the delay of production and other milestones, most by one year or slightly more.

PB15 shifted Milestone C from 1Q FY15 to 1Q FY16. Full Rate Production (FRP) milestone decision shifted from 1Q FY17 to 2Q FY18. Low Rate Initial Production (LRIP) 1 contract award shifted from 2Q FY15 to 2Q FY16 and LRIP 2 contract award from 2Q FY16 to 2Q FY17. FRP Lot 3 contract award shifted from 2Q FY17 to 2Q FY18 and FRP Lot 4 contract award shifted from 2Q FY18 to 2Q FY19. Initial Operational Capability (IOC) shifted from 3Q FY17 to 3Q FY18.

### Canada to Restart JUSTAS MALE?

In May 2015, after nearly a decade of delays, the Canadian Air Force was reportedly again considering beginning its major Joint Unmanned Surveillance Targeting and Acquisition System (JUSTAS) program, to buy an endurance UAV fleet to support a wide range of military and civil missions. As many as 18 UAVs have been planned, along with a 20-year in-service support package.

In April 2015, Canadian Air Force officials outlined a plan to have the first UAVs operational in 2021, with a contract award in 2019 and all air vehicles delivered by 2023. The UAVs sought could potentially range in scale from the Israeli Heron to the Northrop Grumman Global Hawk or Triton – but with a contract not expected until 2019, much will no doubt still change. And with all deliveries expected within four years of initial contract award, real procurements will no doubt slide right again.

Regarding the UAV required, a Department of National Defence audit in March 2014 noted that the Heron UAV that MacDonald Dettwiler and Associates (MDA) supplied to the Canadian military in Afghanistan would not meet today's JUSTAS requirements. Industry sources reportedly have long favored the General Atomics Predator, but with a new generation of post-Predator/Reaper UAVs now on offer, capabilities creep will likely inspire another long and painful competition. For example, General Atomics has already offered its semi-stealthy jet-powered Predator C Avenger.

Regarding sensors, the Canadian Air Force expects a sensor suite including full motion video (FMV) in color EO, IR, and low light, along with a synthetic aperture radar (SAR). The UAVs must be able to carry weapons, though Canada claims the primary mission will be ISR.

### Navy Considering Sensor/EW Pod for MQ-8C Fire Scout

In mid-2014, the US Navy was conducting tests with the new MQ-8C Fire Scout, in addition to continuing testing with the smaller MQ-8B version.

In June 2014, according to Captain Patrick Smith, the Navy's Fire Scout Program Manager, a pod on the MQ-8C would have the space for "a variety of different sensors, which would include EW receivers." Teal Group expects this would mean SIGINT systems, and that if a real program begins it will quickly become a classified program. Thus, this is a good indicator of future Fire Scout SIGINT funding.

### Navy EP-3E

In March 2014, the Navy FY15 budget continued EP-3 upgrade projects in PE# 0305206N. In Operational, Safety and Improvement Program (OSIP) 11-01, the Spiral 1 kit improved operational capability and aircrew productivity by expanding the Electronic Support Measures frequency coverage, applying state-of-the-art signal exploitation/processing/display techniques, expanding Direction Finding frequency coverage, off-board classified communication, and expanding special signal processing capability. The Spiral 2 kit improved information fusion/decision-making capabilities was deferred. The Spiral 3 procurement provides Low Band Communication System Upgrades, Information Operations capability, Environmental Control System modifications, Quick Reaction Capabilities and the replacement of aging and obsolescence aircraft antenna arrays.

 

FY14 funding was increased due to Congressional Adds of $8 million for the 12th A-Kit and B-Kit for Spiral 3, and $14 million for Sensor Obsolescence. Spiral 3 Installation for the 12th EP-3 remains unfunded. There will be a FY14 Congressional reduction of $6.6 million for the 11th Spiral 3 install ahead of need. Installation of the 11th Spiral 3 aircraft is now unfunded. FY15 through FY17 funding increases in ECO, ILS, Other Support and Installations are to sustain ISR operations for EP-3 threat-pacing issues (obsolescence and diminishing material sources).

Research and Development is also funded with National Security Agency (NSA) Military Intelligence Program (MIP) funds. This OSIP provides the procurement tail for Research, Development, Test and Evaluation (RDT&E) funds from the Navy's Advanced Signal Recognition line (PE# 0305206N). The NSA RDT&E line for the Navy Airborne Sensor System Improvements funds sensor improvements with application for the EP-3E. MIP RDT&E funds are responsible for the development and acquisition of EP-3E sensors, data links, data relays and ground stations to achieve and maintain interoperability with Defense-wide airborne reconnaissance assets. Active Primary Aircraft Authorization inventory is 12 with a Backup Aircraft Authorization inventory of 3 for a total of 15 aircraft. Funds budgeted in FY13-FY19 are to continue the EP-3E Joint Airborne Signal Intelligence Architecture Modification Common Configuration Program. The EP-3E has an average age of 38.5 years. The EP-3E service life will be managed through Special Structural Inspection - Kits, Outer Wing Replacement and other aircraft sustainment activities in the P3 Series Modification program (Budget Line Item 0538, OSIP 05-05).

### EP-3E JCC

In March 2014, the EP-3E Joint Airborne Signal Intelligence Architecture Modification Common Configuration (JCC) Program is an upgrade to the capabilities of the Sensor System Improvement Program (SSIP) configuration of the EP-3E. This Operational, Safety and Improvement Program (OSIP) responds to Operational Requirements Document (ORD) #571-78-01 and the CAPSTONE ORD #CAF-002-88. JCC is designed as an evolutionary acquisition program consisting of spiral upgrades. JCC Spirals include an updated EP-3E infrastructure, improved auto-Electronic Support Measures (ESM) with the Story Finder system, incorporated Joint Signal Processor, incorporated SSIP corrections, incorporated low band capability which improves special collection capability, Information Operations and incorporated Quick Reaction Capabilities (QRC). Data Fusion capability is currently deferred.

In OSIP 11-01, the Spiral 1 ForceNet kit improved operational capability and aircrew productivity by expanding the ESM frequency coverage, applying state-of-the-art signal exploitation/processing/display techniques, expanding Direction Finding frequency coverage, off-board classified communication, and expanding special signal processing capability. Spiral 3 procurement began in FY11 with Low Band Communication System Upgrades, IO capability, Environmental Control System modification, QRC and the replacement of aging and obsolescence aircraft antenna arrays. QRC funds address mission avionics system obsolescence and emerging requirements. This OSIP includes JCC Obsolescence funding to replace subsystem obsolescence to ensure EP-3E viability until aircraft recapitalization. JCC Obsolescence and ILS are aligned to meet Electronic Intelligence, Communications Intelligence, Communications, Mission Management and Special Signals obsolescence requirements in order to support EP mod transition to Multi-INT Family of Systems (FoS).

The JCC Spiral 1 Low Rate Initial Production (LRIP) decision was approved as planned in June 2005 with Full Rate Production decision and contract awarded 4QFY06. The JCC Spiral 2 was deferred. The JCC Spiral 3 LRIP decision was approved in February 2011.

### EP-3E Info Operations

This program responds to the current, immediate demand for information operations capabilities on the EP-3E in Overseas Contingency Operations (OCO), and has been funded via the Emergency Supplemental Appropriation for Defense.

This EP-3E Information Operations program will procure the necessary modifications for EP-3E aircraft to selectively conduct offensive intelligence operations. This requirement was originally identified by Commander U.S. Fifth Fleet (US Navy) for Operation Enduring Freedom. The requirement was further identified by Commander Naval Forces - Iraq and endorsed by United States Central Command, United States Naval Forces, Central Command, and Commander, U.S. Fleet Forces Command.

The FY14 EP-3 Escort Production and Red Falcon efforts procure and rapidly integrate Escort production and Red Falcon systems required to conduct COCOM directly missions in support of OCOs. Specific operational details are classified.

FY14 Vortex Installs funded were with FY13 OCO. FY15 Escort Installs and FY15 Red Falcon Installs were funded with FY14 OCO.

### Triton SIGINT High Band and Low Band Multi-INT LRIP to Begin

In February 2016, US Navy FY17 budget plans in PE# 0305421N RQ-4 Modernization provide considerable funds to support increased levels of development effort for the Multi-INT program capability, as the Navy's MQ-4C Triton approaches Critical Design Review.

Increased funding in FY16 and FY17 will continue development of phased capability upgrades, including Multi-Intelligence (Multi-INT) capabilities in support of the Intelligence, Surveillance, Reconnaissance, and Targeting transition plan. Funding includes sense and avoid radar development, and acquisition of development assets for capability upgrades including electro-optical/infra-red and SIGINT High Band and SIGINT Low Band systems.

The Low Rate Initial Production (LRIP) Lot 1 contract award for the Multi-INT system was planned for 2QFY16, with LRIP Lot 1 deliveries (4 systems) planned from 2QFY18-1QFY19. Follow-on Operational Test and Evaluation is scheduled for 3QFY20 and Multi-INT IOC is scheduled for 2QFY21.

In the FY17 budget, in FY16 and FY17, Sierra Nevada Corporation was funded to develop SIGINT High Band sensor kits and Boeing Argon ST was funded to develop SIGINT Low Band sensor kits.

### Germany Seeks Triton UAVs to Carry ISIS

By 2015, Germany had signed agreements with the US Navy to potentially integrate ISIS on the new MQ-4C Triton UAV – the follow-on to Global Hawk – as well as (reportedly) the Bombardier Global 5000 business jet. Total cost of acquiring three Triton UAVs and completing ISIS integration was thought to be in the region of EUR600 million.

By early 2016, there was still no decision from the German government regarding whether to go ahead with Triton development or acquisition, but some sources expected a contract by late 2016.

