

# Boosting Defence Cooperation in Europe: An Analysis of Key Military Capabilities

**Air-to-Air Refuelling, Remotely Piloted Aircraft Systems,  
Space-based Capabilities for Security and Defence,  
Intelligence Surveillance and  
Reconnaissance Capabilities in the Maritime Domain**

Edited by

Alessandro Marrone, Jean-Pierre Maulny, Daniele Fattibene, Andrea Aversano Stabile



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## Index

<b>Introduction</b> .....	4
<b>Executive Summary</b> .....	5
<b>Air-to-Air Refuelling (AAR)</b> .....	6
Estimated Expenditure .....	6
Capabilities .....	6
Cooperation .....	10
<b>Remotely Piloted Aerial Systems (RPAS)</b> .....	13
Estimated expenditure .....	13
Capabilities .....	13
MALE RPAS .....	13
Tactical RPAS .....	15
Small, mini and micro RPAS .....	16
Counter-RPAS: a new and growing sector .....	17
Cooperation .....	18
<b>Space-Based Capabilities for Security and Defence</b> .....	21
Estimated expenditure .....	21
Capabilities .....	21
Earth Observation .....	21
SATCOM .....	23
Cooperation .....	26
Earth Observation .....	26
SATCOM .....	27
<b>Intelligence Surveillance Reconnaissance (ISR) Capabilities in the Maritime Domain</b> .....	29
Estimated Expenditure .....	29
Maritime Patrol Aircraft (MPA) .....	29
Capabilities .....	29
Cooperation .....	30
Naval helicopters with ISR Tasks .....	31
Capabilities .....	31
Cooperation .....	32
Naval units under 3,000 tons .....	32

Capabilities .....	32
Cooperation.....	34
Maritime Unmanned Aerial Vehicle (UAV) and Unmanned Underwater Vehicle (UUV).....	34
Capabilities .....	34
Cooperation.....	35
<b>Annex I – Expenditure Estimate’s Explanation.....</b>	<b>37</b>
Introduction .....	37
Number of Countries .....	37
Available Sources.....	38
Variation across PMA31 Countries.....	38
Multiannual Investments .....	39
Currency Exchange Rate .....	39
Rounding .....	39
Specific Clarifications for Different Chapters.....	39
Chapter 1 – Air-to-Air Refuelling (AAR) .....	39
Chapter 2 – Remotely Piloted Aerial Systems .....	40
Chapter 3 – Space-based capabilities for Security and Defence .....	40
Chapter 4 – ISR Capabilities in the Maritime Domain.....	40
List of Acronyms .....	42

## Introduction

This study is based on the compilation and analysis of open source information conducted as part of the project “Permanent Monitoring and Analysis of military capabilities and defence sector trends” (PMA), managed by a Consortium of European think tanks and funded by the European Defence Agency (EDA)<sup>1</sup>. The content of the publication and the opinions expressed by the authors do not represent the EDA’s official position.

The study aims at analysing the developments regarding key military capabilities of 31 European countries (hereinafter PMA31)<sup>2</sup>, in four specific areas: Air-to-Air Refuelling (AAR), Remotely Piloted Aircraft Systems (RPAS), Space-based capabilities for security and defence, Intelligence Surveillance Reconnaissance (ISR) capabilities in the maritime domain. A chapter is dedicated to each area, by focusing on estimated expenditures, capability development, and cooperation among the considered countries. In doing so, it takes into account the developments occurred in the timeframe going from September 2017 until early May 2018.

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<sup>1</sup> Previous studies resulting from this project encompass: Alessandro Marrone, Olivier de France and Daniele Fattibene (eds.), *Defence Budgets and Cooperation in Europe: Developments, Trends and Drivers*, January 2016, <http://www.iai.it/en/node/5850>. Alessandro Marrone, Olivier de France and Daniele Fattibene (eds.), *Defence Budgets and Cooperation in Europe: Trends and Investments*, July 2016, <http://www.iai.it/en/node/6542>.