### ISIS Sensor Testing to Continue; Moved to Triton UAV?

In July 2016, Germany's Euro Hawk mounting the first ISIS SIGINT sensor waited on the ground in Bavaria, but was expected to begin flying again later in 2016 to complete ISIS sensor testing. Germany still hopes to buy similar MQ-4 Triton air vehicles which will carry a sense-and-avoid or due-regard system to ensure safety in civil air space.

### Army Puma Mini-UAV SIGINT Variant

In February 2016, the Army FY17 budget showed a SIGINT variant of the Puma mini-UAV was available, with an MIPR (Military Interdepartmental Purchase Request) Order Production Milestone planned for FY18.

### USMC Integrator SIGINT/ES Payload Production to Begin

In February 2016, US Marine Corps FY17 budget plans in PE# 0305242M Unmanned Aerial Systems (UAS) Payloads, Proj. #5501 Signals Intelligence (SIGINT), provided funding to continue to develop and integrate a Signals Intelligence (SIGINT)/Electronic Warfare Support (ES) payload for Marine Corps small tactical UASs (basically, the RQ-21A Integrator). The SIGINT/ES payload will fill current capability gaps for the Marine Corps Intelligence, Surveillance, and Reconnaissance (ISR) mission and is required as part of the Marine Corps mission to locate and target adversary Signals of Interest (SOI). The SIGINT/ES payload will leverage payloads previously developed by other Services and/or DoD laboratories to reduce cost and minimize schedule. This project continues efforts started in PE# 0305242M, Proj. #2298.

New Start Procurement funding of $3.0 million in FY17 will procure six Signals Intelligence (SIGINT) Payloads for USMC RQ-21 Integrator UAVs, at a unit cost of $500,000.

### SOF UAV Sensor RDT&E (EO/IR)

In February 2016 in the Special Operations Forces (SOF) FY17 budget, Program Element (PE) #1160402BB SOF Advanced Technology Development, Project #SF101 Engineering Analysis, provides RDT&E funding to develop rapid response capabilities to support Special Operations Forces (SOF) platforms to correct system deficiencies, improve asset life, and enhance mission capability through the means of feasibility studies, analysis of alternatives, pre-developmental risk reduction studies, and engineering analyses. The project provides the engineering required to improve the design and performance integrity of UAV payload sensors, support systems, sub-systems, equipment, and embedded computer software as they relate to the maintenance, overhaul, repair, quality assurance, modifications, materiel improvements, and service life extensions. This project also conducts risk reduction studies, analyses, and demonstrations to support emerging, time-critical weapons and sensor enhancements.

The Platform Engineering Analysis program will be funded with about $5 million annually for UAV sensors engineering assessments and evaluation of technology, manufacturing, and integration readiness in six distinct areas: 1) small UAV payloads; 2) air-to-ground interoperability; 3) mission suite architectures; 4) common sensor suites; 5) low-cost, high-load-out Stand-Off Precision Guided Munitions (SOPGMs) and air-launched UAV; and 6) next generation Intelligence, Surveillance, and Reconnaissance (ISR) capabilities.

In FY16 and FY17, Platform Engineering Analysis plans for small UAV payloads are to identify, assess, and evaluate the risks/benefits of efforts to reduce the size, weight, and power of current capabilities to be integrated into Group I-III UAVs (Tactical [RQ-7 Shadow] to Mini [Raven] UAVs). Air-to-ground interoperability efforts will identify shortfalls and gaps in current SOF air-to-ground communications architecture and recommend and evaluate interoperability enhancements. For mission suite architectures, efforts will identify, assess, and evaluate open architecture approaches to reduce life-cycle costs, increase responsive integration of new capabilities, and increase competition.

 

In the area of common sensor suites, efforts will assess and evaluate individual sensors and suites of sensors to optimize the commonality of sensors between the manned ISR fleet and Group IV/V UAV, and to identify low-cost and high load-out SOPGM and air-launched UAV commodities to reduce costs and provide force multipliers. Efforts will also identify, assess, and evaluate risks/benefits/suitability of emerging ISR products and suites.

These efforts include but are not limited to: hyperspectral imaging, moving target indication, LIDAR, SIGINT, and high definition EO/IR capabilities.

### More Electrical Power Required for New/Multiple Sensors

New UAVs with higher-capability sensors often require more power, especially with multiple sensors being mounted on smaller and smaller UAVs. Tactical UAVs in development today often have a very similar sensor suite to MALE UAVs of a few years ago. Because services also are seeking increased endurance, a key capability for any sensor today is reduced and more efficient size, weight, and power (SWaP) requirements. It is true that engine upgrades are underway for many UAVs, most with increased power generation, but there will always be a trade-off between power generation for increased-capability sensors, and fuel efficiency and flight endurance.

## Recent History: ASIP & TSP

### U-2/Global Hawk Equivalent SIGINT Capabilities

In mid-2016, according to USAF sources, the U-2 and Global Hawk had close to equivalent SIGINT capabilities, though the U-2's EO/IR ability was superior.

### 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.

### Global Hawk Block 30 Sensor Upgrade RDT&E

In May 2017, USAF FY18 budget plans in PE# 0305220F RQ-4 UAV, Proj. #675145 Block 30 fund continuing upgrades from FY16-FY18 and beyond to the Airborne Signals Intelligence Payload (ASIP) Signals Intelligence (SIGINT) sensors and Enhanced Integrated Sensor Suite (EISS) sensors.

### ASIP Increment II for Global Hawk

In May 2017, ASIP Increment II was documented as a new start program in the USAF budget. ASIP Increment II will expand Communications Intelligence (COMINT) and Electronic Intelligence (ELINT) frequency range, reduce special signals bandwidth, and decrease mission loading time via a new encryptor system. Increment II involves enhancements to the Global Hawk ASIP sensor baseline, requiring hardware and software changes. The ASIP Program Office (AFLCMC/WINS) is responsible for development while the RQ-4B Program Office (AFLCMC/WIG) is responsible for integration, flight testing, and fielding. This is a follow-on to the ASIP baseline program in compliance with Signal Intelligence (SIGINT) Capability Working Group priorities.

ASIP Increment II is comprised of two separate builds – Builds A & B. Build A is scheduled to begin in FY18 with Build B projected for an FY22 start date. The time gap between the two builds is primarily due to program priorities. Build A is higher priority and will have lower development risk. The remaining higher risk requirements will be captured with Build B.

This retrofit includes upgrade kits and installs on the following: Build A – Block 30M Global Hawk: twenty-one (21) aircraft and seven (7) spares. Build B – Block 30M: seven (7) aircraft. Additional quantities will be captured in future POM cycles.

Estimated DT completion: September 2018. Estimated OTE: January 2019. Milestone/Development Status: AFLCMC/WINS program office will perform development. Engineering flights are scheduled to begin in February 2018, with DT finishing up in September 2018 and a 53rd Test and Evaluation Group led FDE shortly after DT ends.

### Continuing Upgrades for Predator/Reaper SIGINT: Classified

In May 2017, the USAF planned for new and upgraded SIGINT sensors to be integrated and tested on various platforms including MQ-1B/MQ-9A UAVs, as funding permits, including continuing modernization of current MQ-1B/MQ-9A SIGINT systems. Development and integration of advanced SIGINT capabilities will include, but not be limited to: quick reaction capability sensors; processing, exploitation, and dissemination associated with these systems; and other efforts approved by the USAF SIGINT Capabilities Working Group. Development efforts will include, but are not limited to: new signal sets, antenna improvements, sensitivity upgrades, data distribution upgrades, and new/advanced deployment capabilities.

However, PE# 0304260F Airborne SIGINT Enterprise states an Acquisition Strategy where SIGINT capabilities will be integrated to various classified platforms using an evolutionary acquisition approach. Capabilities and prototypes will be developed by Other Government Agencies and transitioned to select vendors as production needs develop. Essentially, Predator/Reaper SIGINT

continues but has gone classified since Proj. #675182 MQ-1/MQ-9 funding disappeared in FY16.

### TSP Program (FY18)

In May 2017, the Army FY18 budget provided FY18 funding of $1.48 million to complete TSP engineering corrective actions and regression testing from DT/LUT testing, and preparations for TSP Block 2.

The TSP acquisition strategy is discussed as: "TSP is a threshold requirement for the MQ-1C Gray Eagle UAS. The TSP program completed the Engineering and Manufacturing Development (EMD) phase with a Milestone B decision in September 2011. The TSP Program EMD contract award was based on full-and-open competition with a period of performance that was completed in October 2015, and focused on integration and test onto the Gray Eagle platform, and integration and test of TSP software into the Operational Ground Station. The TSP EMD program is a derivative of systems that were fielded as a Quick Reaction Capability on the MQ-1C UAS and a variety of other manned platforms. The demonstrated scalability of these fielded materiel solutions allows the TSP EMD program to leverage effort that directly supports the TSP EMD program.

The TSP program entered the Low Rate Initial Production (LRIP) phase with a Milestone C decision that was approved on 2 May 2014. The TSP Program LRIP contract award was based on sole source selection with a period of performance that was completed on June 2016, and primarily focused on the obsolescence of the EMD phase assets via the required Engineering Change Proposals, and the first initial production of 30 TSP Payloads in support of the Gray Eagle Platform.

The TSP Block 1 is the current Program of Record capability. TSP Beyond Block 1 will address objectives and remaining deferred Block 1 threshold requirements as reflected in the approved Capability Production Document (CPD).

### TSP for Improved Gray Eagle (IGE)

In May 2017, the Army FY18 budget discussed the Improved Gray Eagle (IGE): "Program Manager Unmanned Aircraft Systems (PM UAS) received a Congressional plus up of $49 million in President's Budget 15 (PB15) to procure Extended Range UAS which increases the CPD objective endurance requirements for the current GE configuration to an Improved Gray Eagle (IGE). TSP is scheduled for integration and testing on the IGE platform upon completion of the platform's Follow on Test Evaluation #2 scheduled 1QFY18."