<sup>2</sup> Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom (UK).

## Executive Summary

The estimated expenditures that PMA31 countries are supposed to devote to platforms having AAR capabilities in 2018 range between EUR 1 billion and EUR 2.1 billion. At present, 190 platforms which can perform AAR tasks, split into 12 basis models, are held by fifteen PMA31 countries.<sup>3</sup> The European Air Transport Command (EATC) can become a catalyst of cooperative efforts, since its methodology embraces the logic of pooling and sharing of resources at multinational level.

The estimated expenditures allocated by 15 PMA31 countries for RPAS capabilities in 2018 range between EUR 200 million and EUR 500 million.<sup>4</sup> PMA31 countries still rely notably on the United States (US) for RPAS, and this predominance in the European market may be further strengthened by Washington's plans to revise the military exports regulation. Hence, it is urgent to invest on cooperative programs, the most important being the EURODRONE, participated by France, Germany, Italy and Spain. Coordination among the national planning of these four countries is needed for an effective and timely procurement and entering into service of EURODRONE, as well as to start addressing the training, logistics and Maintenance, Repair and Overhaul (MRO) aspects of cooperation among the owners of this platform.

The estimated expenditure in 2018 by eight PMA31 countries<sup>5</sup> in space-based capabilities for security and defence ranged between EUR 600 and 900 million, focused on capabilities fulfilling Earth Observation (EO) or satellite communication (SATCOM) tasks. The GOVSATCOM project continues to be an important cooperative effort, yet it needs to be carved in a way to avoid duplications with existing national or bilateral programs which so far proved to be an effective way to spur cooperation among interested PMA31 countries.

When it comes to Intelligence Surveillance and Reconnaissance (ISR) capabilities in the maritime domain, seven PMA31 countries own proper Maritime Patrol Aircraft (MPA),<sup>6</sup> while other four have aircraft which can be used for maritime patrol missions.<sup>7</sup> The estimated expenditures that these countries are to allocate for MPA in 2018 are around EUR 275 million. Moreover, there are around 550 naval helicopters with ISR tasks in 15 PMA31 countries<sup>8</sup> whose expenditures for 2018 are estimated at around EUR 679 million, and their number is increasing following the deliveries to several European countries. Twenty-four PMA31 countries<sup>9</sup> hold around 220 naval units under 3,000 t. In 2018, estimated expenditures, worth around EUR 668 million, will cover a mix of Offshore Patrol Vessels (OPV), corvettes and coastal patrol vessels. Finally, ten PMA31 countries<sup>10</sup> currently hold maritime unmanned vehicles, either aerial or underwater, and keep developing these platforms as they are expected to allocate around EUR 27 million to development and/or procurement programs.

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<sup>3</sup> Belgium, Bulgaria, France, Germany, Italy, Lithuania, Luxembourg, Norway, Portugal, Romania, Slovakia, Spain, Sweden, the Netherlands and the UK.

<sup>4</sup> Belgium, Bulgaria, Czech Republic, France, Germany, Greece, Italy, Latvia, Luxembourg, Poland, Slovenia, Spain, Switzerland, the Netherlands and the UK.

<sup>5</sup> Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Spain and the UK.

<sup>6</sup> France, Germany, Greece, Italy, Norway, Poland and Portugal.

<sup>7</sup> Denmark, Estonia, Finland and Sweden.

<sup>8</sup> Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Italy, Lithuania, Norway, Poland, Portugal, Spain, Sweden and the UK.

<sup>9</sup> Belgium, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovenia, Spain and the UK.

<sup>10</sup> Croatia, Denmark, Estonia, France, Germany, the Netherlands, Norway, Poland, Spain and Sweden.

## Air-to-Air Refuelling (AAR)

### Estimated Expenditure

According to available sources, the estimated expenditure that PMA31 countries are supposed to devote to platforms having AAR capabilities in 2018 ranges between EUR 1 billion and EUR 2.2 billion.<sup>11</sup> Such range is slightly narrowed in comparison with 2017, since the budget allocated by PMA31 countries for that year has been estimated between the minimum value of EUR 1.3 billion and the maximum amount of EUR 3 billion. However, both 2017 and 2018 ranges clearly demonstrate a trend of increasing expenditure towards AAR platforms, bearing in mind that overall budget allocated for these capabilities in 2016 oscillated between EUR 1 billion and EUR 1.4 billion.

### Capabilities

The number of platforms owned by states is not the only parameter to assess their AAR capabilities since other features such as the range, the cruising speed and the fuel capacity have a significant impact. Therefore, as showed in the below table, a comprehensive analysis is required in order to have clear indicators regarding AAR capabilities of PMA31 countries. At the same time, it is worth bearing in mind the difference between aircraft which have been designed to perform AAR and platforms which may be adjusted to carry out refuelling tasks. While only the first group of basis models is included in the table with regard to 2018, data for 2017 may also include aircraft from the second group. Accordingly, 190 platforms which can already perform AAR tasks without need of upgrade, split into 12 basis models, are currently held by 15 PMA31 countries. A comparison of the number of platforms for the last two years is useful to highlight capability trends across PMA31 countries in this domain.

On the basis of estimated expenditures from 2018 onwards, it seems predictable that new platforms performing AAR capabilities will be introduced, thus paving the way for a generational replacement of the oldest ones. This development is supported by procurements and actions recently decided by PMA31 countries or planned for the foreseeable future.

A notable update on new acquisition concerns the Belgian procurement of an additional Airbus A-330 Multi Role Tanker Transport (MRTT) to the total European pool of eight, whose operability is expected to be reached by 2025, through an investment worth EUR 258 million<sup>12</sup> - leading to the decommissioning of the first Belgian C-130H.<sup>13</sup> Within the procurement program decided in 2017,

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<sup>11</sup> Figures for 2018 have been found for the following PMA31 countries: Belgium, Croatia, France, Germany, Italy, Luxembourg, the Netherlands, Norway, Spain and the UK.

<sup>12</sup> Maarten Van Den Driessche, "Belgian Defence invests in Airbus A330-MRTT Multi-Role Tanker/Transport plane", in *Aviation24.be*, 22 December 2017, <https://wp.me/p5lySI-9jh>.

<sup>13</sup> Bob Fischer, "Belgien stellt die erste C-130H außer Dienst", in *Aerobuzz.de*, 19 January 2018, <https://www.aerobuzz.de/militar-news/belgien-stellt-die-erste-c-130h-ausser-dienst>.

France will receive its first Phénix in 2018:<sup>14</sup> the 12 units of this version of A-330 MRTT will replace the old fleet of 14 KC-135 and C-135.<sup>15</sup> Moreover, the two A-330 MRTT jointly acquired by the Netherlands and Luxembourg, whose delivery is scheduled for 2020, will foster the phasing out of the two KDC-10 currently used by the Dutch fleet.<sup>16</sup>

Four A-400M have been delivered to Germany between September 2017 and March 2018.<sup>17</sup> The German fleet is now composed of 18 Airbus, thus becoming the leader in numerical terms in Europe together with the United Kingdom (UK).<sup>18</sup> Spain has received its second operational A-400M equipped with two pods enabling the refuelling of fighter jets,<sup>19</sup> and is waiting for the third one so that the phasing out of old C-130 Hercules could start by 2022.<sup>20</sup>

France has welcomed its first A-400M (MSN62) with pods<sup>21</sup> and, subsequently, other two A-400M out of 15, with the remaining ones to be delivered in 2018.<sup>22</sup> In December 2017, the Directorate General of Armaments (DGA, *Direction Générale de l'Armement*) has announced that the entire in service transport aircraft will be updated with AAR capacities through a retrofit campaign, without providing clear indications on the timeline. Because of the delay of A-400M entering into service, France has ordered four C-130J to fill the temporary capability gap and has just received the first unit,<sup>23</sup> set to reach full operational capability by 2020.<sup>24</sup> Luxembourg is waiting for the reception of

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<sup>14</sup> Airbus, *First A330 MRTT Phénix for France makes maiden flight*, 7 September 2017, <http://www.airbus.com/content/dam/corporate-topics/publications/press-release/Photo-Release-MILITARY-AIRCRAFT-07092017-ENG.pdf>.