### ASIP Increment I Fielding Begins

In February 2018, the USAF FY19 procurement budget discussed ***ASIP Increment I***, which incorporates additional signals and integrates advanced collection algorithms to provide increased mission capability. It is a follow-on effort to the ASIP baseline program in compliance with SIGINT Capability Working Group priorities. The retrofit task will be implemented using the rotatable spares concept. Fielding is estimated to start in July 2018.

The ASIP Increment I program will retrofit fifteen (15) Block 30 aircraft as well as twelve (12) spare chassis.

The USAF ISR Sensors group (AFLCMC/WINS) earlier initiated a development effort, which delivered hardware and software for initial testing and DT. The WINS development contract was awarded in June 2015 with delivery in November 2016. Global Hawk's NRE effort supports DT and procurement of modification kits. The retrofit kit procurement contract was awarded in March 2016.

### Global Hawk ASIP Increment II New Start

In February 2018, the USAF FY19 budget outlined P-3A Mod 470021 ***ASIP Increment II*** – a new start in CY18 (Calendar Year), with RDT&E funding scheduled for Northrop Grumman.

### BAE's TSP Finally Dead for Good?

In February 2018 in the US Army's FY19 budget, the TSP program description (PE# 0305204A, Proj. #11B) stated that the Fiscal Year (FY) 2019 FDI/G8 has ceased EE PEG Investment (FY19-FY23) for the TSP PoR (Program of Record) in support of (preference for) an acquisition strategy of QRCs towards a Family of Systems to meet the critical SIGINT capability need with the desired Signals of Interest on the UAS Grey Eagle Platform and the MQ-1C (ER).

Final (minor) Proj. #11B funding in FY18 will execute corrective engineering actions resulting from the DT/LUT Testing Event, and initiate the required development work for TSP Beyond Block 1 for future upgrades, as well as continuing TSP Interim Contractor Logistics Support (ICLS).

What this says to Teal Group, is that TSP again did not succeed with flying colors….

### TSP Acquisition Strategy

In February 2018, US Army FY19 budget documents stated the TSP program entered the Low Rate Initial Production (LRIP) phase with a Milestone C decision in May 2014. The TSP Program LRIP contract award was based on sole source selection (BAE Systems) with a period of performance that was completed in June 2016, and primarily focused on the obsolescence of the EMD phase assets via the required Engineering Change Proposals, and the first initial production of 30 TSP Payloads in support of the Gray Eagle Platform.

The TSP Program ICLS contract award was a result of a previous sole selection (BAE Systems) with a period of performance of 12 months

 

with a 5 year option for completion in August 2021. The primary focus supports fielding of the system/network, continuous contractual support through operational and sustainment transition, engineering corrective actions, support of the MQ-1C (ER), and the conversion of the 30 LRIP TSP systems.

The ***TSP Block 1*** is the current Program of Record capability. ***TSP Beyond Block 1*** will address objectives and remaining deferred Block 1 threshold requirements as reflected in the approved Capability Production Document (CPD).

Additionally, the Improved Gray Eagle (IGE)-Program Manager Unmanned Aircraft Systems(PM UAS) received a Congressional plus up of $49 million in the President's Budget 15 (PB15) to procure Extended Range UAS, which increases the CPD objective endurance requirements for the current GE configuration to an Improved Gray Eagle (IGE). TSP is scheduled for integration and testing on the IGE platform upon completion of the platform's Follow on Test Evaluation #2 scheduled 1QFY18.

## Recent History: MQ-4C Triton SIGINT

### Germany Approves Triton SIGINT Buy with 2025 IOC

In March 2017, the German chief of defence staff General Volker Wieker approved the procurement of the MQ-4C Triton to meet the country's airborne SIGINT requirements, with the Airbus Defence and Space Integrated Signal Intelligence System (ISIS) mission system (originally planned for the cancelled Euro Hawk) as the payload. The planned procurement of three Triton/ISIS UAVs will give the Bundeswehr an airborne signals collection system for wide area surveillance and reconnaissance starting around the middle of next decade – planned IOC in 2025 – filling the gap in the Bundeswehr's capabilities that has existed since the manned Breguet Atlantic BR 1150 SIGINT aircraft was retired from service in 2010.

Reports indicate about €600 Million (including €270 Million for ISIS development) have been spent up to 2016. Assuming no overruns, the additional cost of the program (including three Tritons and additional ISIS/Euro Hawk testing) will be another €900+ Million, with an IOC of 2025 – ten years later than the Euro Hawk planned IOC of 2015.

### SIGINT Additions for Multi-INT

The MQ-4C Triton acquisition approach supports the Navy's Maritime Intelligence, Surveillance, Reconnaissance, and Targeting (MISR&T) Transition Plan by providing a stable and effective baseline early operational capability in FY18 to facilitate Fleet introduction and learning, while continuing System Development and Demonstration engineering and integrated test on Signals Intelligence (SIGINT) and other upgrades to deliver a Multi-INT configuration at Initial Operational Capability (IOC). Phased capability upgrades will continue post IOC to enable the MQ-4C Triton to keep pace with rapidly evolving technologies and threats, and address correction of deficiencies and obsolescence issues to ensure the Navy maintains persistent Intelligence, Surveillance and Reconnaissance dominance through the system's lifecycle.

In the May 2017 US Navy budget, Sierra Nevada Corporation, Beaver Creek, OH (High Band Sensor kits) and Boeing Argon ST, Fairfax, VA (Low Band Sensor kits) were funded through FY17 for Primary Hardware Development, but planned funding ended in FY17.

### Triton RDT&E Projects

In May 2017, the US Navy budget showed funding from FY16 onward providing for Sense and Avoid radar development, Airborne Mission Processor (AMP) development, and acquisition of development assets for capability upgrades including electro-optical/infra-red, and SIGINT High Band and SIGINT Low Band systems.

### Triton IFC 4.0 Materials Order

In July 2018, the Naval Air Systems Command at Patuxent River Naval Air Station, MD, announced a $19.3 million order to Northrop Grumman Aerospace Systems, San Diego, CA, to purchase unique materials necessary to integrate the Triton Integrated Functional Capability (IFC) 4.0. Northrop Grumman will conduct work in San Diego, Menlo Park, Placentia, and San Clemente, CA; Waco, TX; New Town, ND; West Chester, OH; Middletown, WI; Malabar, FL; Medford, NY; Bridgeport, WV; and other locations in the continental US, and should be complete by July 2020.

### Navy Triton IFC 4.0 Plan

In July 2018, the US Navy planned for Triton Integrated Functional Capability (IFC) 4.0 to upgrade the Triton with multi-intelligence ("multi-int") capabilities that include SIGINT (from Boeing Argon ST and Sierra Nevada Corp.), with initial IFC 4.0 deliveries scheduled for 2021. The Navy continues to sort of suggest that Triton IFC 4.0 UAVs "could replace" the Navy's EP-3 fleet, still scheduled to be retired in 2021. But no one ever seems very happy about discussing how this might actually be possible. The Navy has never specifically addressed the very expensive, very heavy, long-range SIGINT systems in the EP-3, designed for functionality at long standoff ranges.

About the only thing the much-smaller-payload Triton will have in common with the four-engine manned EP-3 is that it will also have to operate long distances from active targets, as it is nearly as defenseless as the P-3 Orion-based aircraft. Fortunately, at least for planned Triton operations monitoring civilians within the continental US, innocent American citizens rarely shoot back.

In early 2017, Triton completed its preliminary design review phase of Triton IFC 4.0.

The "baseline" LRIP Triton is the IFC 3 version entering service in 2018. It carries the MFAS radar, MTS-B EO/IR turret, an automatic identification system (AIS) receiver, and "electronic support measures."

## Recent History: Other Airborne SIGINT

### ARDS ELINT Pod Introduced for Reaper

In July 2016, General Atomics and Raytheon Deutschland GmbH ("a leading manufacturer of airborne electronic warfare and sensor systems and airborne radars") announced that they will integrate the Advanced Radar Detection System (ARDS) onto a Predator B/MQ-9 Reaper. ARDS is a scalable Electronic Support Measures (ESM) system for passive, wide-area radar monitoring over land and sea, designed and developed by Raytheon Deutschland on the basis of modules which are produced in Spain and in the UK. According to General Atomics' CEO, Linden Blue, "Adding an ELINT [Electronic Intelligence] role to Predator B by integrating ARDS will help our customers to map air defense radar threats in contested airspace, from stand-off distances."

ARDS enables "high-fidelity" detection and direction-finding of RF emitters, and will be integrated into a standard pod that will be mounted on the centerline hard point of Predator B. According to Andreas Radermacher, managing director, Raytheon Deutschland GmbH, "Predator B is the ideal platform for our ARDS as it deploys the ELINT capability with significantly greater endurance at much lower cost per flight hour compared with other platforms."

ARDS was previously developed by Raytheon Deutschland's Space and Airborne Systems business under private venture funding, as an advanced exploitation of digital receiver technology to upgrade the Emitter Location System (ELS) fitted to German and Italian Tornado ECR (Electronic Combat and Reconnaissance) aircraft. The new Tornado configuration, known as dELS, was in production by mid-2017 and completing final certification ahead of fielding on the ECR Tornado in early 2018.

According to Andreas Radermacher, ARDS for the Predator B is based on the same dELS technology but incorporates improvements in hardware, firmware, and software, as "a new high-sensitivity payload designed for long-range, long-endurance reconnaissance missions…. Integrated into a standard pod that will be mounted on the centerline hard point of Predator B, it will [provide] passive, wide-area ELINT over land and sea and enable high-fidelity detection and precision direction finding [DF] of RF [radio frequency] emitters to auto-generate the electronic order of battle."

A combined GA-ASI and Raytheon team freezing the design of the integration hardware in mid-2016 in order to make ARDS available to customers in 2018. The team planned to execute developmental and operational flight tests in the second half of 2017.

### New ARDS Testing Schedule

In June 2017, Raytheon Deutschland announced it planned to flight test ARDS on a Predator B in the first half of 2018.

### Germany Approves Triton Buy for ISIS

In March 2017, Germany's defense ministry approved the buy of three Northrop Grumman MQ-4C Triton UAVs to mount the already-developed ISIS SIGINT system. The Tritons are to be delivered in 2025 and 2026.

### Raytheon ALR-69A Tested on Reaper UAV

In April 2017, General Atomics announced the successful airborne demonstration of a Raytheon AN/ALR-69A radar warning receiver (RWR) on a Predator B/MQ-9 Reaper Block 5, carried within a standard payload pod. According to Claudio Pereida, executive vice president, General Atomics, Mission Systems, "The successful demonstration of a mature radar warning receiver on our company-owned Predator B clearly shows the utility of the aircraft in conducting missions in the proximity of threat radars and enemy air defenses…. We are pleased to be the first company to demonstrate this capability on a remotely piloted aircraft and hope to make it available to interested customers on a quick-reaction basis."

The ALR-69A provides enhanced situational awareness to aircrew and air element command and control units by identifying potential radar threats in or near "contested airspace" environments. According to Paul Overstreet, Raytheon's ALR-69A program manager, "The ALR-69A provides improved detection range and accurate, unambiguous identification in dense signal environments…. Its open architecture is what allows it to operate on manned or unmanned aircraft."

According to General Atomics, the pod was able to validate RWR performance in various flight profiles which met or exceeded current thresholds for both air and ground radar threats. Additionally, the RWR information to the flight crew was deemed useful for triggering flight crew action, such as manually cross-cueing to other onboard sensors to validate threat information.

General Atomics planned further RWR demonstrations later in 2017, to include integrating with the Link 16 datalink. Development and testing is currently being conducted under Internal Research and Development (IRAD) funding, "with the goal of partnering with potential customers in the near future."

 

### MFEW RFI for Gray Eagle UAV (Modular System Sought)

In August 2017, the Army's SFAE-IEW-EA Office at Aberdeen Proving Ground, MD, issued a follow-on Request for Information (RFI) for a pre-solicitation to support the development of an RFP to procure a Multi-Function Electronic Warfare (MFEW) system to be mounted in a wing pylon pod on the Class IV Unmanned Aircraft System (UAS) – Gray Eagle – though future variants of different sizes and for different UAVs is anticipated.

Based on previous market surveys, the Government planning assumptions are: 1). The Gray Eagle UAS is the current host platform for MFEW Air Large (AL) with no significant modifications required to the aircraft; 2). The goal is for command, control, and mission planning of MFEW assets to be provided by the Electronic Warfare Planning & Management Tool (EWPMT) when available, but alternative Command and Control (C2) solutions can be used in the interim; 3). MFEW critical technology elements are sufficiently mature that the program can utilize a modified COTS/GOTS approach; 4). MFEW HW/SW will be based on open standards to allow for future upgrades and maximum re-use across other MFEW air variants; 5). Prototype deliveries can begin 18 months after contract award to begin qualification testing and air platform integration.

### Gray Eagle ER Flies

In August 2017, General Atomics conducted a 41.9-hour flight of an MQ-1C Gray Eagle Extended Range (ER) variant, which is a 68 percent improvement in endurance over the current UAV (25 hours). General Atomics plans to start delivering MQ-1C ERs to the US Army next year. Dubbed "Predator Plus," the ER has a higher-horsepower (180hp) heavy-fuel engine and a two-foot-longer wingspan with embedded fuel bladders supporting 56 percent more fuel capacity. Maximum gross takeoff weight is also increased, from 3,600 to 4,200 pounds, and maximum internal payload from 380 to 500 pounds. The ER adds a centerline hard point to the Gray Eagle's four wing hard points.

With the added endurance, General Atomics is studying enhanced applications for the Gray Eagle, which will participate in manned-unmanned teaming (MUM-T) operations with the Army's AH-64D/E Apache attack helicopter. Fitted with a radar warning receiver (RWR), the Gray Eagle could help protect the helicopters in contested environments, according to General Atomics.

### RFI for MQ-25 COMINT & EO/IR

In August 2016, NAVAIR released an RFI for a COMINT payload for the MQ-25 aerial refueling UAS, as part of its secondary ISR mission, to be incorporated into the air vehicle's "tanking trade space" (probably an interchangeable pod). According to NAVAIR, ISR capabilities may include Maritime Domain Awareness via SIGINT, Automatic Identification System (AIS), and EO/IR sensors. Data is to be transmitted to the CVN Ships Signal Exploitation Space (SSES) and/or Fleet Information Operations Center (FIOC) operators for remote operations via Classic Reach. The RFI solicitation number was N00019-16-P7-ZD053. POC was Joe O'Brien, tel: (301) 342-9584, email: joe.obrien@navy.mil.

But by late 2017, the ISR mission of the MQ-25A had been descoped (or, for the moment, eliminated), so what will happen to this RFI is uncertain but probably not optimistic.

### DARPA CONCERTO for Mini-UAVs: Goals

According to the DARPA website: "Dominance of the radio frequency (RF) spectrum is critical to successful U.S. military operations. Today, we do this using discrete radar, electronic warfare (EW), and communication payloads that are separately designed, procured, and integrated on platforms. These payloads typically use dedicated apertures, are realized with tightly coupled hardware and software, and are not well-coordinated in their use of spectrum. This rigid and constrained approach makes it difficult and time-consuming to adopt new technology, adapt to rapidly changing adversary threats, maneuver functions effectively in spectrum, and create comprehensive compact RF systems.

DARPA's CONverged Collaborative Elements for RF Task Operations (CONCERTO) program addresses these challenges by developing a modular architecture for adaptive, converged RF systems and using it to realize a single converged RF payload supporting radar, EW, and communications. CONCERTO systems would realize multi-function operations in less space and power than the combined collections of discrete systems, raise operational tempo by increasing the capability of smaller, more readily available UAS hosts, maximize the use of common apertures, and speed technology migration by decoupling hardware from software and firmware. CONCERTO is developing a multi-objective management system to intelligently coordinate RF mission goals in spectrum, space, and time to maximize the effectiveness of CONCERTO payloads. The architecture will be modular and scalable across a range of platforms, with a demonstration payload to be carried on a Group 3 UAS."

### DARPA Contracts with BAE Systems for CONCERTO

In June 2017, DARPA announced a $5.4 million contract with BAE Systems to develop small multifunction UAVs that can conduct multiple missions with a single payload, to develop a new line of multi-role UAVs designed to be modular and able to mount different sensor, radio-frequency, and weapons packages. The sensor program is known as CONCERTO and includes radio communications, and radar and electronic warfare systems. It has a flexible radio frequency (RF) platform, and will be used for intelligence, surveillance, command and control, and reconnais-

sance. It can provide networking and combat operations support without any changes to its payload.

According to Randall Lapierre, technology development manager at BAE Systems, "This agility is particularly important in denied environments, where multiple mission functions are typically needed to penetrate defenses and remain operational…. By enabling small platform systems to share core components, we're helping them become more agile and stay on station longer."

### CONCERTO: Multi-Capability Small UAVs

In August 2017, DARPA and BAE Systems discussed the CONCERTO effort, as a technology initiative designed to change the paradigm for how small UAVs operate in combat scenarios. Current small UAVs typically have a single sensor or sensor type – for example EO/IR, SIGINT, or SAR. The plan is for CONCERTO to use integrated antennas, circuitry, software, and hardware to enable one UAV to quickly switch from one payload function to another. According to a BAE Systems official, "These single-function payloads can't be installed on a compact UAS at the same time because of the size, weight, and power constraints of these platforms, limiting what they can do without swapping payloads on the ground – a process that seriously hinders mission efficiency."

According to DARPA's CONCERTO development solicitation, multi-function missions today typically require integration and control of separate, discrete systems, either on a single larger platform or many smaller ones. These systems typically use dedicated apertures, are realized with tightly coupled hardware and software, and are not well-coordinated in their use of spectrum. The new "converged" CONCERTO payload will include an "RF front end including radiating aperture, a heterogeneous RF processing engine and multi-objective management system."

According to BAE Systems developers, they are focusing on maximizing the RF capabilities of the hardware to include bandwidth, frequency, distance, and field of view, to ensure multiple missions can be performed from the same components. According to Randall Lapierre, BAE Systems CONCERTO technology development manager, the emerging flexible RF technology will depend on technical breakthroughs with chip technology able to operate with reconfigurable radio frequencies – including "Adaptive RF technologies like MATRICs (Microwave Array Technology for Reconfigurable Integrated Circuits) and commercial digital components."

According to a DARPA statement, CONCERTO will also speed sensor/system modernization efforts, in addition to combining functionality: "The rigid and constrained nature of the existing approach makes it difficult and time-consuming to adopt new technology, adapt to rapidly changing adversary threats, maneuver functions effectively in spectrum, and create comprehensive compact RF systems."

In June 2016, the CONCERTO development program was to be managed by DARPA's Strategic Technology Office (STO), and was planned as a five year effort with three phases. Phase 1 was to study missions and create new mission architectures. Phases 2 and 3 were to see the design, building, and demonstration of prototypes. CON-CERTO was also to be divided into four technical areas, with multiple contractors expected to participate in each one.