<sup>15</sup> “First French A330 MRTT Phénix maiden flight”, in *Blog Before Flight*, 10 September 2017, <https://www.blogbeforeflight.net/2017/09/first-french-a330-mr-tt-phenix-maiden-flight.html>.

<sup>16</sup> Nicholas Fiorenza, “Netherlands to host NATO MRTT unit”, in *IHS Jane’s 360*, 26 January 2018, <http://www.janes.com/article/77380>.

<sup>17</sup> Craig Hoyle, “A400M deliveries hit new high in 2017”, in *FlightGlobal*, 17 January 2018, <https://www.flightglobal.com/news/articles/a400m-deliveries-hit-new-high-in-2017-444971>. See also Thomas Wiegold, “Der 50. (ausgelieferte) A400M geht an die Bundeswehr”, in *Augen Geradeaus!*, 27 September 2017, <http://augengeradeaus.net/2017/09/der-50-ausgelieferte-a400m-geht-an-die-bundeswehr>; and “Consegnati il 60° e 61° A-400M”, in *Portale Difesa*, 23 March 2018, [http://www.portaledifesa.it/index~phppag,3\\_id,2265.html](http://www.portaledifesa.it/index~phppag,3_id,2265.html).

<sup>18</sup> Craig Hoyle, “A400M deliveries hit new high in 2017”, cit. See also “A400M für Deutschland und Frankreich”, in *Flug Revue*, 22 March 2018, <https://www.flugrevue.de/militaerluftfahrt/kampfflugzeuge-helikopter/750514>.

<sup>19</sup> Robbin Laird, “Spanish Air Force Update on A400M”, in *SLDinfo.com*, 6 January 2018, <https://sldinfo.com/?p=107312>.

<sup>20</sup> “La Fuerza Aérea de España incorpora su segundo avión de transporte militar A400M”, in *Máquina del Combate del Perú*, 4 January 2018, <http://maquina-de-combate.com/blog/?p=55352>.

<sup>21</sup> Pierre Tran, “France receives its first A400M fitted with pods for midair refueling”, in *Defense News*, 1 December 2017, <https://www.defensenews.com/air/2017/12/01/france-receives-its-first-a400m-fitted-with-pods-for-midair-refueling>.

<sup>22</sup> Justine Boquet, “L’Armée de l’Air reçoit son 13ème A400M”, in *Air&Cosmos*, 20 December 2017, <http://www.air-cosmos.com/l-armee-de-l-air-recoit-son-13eme-a400m-104849>. See also “France Receives 14th A400M Ahead of Schedule”, in *Mirage14*, 24 March 2018, <http://mirage14.blogspot.it/2018/03/france-receives-14th-a400-ahead-of.html>.

<sup>23</sup> Victor Barreira, “France receives first C-130J Hercules”, in *IHS Jane’s 360*, 1 January 2018, <http://www.janes.com/article/76683>. See also, according to the last report, Beth Stevenson, “French government confirms C-130J buy”, in *FlightGlobal*, 4 February 2016, <https://www.flightglobal.com/news/articles/french-government-confirms-c-130j-buy-421606>.

<sup>24</sup> The second aircraft will be delivered by June 2018 while the other two are expected to be on the French soil the following year. See Helen Chachaty, “Priorité aux expérimentations pour le C-130J”, in *Le Journal de l’Aviation*, 18 January 2018, <https://www.journal-aviation.com/actualites/39393-priorite-aux-experimentations-pour-le-c-130j>.

the A-400M procured together with Belgium as part of a project worth EUR 420 million.<sup>25</sup> The delivery of the aircraft is planned for 2020 and its operational life is supposed to last 35 years. Slovakia has received from Leonardo the first (out of two) C-27J aircraft ordered in 2014.<sup>26</sup> Conversely, the last operational C-27J is close to be dismissed by the Bulgarian government since the contract for technical support signed with Leonardo expired in March 2017 and, at the moment, no solution has been found because of fund shortages. Lastly, Portugal may be endowed with new AAR capabilities in the immediate future since it has confirmed its desire to purchase at least five Embraer KC-930 multi-purpose transport aircraft able to fulfil AAR.<sup>27</sup> However, due to the amount of time required to conclude this procurement plan, the Portuguese government seems to focus on the modernisation of its fleet of three C-130H-30 in 2018.<sup>28</sup> Concerning C-130H Hercules, although Sweden has already planned to modernize its ageing fleet of five units (Tp-84) until 2021, decisions related to funds have not been unveiled yet.<sup>29</sup> Germany has shown interest in buying three C-130J-30 and three KC-130J, for an estimated amount of EUR 1.4 billion, which may be used to perform AAR.<sup>30</sup> In addition, potential acquisitions of AAR platforms have been long under consideration in Poland, albeit with no precise indication of the basis model, because of the acknowledgment of a capability gap to be filled only within the next 15 years.<sup>31</sup>

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<sup>25</sup> Roxana Mironescu and Pol Schock, “Luxembourg to Reinforce Defence Capabilities”, in *Luxembourg Times*, 17 April 2018, <https://luxtimes.lu/luxembourg/33510-luxembourg-to-reinforce-defence-capabilities>.

<sup>26</sup> “Leonardo consegna il primo C-27J Spartan alle forze armate slovacche”, in *Fly Orbit News*, 31 October 2017, <https://wp.me/p7AKj8-a9l>. See also “Slovakia saved money on late Spartan aircraft”, in *The Slovak Spectator*, 2 January 2018, <https://spectator.sme.sk/c/20729938/slovakia-saved-money-on-late-spartan-aircraft.html>.

<sup>27</sup> Portuguese Government, *Apresentada a equipa de negociação para a compra de aviões KC-390*, 4 September 2017, <https://www.portugal.gov.pt/pt/gc21/comunicacao/noticia?i=20170904-mdn-kc390>.

<sup>28</sup> “Governo prevê dotação de 270 ME para Programação Militar em 2018”, in *Diário de Notícias*, 2 October 2017, <https://www.dn.pt/lusa/interior/governo-preve-dotacao-de-270-me-para-programacao-militar-em-2018-8815781.html>.

<sup>29</sup> Swedish Armed Forces, *Materieförsörjning 2014-2021*, 2013, [https://www.forsvarsmakten.se/siteassets/4-om-myndigheten/vart-arbetsatt/materieforsorjning/mp13\\_materieforsorjning\\_2014-2021.pdf](https://www.forsvarsmakten.se/siteassets/4-om-myndigheten/vart-arbetsatt/materieforsorjning/mp13_materieforsorjning_2014-2021.pdf).

<sup>30</sup> “Germany requests C-130J and KC 130Js”, in *Shephard*, 8 May 2018, <https://www.shephardmedia.com/news/mil-log/germany-requests-c-130j-and-kc-130j-aircraft>.

<sup>31</sup> “Szatkowski: nie będziemy tworzyli od podstaw nowej dywizji pancerniej”, in *Gazeta Prawna*, 22 November 2017, <http://www.gazetaprawna.pl/artykuly/1086971>.