In August 2017, BAE and DARPA reported they are planning to demonstrate CONCERTO "in the near future." CONCERTO is planned as a package weighing 80 lbs. or less, intended for a Group 3 UAS like the RQ-7 Shadow or RQ-21 Blackjack. BAE Systems reports the initial technology demonstration is planned for an RQ-21A Blackjack UAV.

### Xtender Satellite Phone SIGINT for Hand-launched UAVs

In mid-2017, UK-based Horizon Technologies began offering its Xtender "proprietary processing module" (5 kg) and antennas for small (hand-launched) UAVs. This would extend the range of their FlyingFish SIGINT systems for detection of satellite phone handsets/terminals (uplinks).

About 50 FlyingFish systems are reportedly in operation with NATO and non-NATO customers aboard manned aircraft, but the full FlyingFish system is too heavy for most UAVs, and FlyingFish is limited to Line Of Sight (LOS) detection. The Xtender allows a remote processing module to pick up signals beyond the LOS of a ground or airborne base system. According to Horizon, Xtender uses a "proven and tested proprietary method of sending all the call data (location, metadata, and audio) back to a modified 3rd Generation FlyingFish system which functions as though it is within LOS of the handset."

Xtender reportedly passively monitors Thuraya and IsatPhone Pro networks (64 Duplex channels, 32 Thuraya, 32 IsatPhone Pro), and can detect and intercept terminal and call activity including voice, fax, data, and SMS. It can also integrate an Automatic Identification System (AIS)/GPS receiver for maritime use. The system can also be used with 3rd party special signals decryption software under export license.

Xtender can also be deployed in a low-cost pod (Xpod) attached to a manned aircraft's weapon station or hard point, to be available in 2018.

### With Compass Call Choice, Gulfstream – and L-3 – Benefit for Future JSTARS+Rivet Joint

In late 2017, Gulfstream's G550 business jet was also a leading candidate for the Air Force's new JSTARS Recap platform. Now that is has been chosen for the USAF Compass Call Recap, the belief is that the G550 will be more favored both for a JSTARS

Recap and possibly a future RC-135 Rivet Joint platform (both currently hosted aboard much larger Boeing 707 aircraft). According to Michael Strianese, chairman and CEO of L-3 Technologies, "What we're doing with this recap, there's likely to be more after this. There is some wisdom to just having the same aircraft in the fleet, for maintenance and logistics."

Strianese also stated that L-3 is more able than original equipment manufacturers to quickly and effectively perform military systems integration work – "When those planes get recapitalized, if they give that work to an OEM, they're going to pick themselves to do the mission integration, and they usually don't do it well."

### U-2 Payload Update 20.1: Procurement of ALQ-221 Upgrade Kits

In February 2018, in the USAF FY19 budget, PE# 0305202F Dragon U-2, Proj. #674820 Sensor Development funds the U-2 Payload Update Block 20.1: Aircraft payload development supports sustainment and/or enhancement development including activities such as, but not limited to, trade studies, analysis, preliminary system engineering, system and subsystem testing or demonstrations, sensor specification development, Advanced Synthetic Aperture Radar System (ASARS) development and test, SIGINT and multi-spectral sensor technical refresh integration and test, defensive systems, sensor range improvements, strategic and tactical data link (L-16, IBS, IFDL, MADL, etc.) design and integration.

FY18 and FY19 will support payload sustainment and/or enhancement activities such as, but not limited to, ASARS development, integration and test, defensive systems, datalinks, avionics technical refresh, ***SIGINT*** and multi-spectral sensor technical refresh, advanced and agile payloads, Optical Bar Camera technical refresh, sensor range improvements, and associated ground support equipment.

FY19 OCO plans will counter emergent threats in the low band spectrum for detection, display and defeat by the ***AN/ALQ-221 Low Band (LB)*** subsystem in order to allow U-2 flight ops in moderately contested environments. Requirements will be met with two system modifications: an ***Advanced Threat Systems modification*** and a ***Continuous Wave Power Amplifier (CWPA) modification***. This is the development work for follow-on FY19 procurement of 15 kits and spares. Additional information is available via classified means.

### Navy EP-3 Funding Continues to Decline

In February 2018, Navy budget documents showed that major public, unclassified procurement funding for the EP-3 continued through FY16 – worth about $100 million in FY16. But beginning in FY17 funding dropped significantly, by about half in FY17 and to a quarter in FY18. However, all funding lines were not available in the FY19 budget in February 2018, so these numbers are estimated.

### USMC: Template for Comprehensive New Small UAV Sensor Technologies

In February 2018, the US Marine Corps FY19 procurement budget funded the *Unmanned Aerial Systems (UAS) Payloads* integration program (BLI 4787 Procurement Marine Corps), to alleviate Marine Corps Intelligence, Surveillance and Reconnaissance (ISR) capability gaps caused by rapidly changing missions, threats, and technologies. It will provide responsive capability to integrate and support rapid fielding of ISR payloads for all UAS within the Marine Corps (primarily the RQ-21A Blackjack and other small tactical and mini-UAVs). Note that total USMC funding is low, but this program line provides something of a template for what the other services are doing (with considerably more funding) through classified or unpublished programs….

Note also that in FY19, this program is being consolidated into the Program of Record (POR) for the RQ-21A Blackjack – and at that point, we expect transparency to cloud over and many programs to disappear from the PoR record, as published details focus more on RQ-21A platform and overall program progress. Funding for BLI 4787 Procurement Marine Corps will transition to BLI 0444 Aircraft Procurement, Navy (APN) in FY19.

Sensor payloads will increase the effectiveness and versatility of the Marine Corps UAS currently planned to have *Electro-Optic (EO)/Infrared (IR)* collection, *Communications Relay*, and *Automatic Identification* capabilities. Upgrades include, but are not limited to, *Signals Intelligence (SIGINT)/Electronic Warfare Support (ES)*, *Synthetic Aperture Radar (SAR)/Moving Target Indicator (MTI)*, and *Wide Area FOV* and *Hyperspectral Imagery* collection – pretty much running the gamut of sensor types in this Teal Group UAV study.

In FY18, the UAS Payloads procurement line was expanded to include funding for Marine Corps Group I UAS system intelligence payloads. P-5 cost elements were broken out to reflect the payload procurement in support of Group III and Group I UAS. Group I and III *SIGINT/ES payloads* will fill current capability gaps for the Marine Corps ISR mission and is required as part of the Marine Corps mission to locate and target adversary *Signals of Interest (SOI)*.

### Group III Spectral Bat SIGINT Production Funded

In February 2018, the US Marine Corps FY19 procurement budget for *Unmanned Aerial Systems (UAS) Payloads* (BLI 4787 Procurement Marine Corps) provided $14.2 million procurement funding in FY18. The increase of $11.2 million from FY17 to FY18 provides newly developed payloads to address capability gaps caused by rapidly changing missions, threats, and technologies. In ad-

dition, there was an increase due to the expansion of this BLI to include Group I payloads realigned from BLI 4757 ($4.0 million). Systems procured included:

Eight (8) Group III (RQ-21A Blackjack) Spectral Bat Signals Intelligence (SIGINT) payloads

Six (6) Group III UAS Synthetic Aperture Radar/Moving Target Indicator (SAR/MTI) payloads

Fifty (50) Group I (Raven/Puma) UAS SIGINT payloads

(345) Group I UAS Mobile Ad-Hoc Network (MANET) payloads

## Current Developments: ASIP & TSP

### ASIP RDT&E

In February 2019, in the USAF FY20 budget, PE# 0304260F Airborne SIGINT Enterprise, Proj. #675183 Common Airborne SIGINT (ASIP) Development funds continuing ASIP development, including continuing development of new signals capabilities and enhancements for the ASIP Family of Systems (FoS), continuing integration activities and incorporating upgrades as appropriate, continuing to develop replacement components affected by DMSMS, continuing to evaluate options for expected follow-on open architecture systems, and beginning new sensor development activities.

### ASIP & ASIP Follow-on Acquisition Strategy

In February 2019, the USAF planned that future SIGINT capabilities will be developed and integrated onto various platforms using an incremental acquisition approach. In response to requirements as validated by the SCWG, an incremental acquisition strategy plan will be executed, contracting with appropriate vendor(s) to deliver capability while encouraging competition where possible. In response to SCWG-validated requirements, a competitive acquisition approach is expected for a follow-on system.

### Reaper/Predator SIGINT Upgrade RDT&E

In February 2019, in the USAF FY20 budget, PE# 0304260F Airborne SIGINT Enterprise, Proj. #675186 Special Programs funds special SIGINT studies as well as the development and integration of advanced SIGINT capabilities for special programs including, but not limited to: quick reaction capability sensors, the processing, exploitation, and dissemination associated with these systems, and other efforts approved by the USAF SCWG. Development efforts will include, but are not limited to: new signal sets, antenna improvements, sensitivity upgrades, and data distribution upgrades, and new/advanced deployment capabilities. This project provides the warfighter with near term combat capabilities with increased capability improvements accomplished as technologies and risks achieve satisfactory levels.

Sensors will be integrated and tested on various platforms, but primarily the MQ-1B/MQ-9A Predator/Reaper, as funding permits.

### Classified Reaper Quick Reaction Capability Upgrade Acquisition Strategy

In February 2019, the USAF planned that future SIGINT capabilities will be integrated to various classified platforms using an evolutionary acquisition approach, but primarily to upgrade the quick reaction capability sensors already on the MQ-1/9 fleet. Capabilities and prototypes will be developed by Other Government Agencies and transitioned to select vendors as production needs develop.

### TSP Funding Ends in FY18…

In February 2019, US Army FY20 budget documents re-stated the same TSP program information as in the FY19 budget, but also stated that, “there is no Investment Funding for (FY 2019- beyond) for TSP POR [Program of Record].” BAE Systems’ program may finally be done for good.

## Current Developments: MQ-4C Triton SIGINT

### Triton SIGINT High Band and Low Band RDT&E Continues

In February 2019, in the US Navy’s FY20 budget, PE# 0305421N RQ-4 Modernization Project, Proj. #2939 RQ-4 Modernization funds integration of development assets for capability upgrades including SIGINT High Band and SIGINT Low Band systems.

## Current Developments: Other Airborne SIGINT

### Continuing RQ-21A SIGINT/ES Procurement

In February 2019, the US Navy’s FY20 procurement budget funded an increase in ancillary equipment funding to include all program procured equipment to support the RQ-21A system. This equipment “may include, but is not limited to”: the Tactical Intelligence, Surveillance and Reconnaissance Processing Exploitation and Dissemination System (TIPS), payloads to enable Signals Intelligence (SIGINT)/Electronic Warfare Support (ES), Synthetic Aperture Radar (SAR)/Moving Target Indicator (MTI), and Wide Area and Hyperspectral Imagery collection.

 

# Teal Group Evaluation

### SIGINT Joins the EW A-List

Signals Intelligence (SIGINT) has become not only a primary focus of electronic warfare today (along with infrared countermeasures systems), but it now garners genuine "A-list" funding for UAVs as well as manned airborne platforms. Because threats are constantly evolving, and because detecting the IED threat has been so dependent on SIGINT, substantial continuing RDT&E and upgrade funding will be needed. There are several major ongoing manned SIGINT programs, as well as several more changeable endurance UAV programs, for Global Hawk, Triton, Gray Eagle, and others.

Other smaller-scale projects also continue, such as the Army's Puma hand-launched mini-UAV SIGINT variant, with a production milestone planned for FY18. And the US Marine Corps continues to develop and integrate a SIGINT/Electronic Warfare Support (ES) payload for small tactical UASs (basically, the RQ-21A Integrator).

## ASIP & TSP

### ASIP Production Continues

USAF budgets provide limited information and Army budgets virtually no information on ASIP production numbers. This has partly been due to uncertainty over the future of the primary Block 30 Global Hawk platform, and unspecified delays to the Reaper ASIP-2C, but also due to the increasingly classified nature of SIGINT programs.

Northrop Grumman contract information showed that USAF ASIP procurement for Global Hawk continued in 2014, and upgrades continued to be contracted in 2016, but ASIP-1C for Predator was cancelled in October 2009 and ASIP-2C for Reaper was to be cancelled after FY14. Instead, Quick Reaction Capability (QRC) systems already installed on Predator and Reaper were to be upgraded.

By late 2018, it looked as though ASIP procurement has continued for Global Hawk.

The Army's manned Guardrail aircraft also received a version of ASIP for the RC-12X Guardrail Modernization System Integration (GMSI) upgrade, with 14 systems reportedly installed by the end of 2013.

Precise production numbers have been impossible to determine – though with Global Hawk production ending soon, contracted new production may soon end entirely, to be superseded by continuing upgrade production. In any case, with at least a moderate number of systems now in service, ASIP should remain the number one medium-sized airborne SIGINT system in the US inventory for a decade or more, and it is likely FMS sales for Global Hawk are already contracted, with sales for other platforms possible also – though these sales may remain classified. Our forecasts are thus highly speculative.

In May 2017, ASIP Increment II was funded as a new start program in the USAF budget, to expand COMINT and ELINT frequency range, reduce special signals bandwidth, and decrease mission loading time via a new encryptor system. Build A upgrade kits for 21 Block 30M Global Hawks (and seven spares) were scheduled to begin in FY18, with Build B projected for an FY22 start date.

In May 2017, the USAF also planned new and upgraded SIGINT sensors to be integrated and tested on various platforms including Predator and Reaper UAVs, including new signal sets, antenna improvements, sensitivity upgrades, data distribution upgrades, and new/advanced deployment capabilities. But the funding and details of these programs have gone classified since public MQ-1/MQ-9 SIGINT funding disappeared in FY16.

In February 2018, the USAF FY19 procurement budget discussed ***ASIP Increment I***, as a follow-on effort to the ASIP baseline program, with retrofits to be implemented using the rotatable spares concept, with fielding estimated to start in July 2018. The ASIP Increment I program is now planned to retrofit fifteen Block 30 aircraft as well as twelve spare chassis.

In February 2018, the USAF FY19 budget also outlined ***ASIP Increment II*** – a new start program in CY18 (Calendar Year), with RDT&E funding scheduled for Northrop Grumman.

### TSP Block 1 LRIP and Beyond

The US Army has been funding development of BAE Systems' ***Tactical SIGINT Payload (TSP)*** since 2001, originally planned for smaller tactical UAVs such as Shadow and Fire Scout, but more recently for the Predator-derived Gray Eagle UAV. Progress has been slow, especially for the smaller UAVs, and Northrop Grumman's reduced-size Predator ASIP-1C (now cancelled) and Reaper ASIP-2C (to be cancelled after FY14) had time to become more directly competitive with TSP. The Office of the Secretary of Defense (OSD) questioned the need to develop two separate SIGINT systems for Predator and Gray Eagle, for the USAF and Army, and after the Air Force Predator ASIP-1C was cancelled it initially seemed the new TSP competition might choose the sole winner.

In mid-2009, the US Army planned to issue an RFP for an Enhanced TSP (ETSP) for UAVs. The Army planned to award a $22 million non-developmental item engineering contract in 1QFY10, which would include a $94.5 million production option, potentially to be awarded in late 2010.

In October 2010, the Army finally released a "sources sought" solicitation to identify companies for TSP (was ETSP) EMD and production, for a podded system for Gray Eagle UAVs. The TSP could not exceed 200 lbs. and 3 cu. ft. in size, and must require no more than 1,200W power. The Army planned to award a single EMD contract and procure 12 production-representative systems for testing aboard RC-12 manned aircraft. The contract would contain options for up to 97 full-rate production systems.

In October 2011, the Army awarded BAE Systems a $27.7 million, 18-month contract to fund engineering and manufacturing services for EMD of TSP systems. In January 2012, the Army also awarded BAE Systems a $12.3 million contract for Quick Reaction Program T-Pod Systems for Gray Eagle, with production and deliveries to be completed by December 2012.

But then in April 2012, the Army issued an RFI "to help determine the acquisition approach for the production phase of the TSP being developed by BAE Systems." The Army still wanted to buy up to 95 TSP systems across five production lots at a price of approximately $950,000 per unit – similar numbers to Army requirements for the past several years. Presumably, the Army was hedging its bets by not relying entirely on BAE Systems. With no production contracted beyond about a dozen QRC T-Pods, the TSP/ETSP program could have started all over again.

Apparently, the Army was keeping its production options open, maintaining the theoretical availability of current and future TSP production. In August 2013, the Army solicited contractor bids for TSP low-rate initial production, before announcing it would negotiate a sole-source two-year ID/IQ contract with BAE Systems for up to 30 LRIP podded TSP systems, including airborne pods for Gray Eagle UAVs and other platforms and ground workstations.

In February 2016, the Army provided funding for completing development of the TSP, perhaps continuing some stability at least for the Gray Eagle, with the final substantial RDT&E development funding to BAE Systems in FY15 and FY16. The FY17 procurement budget "reinstated" the BAE Systems TSP, with the initial twelve (12) production systems already paid for with FY13 funding of $18.7 million, and the other six initial systems funded with $9.4 million in FY15 funding. Initial TSP production deliveries were due in February 2017.

So, ***Block 1*** "initial production capability" TSP LRIP – by BAE Systems – finally began (although an undisclosed number of QRC systems were already in service). In the March 2014 Army budget documents, BAE had only about 1/3 of planned TSP funding through FY14, but this was likely because a formal LRIP contract award had not yet been signed.

We believed it was most likely that the Army's TSP would remain a BAE Systems design, though we thought Northrop's ASIP or a new system could still jump in to replace it during the production run, and we believed the Army wanted to continue to keep this option open. Despite the time it has taken to get to series production for the Gray Eagle, which is a smallish MALE UAV, small – and effective – airborne SIGINT systems are still at a relatively early stage of development. Teal Group was (and still is) convinced there will eventually be high volume production of a series-production SIGINT system for MALE UAVs, but it may or may not be from BAE Systems.

Then, in February 2018 the Army once again apparently truncated BAE's TSP, ending the TSP PoR (Program of Record) in support of (preference for) an acquisition strategy of QRCs towards a Family of Systems for Grey Eagle, with BAE's TSP production ending after the initial 30 LRIP systems. These QRCs for Grey Eagle are in our forecast as ***Future (TSP) QRC Systems***.

So, our forecast from the last few years now seems to be "official." Beyond the 30 Block 1 LRIP systems from BAE Systems, future Gray Eagle (and all the other) SIGINT systems will be open for project bids. Northrop Grumman's ASIP, possibly a BAE Systems follow-on to TSP, and other systems will undoubtedly be offered for future endurance and tactical UAV competitions for the US Army and other customers – worth hundreds of millions of dollars – as we speculatively forecast in our undetermined ***Future MALE UAV SIGINT System*** forecast lines.

Some of this production could still go to BAE Systems' TSP or future variants, or it could go to a mix of TSP and ASIP, with a good possibility of a new system altogether. In any case, TSP and follow-on systems could still ultimately rival ASIP for UAV SIGINT dominance, but that is looking more and more unlikely. By 2019, TSP may have finally (again) become another very expensive, two decades-long dead end….

Our forecasts are speculative, and assume the 30 BAE Systems LRIP Block 1 TSPs will be completed, with subsequent production and funding "Available." Note that we forecast production funding in each year of actual production, not the pre-allocated FY of original Army TSP procurement funding.