Table 1: AAR Capabilities among PMA31 countries

Basis Model	AAR capacity	Fuel capacity (tons/liter)	Range (in km)	Cruising speed (km/h)	2017 Holders	2017 Total Quantity	2018 Quantity per Holders	2018 Total Quantity
A-310 MRTT	Hose and drogue	74 t	11,000	860	DE, FR	5	4 DE	4
C-27J	Hose and drogue	12,320 l	1,759	583	BG, EL, IT, LT, RO	33	3 BG, 12 IT, 3 LT, 7 RO, 1 SK	26
C-130	Probe and drogue	33 t	3,334	643	AT, BE, DK, EL, ES, FR, IT, NL, NO, PL, PT, RO, SE, UK	44	11 BE, 11 ES, 2 NL, 2 PT, 1 RO, 1 SE	28
KC-130J	Probe and drogue	26 t	5,250	671	IT	2	2 IT	2
KC-767	Boom and receptacle	73 t	12,200	851	IT	4	4 IT	4
KDC-10	Boom and receptacle	161 t	7,080	890	NL	2	2 NL	2
B-707	Probe and drogue	65,590 l	9,262	977	ES	1	1 ES	1
KC-135	Probe and drogue	91 t	2,419	853	FR	3	3 FR	3
C-135	Boom and receptacle	87 t	5,550	933			11 FR	11
A-330 MRTT (Voyager KC2/3)	Hose and drogue	111 t	14,800	860	DE-NO, LU-NL, FR, UK	21	1 BE, 5 DE-NO, 1 FR, 2 LU-NL, 14 UK	23
C-160	Probe and drogue	28,000 l	1,853	495	DE, FR	63	33 DE, 21 FR	54
A-400M	Probe and drogue	50 t	8,900	780	DE, ES, FR, UK	26	13 DE, 1 ES, 1 FR, 1 LU, 16 UK	32

## Cooperation

In accordance with the aforementioned estimated expenditures and capability developments, future opportunities of cooperation may arise and become effective in different timeframes.

The Belgian decision to acquire a new A-330 MRTT will enlarge the Multinational Multi-role tanker transport Fleet (MMF), a multinational program aiming at pooling the operations of aircraft now owned by five countries. Albeit Belgium, Germany, Luxembourg, the Netherlands and Norway will receive their aircraft between 2020 and 2022,<sup>32</sup> cooperative efforts have already started and/or further pursued. First, the Spanish company Indra has been contracted by Airbus to build a refuelling simulator for A-330 MRTT by 2019, so that all the European pilots may have the opportunity to familiarize with the systems of the aircraft.<sup>33</sup> In addition, this agreement may further encourage the Spanish Ministry of Defence (MoD) to join the fleet of A-330 MRTT, as shown by recent plans concerning the acquisition of three aircraft of this type.<sup>34</sup> Second, on the basis of an agreement signed between the North Atlantic Treaty Organisation (NATO) and Elbit Systems, the fleet of A-330 MRTT will be equipped with J-Music Directional Infrared Counter Measures (DIRCM) self-protection systems aimed to allow aircraft to safely operate even in hostile environments.<sup>35</sup>

The intent of both Germany and Spain to sell part of their planned A-400M may foster the acquisition of these platforms by other PMA31 countries, as the recent interest of Czech Republic and Switzerland shows.<sup>36</sup> Because of this overproduction, Airbus has ordered a 45 per cent reduction in its factories in order to prioritize the purchase of stocks.<sup>37</sup> Meanwhile, the Organisation for Joint Armement Cooperation (OCCAR, *Organisation Conjointe de Coopération en matière d'Armement*) procurement of DIRCM systems to be installed on nine Spanish A-400M,<sup>38</sup> as well as the provision of training and Maintenance, Repair and Overhaul (MRO) of these aircraft, could spur significant cooperation among PMA31 countries. Considering the latter example, bilateral contacts took place between France and Spain for the transfer of a French aircraft to the plant of La Muñoza because of the necessity of MRO works.<sup>39</sup> Bilateral ties would also be possible between France and Germany,

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<sup>32</sup> Craig Hoyle, "Airbus tops up A330 tanker backlog", in *FlightGlobal*, 15 January 2018, <https://www.flightglobal.com/news/articles/airbus-tops-up-a330-tanker-backlog-444893>.