 

## MQ-4C Triton SIGINT

### Triton SIGINT (I)

The US Navy's manned/UAV BAMS program did not initially have a UAV SIGINT requirement, and Northrop undoubtedly chose Sierra Nevada's inexpensive system for its MQ-4C Triton BAMS bid to keep costs low but provide some basic capability. Northrop seems to have stuck with a derivative of the simple Merlin-MC system, now designated the ***AN/ZLQ-1 ESM*** system, but in 2011 Northrop Grumman and the Navy began discussions of a more elaborate SIGINT capability for the Triton UAV. Following the Navy decision to retire some of its full-bore manned EP-3E SIGINT aircraft, Northrop and the Navy have reportedly been working on (highly classified) new capabilities. This could even eventually take the form of designated SIGINT UAVs, similar to Germany's planned "Euro Hawk," rather than simply an upgraded SIGINT capability for today's planned multi-INT Triton air vehicles. Or it might involve a more capable multi-INT sensor akin to ASIP, which would make ASIP an obvious choice.

Talks were reportedly at an early stage in late 2011, but significant classified funding has probably been in place since then. By late 2012, the Navy had announced plans for an upgraded Triton BAMS SIGINT capability, expressing hopes a system would be deployed by 2019.

Our Triton SIGINT forecast has two parts. First is for moderate near-term funding for a simple SIGINT/ESM system – listed in the Navy budget as Sierra Nevada's SIGINT High Band sensor kits and Boeing Argon ST's SIGINT Low Band sensor kits – for early production US Navy Tritons. Navy Triton production is beginning now and looks like it is holding steady to ramp up rather quickly in a few years, with international buys following soon (see *Global Hawk & Triton & Next-Gen HALE EO/IR & Radars* report for more discussion).

At some point in our forecast period, our Triton AN/ZLQ-1 ESM & ***Follow-On Triton SIGINT Sensor*** forecast lines will likely become "Available" for a still fairly small follow-on system. We are not sure when this might occur.

The second part of our Triton SIGINT forecast is for much greater "Available" funding for a much more capable follow-on system, which we dub the ***Future Triton SIGINT Suite***, likely to be bought for only a limited number of Tritons. We doubt these SIGINT Tritons will totally replace manned SIGINT for the Navy, as claimed in 2011, but we allot unit cost and funding equivalent to a speculative next-generation ASIP-type or larger system – possibly ASIP or an enlarged version of BAE Systems' TSP, but quite likely an entirely new system.

Note that Germany gave indications in 2016 of purchasing about three MQ-4C Tritons, near the end of the decade, to carry Airbus Defence & Space's already-developed ISIS (Integrated SIGINT System) sensor from the cancelled Global Hawk "Euro Hawk" SIGINT UAV program. This procurement was finally approved in March 2017. The US Navy – or the Air Force – could well develop a similar all-SIGINT HALE UAV, and Triton would be the obvious platform to use, as it is approaching certification for use in civilian airspace.

Our Future Triton SIGINT Suite forecast could easily prove conservative, as the funding we forecast is not really enough for a full-blown all-SIGINT HALE UAV program. The USAF RC-135/Rivet Joint manned SIGINT/EW aircraft is routinely budgeted at more than $200 million annually for upgrades & support alone. Developing an all-SIGINT HALE UAV sensor would likely require $100 million or more per year – but we are hesitant to forecast that much funding for a classified project that is not yet "guaranteed" to be planned or ongoing (even though it would be a very good idea, and we feel it is increasingly likely, as the Navy has cut back EP-3 funding – as if they have something else absorbing that $100 million per year…).

Our forecasts are highly speculative, as either the Follow-On Triton SIGINT Sensor or even the Future Triton SIGINT Suite program could already be under way with classified funding.

### Triton SIGINT (II): Navy Fibs a Big One, and Provides More Evidence for a Classified Dedicated-SIGINT Triton

In early 2017, Sean Burke, the Naval Air System Command's Triton program manager, reportedly claimed the Pentagon's approval of the High and Low Band Sensors for Triton (with IOC planned for FY21) would enable the Navy to retire its EP-3E Aries II SIGINT aircraft – implying that the little bitty sensors on Triton (carried along with the MFAS radar and the EO/IR sensor) could somehow replace the thousands of pounds of modern sensors aboard the four-engine Orion-based EP-3. Um… unlikely. As an indication of the continuing importance and sophistication of the EP-3, recent "Prior Years" Navy procurement funding for the small fleet stood at more than $1.3 billion as of May 2017, with $127.4 million spent in FY12 and more than $48.1 million spent in FY16 – meaning the EP-3 has large, complex, still-cutting edge SIGINT sensors. And this is just the "procurement tail" funding. Research and Development is funded with (classified) National Security Agency (NSA) Military Intelligence Program (MIP) funds – indicating the obvious source for classified Triton SIGINT RDT&E.

Burke also reportedly said, "Triton does similar things to what the EP-3 can do – similar profiles, CONOPS [Concepts of Operations], so it's kind

of a logical transition." Um… not really. A high-altitude, long-endurance, multi-INT UAV focused on its primary MFAS radar (and which is still not cleared for operations over most populated land areas) does not fly the same profile as the lower-altitude, shorter endurance, manned (with a full operations crew for processing SIGINT in real time onboard) EP-3, which has seen much service recently over land. Not hardly.

Rather, this sounds like an obvious deception to provide some confusion over the dedicated, all-SIGINT Triton likely in development for the US Navy as a classified program – remember, Germany just contracted for three of its own all-SIGINT Tritons – which would indeed try to take over some EP-3 missions (though still with a much smaller payload and no in-the-air C4I from a big manned operations crew).

In 2018, Navy officials continued to discuss the minor SIGINT capabilities to be added to Triton in 2021 (and with minor funding), and continued to imply that these might take over from the EP-3. But the Navy men always seemed embarrassed, as if they are really not comfortable lying about this whole story…. It must be much easier for Air Force officials, who simply ignore discussing their own classified new UAVs, rather than having to fudge a story to the media for why a far superior manned capability will be retired.

The first two Tritons were delivered to the Navy in FY18 with only the maritime reconnaissance capability (MFAS and EO/IR), to be followed three years later by the SIGINT/Multi-INT IOC.

### Triton SIGINT (III): Conclusions

Teal Group has no doubt that small Low and High Band SIGINT sensors aboard a multi-INT Triton will provide a useful capability. But aircraft and UAV designers (and their computers) don't usually leave much *empty* space on new aircraft for unplanned future sensors, especially aboard an aircraft as tightly-packed and low-payload as Global Hawk/Triton. This is why the U-2 is still flying – because the Global Hawk does not have the payload to replace U-2 sensor capabilities.

How even a dedicated-SIGINT Triton (with the other sensors removed) can replace the EP-3 – which is much bigger than a U-2 – is a big question, and Teal Group suspects many in the Navy are as concerned about the loss of capability as the Air Force was at every proposed U-2 retirement (every time cancelled).

But the suggestion that small, retro-fitted SIGINT sensors jammed into corners can replace the glory that is an Orion-based EP-3 is just plain silly….

## Other Airborne SIGINT

### USMC: Template for Comprehensive New Small UAV Sensor Technologies

Signals Intelligence (SIGINT) programs tend to be among the most classified programs in the U.S. and other militaries. While bits of information often become available – especially RFPs – comprehensive program information and funding tend to remain secret. It is certain that many small, probably inexpensive SIGINT sensors are currently flying aboard small UAVs, but comprehensive information is not available publicly.

On the other hand, by 2016 at least hints of programs had begun to fill out to all services and classes of small UAVs, from the Army/USMC RQ-7 Shadow and Navy MQ-8 Fire Scout at the larger tactical UAV scale, to hand-launched Army Puma mini-UAVS at the smaller end. In 2018, a raft of new sensors (not just SIGINT) for small UAVs of the U.S. Marine Corps were outlined in detail in the FY19 budget.

In February 2018, the U.S. Marine Corps FY19 procurement budget funded the *Unmanned Aerial Systems (UAS) Payloads* integration program (BLI 4787 Procurement Marine Corps), to alleviate Marine Corps Intelligence, Surveillance and Reconnaissance (ISR) capability gaps caused by rapidly changing missions, threats, and technologies. It will provide responsive capability to integrate and support rapid fielding of ISR payloads for all UAS within the Marine Corps (primarily the RQ-21A Blackjack and other small tactical and mini-UAVs). Note that total USMC funding is low, but this program line provides something of a template for what the other services are doing (with considerably more funding) through classified or unpublished programs.

Note also that in FY19, this program is being consolidated into the Program of Record (POR) for the RQ-21A Blackjack – and at that point, we expect transparency to cloud over and many programs to disappear from the PoR record, as published details focus more on RQ-21A platform and overall program progress. Funding for BLI 4787 Procurement Marine Corps will transition to BLI 0444 Aircraft Procurement, Navy (APN) in FY19.

Sensor payloads will increase the effectiveness and versatility of the Marine Corps UAS currently planned to have *Electro-Optic (EO)/Infrared (IR)* collection, *Communications Relay*, and *Automatic Identification* capabilities. Upgrades include, but are not limited to, *Signals Intelligence (SIGINT)/Electronic Warfare Support (ES)*, *Synthetic Aperture Radar (SAR)/Moving Target Indicator (MTI)*, and *Wide Area FOV* and *Hyperspectral Imagery* collection – pretty much running the gamut of sensor types – and this is all for the quite small RQ-21A Blackjack and the even smaller hand-launched Raven/Puma.