<sup>33</sup> Richard Tomkins, "Indra developing new simulator for A330 MRTT refuelling", in *UPI*, 17 October 2017, <https://upi.com/6641572t>.

<sup>34</sup> B. Carrasco, "El Ejército del Aire apuesta por la compra de tres A330 MRTT", in *Infodefensa*, 2 April 2018, <http://www.infodefensa.com/es/2018/04/02/noticia-ejercito-apuesta-compra.html>.

<sup>35</sup> "NATO orders Elbit Systems' DIRCM systems", in *Shepard*, 22 December 2017, <https://www.shephardmedia.com/news/digital-battlespace/elbit-systems-receives-follow-dircm-contract>.

<sup>36</sup> Jaroslaw Adamowski, "Czech, Swiss militaries could lease Airbus A400M from Germany", in *Defense News*, 14 February 2017, <https://www.defensenews.com/air/2017/02/14/czech-swiss-militaries-could-lease-airbus-a400m-from-germany>.

<sup>37</sup> B. Carrasco, "Airbus reducirá la producción del A400M tras entregar 20 aeronaves este año", in *Infodefensa*, 22 December 2017, <http://www.infodefensa.com/es/2017/12/22/noticia-airbus-entregara-veintena-a400m.html>. See also Tomás Monago, "La producción del A400M se reducirá un 45% en dos años para dar salida al stock", in *Diario de Sevilla*, 21 December 2017, [http://www.diariodesevilla.es/\\_47a4c437](http://www.diariodesevilla.es/_47a4c437).

<sup>38</sup> Indra, *Indra will protect the Spanish Airforce A400M fleet with its inShield DIRCM system*, 23 February 2018, <https://www.indracompany.com/en/node/74271>.

<sup>39</sup> Julio Maíz Sanz, "Un A400M francés sobre la ciudad de Madrid", in *Defensa.com*, 22 December 2017, <http://www.defensa.com/otan-y-europa/a400m-frances-sobre-ciudad-madrid>.

in light of the contracts signed by the two countries with Indra for the development of A-400M aircraft simulators in order to train pilots.<sup>40</sup>

Other recent examples of bilateral cooperative initiatives are the joint procurement programs for A-330 MRTT aircraft by, on the one hand, Luxembourg and the Netherlands and, on the other, Germany and Norway. Thanks to the increasing support provided by Leonardo, Italy has the potential to become a relevant cooperative partner on AAR for PMA31 countries such as Bulgaria, Slovakia and the UK. In the latter case, it may also be highlighted that Brexit should not be configured as an insurmountable hurdle for the creation of close bilateral cooperative ties for London.

Lastly, the European Air Transport Command (EATC) may be another catalyst of cooperative efforts, since its methodology embraces the logic of pooling and sharing of resources at a multinational level. In this context, the Letter of Intent (LoI) signed on 25<sup>th</sup> of January 2018 by European Defence Agency (EDA), EATC and OCCAR for common in-service support for A-400M aircraft aims at facilitating the interoperability among PMA31 countries which hold this platform.<sup>41</sup> Against this backdrop, a significant contribution may be also brought by the launch of the permanent Structured Cooperation (PESCO).