In February 2018, the U.S. Marine Corps FY19 procurement budget for *Unmanned Aerial Systems (UAS) Payloads* (BLI 4787 Procurement

 

Marine Corps) provided $14.2 million procurement funding in FY18. Systems procured included:

Eight (8) Group III (RQ-21A Blackjack) Spectral Bat Signals Intelligence (SIGINT) payloads

Fifty (50) Group I (Raven/Puma) UAS SIGINT payloads

In FY18, the UAS Payloads procurement line was expanded to include funding for Marine Corps Group I UAS system intelligence payloads. P-5 cost elements were broken out to reflect the payload procurement in support of Group III and Group I UAS. Group I and III *SIGINT/ES payloads* will fill current capability gaps for the Marine Corps ISR mission and is required as part of the Marine Corps mission to locate and target adversary *Signals of Interest (SOI).*

### Last Year's Future – Already Disappeared? CONCERTO Multi-Capability for Small UAVs

Well… in my 23+ years at Teal Group, I have seen the same desire behind CONCERTO time and time again. Of course. Why not get three sensors in one? That would be great! And, it just never works. Remember the E-10A Multi-Sensor Command and Control Aircraft (MC2A)? The JSTARS/AWACS/Rivet Joint/E-4B Advanced Airborne Command Post replacement that would combine every RF sensor and system in one aircraft, with all kinds of operational benefits? Not surprisingly, it turned out it would cost three times as much, take three times as long to develop, and be twice as heavy (or something like that). And remember this was for a very large aircraft, not a mini-UAV. The DoD is full of something-for-nothing ideas, and sometimes the best examples really do go ahead – but usually also wind up incredibly over-cost and behind schedule, and sometimes ineffective. Look at the JSF – it will not be as good as current fighters for any single mission (air superiority, ground attack, whatever), and it currently has little if any combat capability at all (software still in development…), but by combining all missions with new sensors and 3D situational awareness and next generation C4I, we have birthed a hyper-expensive, super-delayed, too-big-to-fail aircraft program that may or may not ever be successful, but which will never be the low-cost, please-every-service and every customer aircraft that was initially pitched – and paid for.

CONCERTO will likely result in some good basic research, and some advancements in combining RF systems and antennas. But to expect the next Class 3 UAV to have a sensor that does the work of three, with the same weight and cost as just one? Don't count on it. And don't count on a CONCERTO production program in the next 10 years….

## Funding Forecast

| *RDT&E (FY19$ Millions)* | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | FY26 | FY27 | FY28 |
|---|---|---|---|---|---|---|---|---|---|---|
| **All RDT&E** | | | | | | | | | | |
| Common ASIP (UAV) | 42.0 | 34.0 | 36.0 | 40.0 | 28.0 | 26.0 | 24.0 | 40.0 | 44.0 | 44.0 |
| Global Hawk & HALE ASIP | 16.0 | 24.0 | 22.0 | 14.0 | 12.0 | 10.0 | 14.0 | 10.0 | 12.0 | 14.0 |
| Reaper & MALE ASIP | 14.0 | 16.0 | 18.0 | 12.0 | 18.0 | 16.0 | 18.0 | 16.0 | 18.0 | 20.0 |
| Common ASIP (Manned) | 12.0 | 8.0 | 10.0 | 8.0 | 10.0 | 12.0 | 8.0 | 10.0 | 8.0 | 6.0 |
| Guardrail ASIP/ESA | 4.0 | 8.0 | 6.0 | 2.0 | 4.0 | 4.0 | 2.0 | 4.0 | 6.0 | 6.0 |
| **Subtotal ASIP RDT&E [Northrop Grumman]** | **88.0** | **90.0** | **92.0** | **76.0** | **72.0** | **68.0** | **66.0** | **80.0** | **88.0** | **90.0** |
| TSP QRC [BAE Systems] | 1.0 | — | — | — | — | — | — | — | — | — |
| TSP Block 1 [BAE Systems] | 3.0 | 2.0 | — | 1.0 | — | 1.0 | — | — | — | — |
| Future (TSP) QRC Systems [Available] | 14.0 | 12.0 | 10.0 | 8.0 | 10.0 | 8.0 | 6.0 | 22.0 | 24.0 | 24.0 |
| Future MALE UAV SIGINT System [Available] | 16.0 | 16.0 | 22.0 | 26.0 | 26.0 | 24.0 | 28.0 | 34.0 | 36.0 | 38.0 |
| Triton ZLQ-1 ESM or Follow-On [Sierra Nevada/Boeing Argon ST & Available] | 7.0 | 9.0 | 8.0 | 7.0 | 8.0 | 6.0 | 4.0 | 3.0 | 4.0 | 3.0 |
| Future Triton SIGINT Suite [Available] | 70.0 | 58.0 | 46.0 | 38.0 | 36.0 | 44.0 | 56.0 | 46.0 | 42.0 | 40.0 |
| RC-135 (USAF) | 58.0 | 46.0 | 44.0 | 52.0 | 46.0 | 40.0 | 48.0 | 50.0 | 52.0 | 50.0 |
| Rivet Joint (UK RAF) | 18.0 | 28.0 | 22.0 | 20.0 | 18.0 | 16.0 | 14.0 | 18.0 | 20.0 | 24.0 |
| EP-3/SPA# | 52.0 | 42.0 | 46.0 | 40.0 | 32.0 | 28.0 | 26.0 | 22.0 | 18.0 | 20.0 |
| **Subtotal non-ASIP SIGINT RDT&E** | **239.0** | **213.0** | **198.0** | **192.0** | **176.0** | **167.0** | **182.0** | **195.0** | **196.0** | **199.0** |

*#Much EP-3 funding is now classified, in National Security Agency (NSA) Military Intelligence Program (MIP) funding lines; our forecast is speculative.*

| *Procurement (FY19$ Millions)* | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | FY26 | FY27 | FY28 |
|---|---|---|---|---|---|---|---|---|---|---|
| **All Production and Upgrade & Support** | | | | | | | | | | |
| ASIP (UAV) | 62.0 | 56.0 | 58.0 | 56.0 | 64.0 | 62.0 | 52.0 | 58.0 | 52.0 | 50.0 |
| ASIP (Manned) | 18.0 | 20.0 | 16.0 | 18.0 | 26.0 | 24.0 | 22.0 | 20.0 | 18.0 | 16.0 |
| **Subtotal ASIP Procurement [Northrop Grumman]** | **80.0** | **76.0** | **74.0** | **74.0** | **90.0** | **86.0** | **74.0** | **78.0** | **70.0** | **66.0** |
| TSP QRC [BAE Systems] | 1.0 | 1.0 | 1.0 | — | — | — | — | — | — | — |
| TSP Block 1 [BAE Systems] | 30.0 | 6.0 | 4.0 | 5.0 | 3.0 | 3.0 | 2.0 | 2.0 | — | — |
| Future (TSP) QRC Systems [Available] | 20.0 | 70.0 | 98.0 | 90.0 | 40.0 | 16.0 | 14.0 | 18.0 | 22.0 | 20.0 |
| Future MALE UAV SIGINT System [Available] | 48.0 | 88.0 | 90.0 | 136.0 | 162.0 | 188.0 | 190.0 | 184.0 | 186.0 | 192.0 |
| Triton ZLQ-1 ESM or Follow-On [Sierra Nevada/Boeing Argon ST & Available] | 6.0 | 12.0 | 18.0 | 47.0 | 72.0 | 84.0 | 76.0 | 76.0 | 64.0 | 62.0 |
| Future Triton SIGINT Suite [Available] | 56.0 | 8.0 | 54.0 | 62.0 | 62.0 | 52.0 | 54.0 | 64.0 | 66.0 | 64.0 |
| RC-135 (USAF) | 186.0 | 184.0 | 190.0 | 172.0 | 160.0 | 168.0 | 162.0 | 164.0 | 160.0 | 164.0 |
| Rivet Joint (UK RAF) | 44.0 | 42.0 | 34.0 | 40.0 | 42.0 | 46.0 | 44.0 | 46.0 | 44.0 | 48.0 |
| EP-3/SPA | 36.0 | 32.0 | 32.0 | 28.0 | 16.0 | 14.0 | 18.0 | 14.0 | 10.0 | 12.0 |
| **Subtotal non-ASIP SIGINT Procurement** | **427.0** | **443.0** | **521.0** | **580.0** | **557.0** | **571.0** | **560.0** | **568.0** | **552.0** | **562.0** |

# Production Forecast

| User (Platform) | Through 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TSP Block 1 [BAE Systems]** | | | | | | | | | | | | |
| US Army (Gray Eagle) | 20 | 10 | — | — | — | — | — | — | — | — | — | 30 |
| **Future (TSP) QRC Systems [Available]** | | | | | | | | | | | | |
| US Army (Gray Eagle) | — | 6 | 24 | 28 | 30 | 14 | — | — | — | — | — | 102 |
| **Future MALE UAV SIGINT System [Available]** | | | | | | | | | | | | |
| Undetermined (Various) | 8 | 8 | 16 | 16 | 24 | 28 | 32 | 32 | 32 | 32 | 32 | 260 |
| **Triton AN/ZLQ-1 ESM & Follow-On Triton SIGINT Sensor [Sierra Nevada/Boeing Argon ST & Available]** | | | | | | | | | | | | |
| USN (Triton MQ-4C) | 4# | 2 | 2 | 4 | 2 | 2 | 4 | 5 | 5 | 5 | 5 | 40 |
| Australia (MQ-4C Triton) | — | — | — | — | 1 | 1 | 2 | 2 | 2 | — | — | 8 |
| Germany (MQ-4C Triton) | — | — | — | — | — | — | 1 | 2 | — | — | — | 4 |
| Undetermined (MQ-4C Triton) | — | — | — | — | — | — | 1 | 1 | 1 | 1 | 1 | 5 |
| **Total** | **4#** | **2** | **2** | **4** | **3** | **3** | **8** | **10** | **8** | **6** | **6** | **56** |

*#LRIP ESM systems*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Future Triton SIGINT Suite [Available]** | | | | | | | | | | | | |
| USN (Triton) | — | 1 | — | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 |

**October 2019**