In this domain, the role covered by Italy may be enhanced, in light of the decision to appoint Gen. Francesco Agresti as Deputy Commander in charge of supervising the operational phase of the EATC in its headquarters in Eindhoven.<sup>42</sup> Noticeably, EART 2018 tanker exercise took place in April and by involving France, Germany, Italy, the Netherlands and the United States (US), it was the first training opened to non-EATC members.<sup>43</sup> The US has shown interest in this initiative after having accepted to cooperate in the Movement Coordination Centre Europe (MCCE), located in Eindhoven too, in order to gain benefits from a deep cooperation aiming at reducing costs through the mutual use of AAR capabilities.<sup>44</sup>

In view of the developments occurred, a positive trend for AAR capabilities and cooperation among PMA31 countries has been detected. Accordingly, albeit only one new contract for the provision of AAR platforms has been signed since September 2017, several deliveries have been completed and a number of plans is currently in progress in order to contribute to replacing ageing fleets, as confirmed by the significant amount of expenditure estimated for 2018. Nevertheless, a generational turnover is difficult to realize in the short-term also given that clearances are not easy to be obtained, since a refueller generally receives the certification in a timespan of around six months. Indeed, a progressive numerical reduction of different types of refuellers and fighter aircraft requires a continual effort to grant the mutual AAR certification, as well as to overcome obstacles deriving from

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<sup>40</sup> Indra, *Indra works on the development of new simulators for the A400M, one of the most powerful aircrafts in the world, for the French and German air force*, 18 April 2018, <https://www.indracompany.com/en/noticia/indra-works-development-new-simulators-a400m-one-powerful-aircrafts-world-french-german-air>.

<sup>41</sup> OCCAR, *Increased Cooperation between OCCAR, EATC and EDA*, 25 January 2018, <https://www.occar.int/node/306>. See also EDA, *EDA, EATC and OCCAR-EA enhance cooperation for A400M in-service phase*, 25 January 2018, <https://eda.europa.eu/info-hub/press-centre/latest-news/2018/01/25/eda-eatc-and-occar-ea-enhance-cooperation-for-a400m-in-service-phase>.

<sup>42</sup> Italian Ministry of Defence, *Il Gen. B.A. Francesco Saverio Agresti ha assunto l'incarico di Vice Comandante dell'European Air Transport Command di Eindhoven (NL)*, 17 November 2017, [https://www.difesa.it/SMD/\\_Eventi/Pagine/GenBA\\_Agresti\\_assume\\_incarico\\_viceComte\\_EATC.aspx](https://www.difesa.it/SMD/_Eventi/Pagine/GenBA_Agresti_assume_incarico_viceComte_EATC.aspx).

<sup>43</sup> EATC, *EART 2018 will be launched soon*, 5 March 2018, <https://eatc-mil.com/post/eart-2018-will-be-launched-soon>.

<sup>44</sup> Movement Coordination Centre Europe official website: <http://mcce-mil.com>.

the lack of uniformity and common criteria among dedicated authorities in Europe. The path towards a European Military Airworthiness Authority may represent a solution to this bottleneck, thus paving the way for a faster and more harmonized AAR capability development.

The conduct of training exercises which have foreseen the involvement of PMA31 countries not holding AAR platforms, such as Czech Republic in the Ample Strike exercise,<sup>45</sup> may be considered as a signal for future acquisitions. In line with this reasoning, the Croatian decision to procure a new fighter aircraft -the second-hand Israeli F-16 seems likely to be selected-<sup>46</sup> may lead to the search for AAR capabilities, after the participation in trainings like Vega 2017 where KC-130J and KC-767 have refuelled Eurofighter Typhoons.<sup>47</sup> However, the participation to training exercises or the draft of procurement plans for fighter aircraft are not necessarily related to the future endowment of AAR capabilities, as shown by the case of Finland. This country, in spite of the participation to the Arctic Challenge Exercise (ACE 17)<sup>48</sup> and of its willingness to replace its fleet of F-18 fighter aircraft,<sup>49</sup> has not unveiled any plans regarding potential acquisitions. This may depend upon the choice of participating to training and operations only with receivers, rather than with tankers, so to be interoperable with other PMA31 and NATO countries.

AAR cooperation is likely to be speeded up by recent developments in political terms such as the launch of PESCO and the agreement among EDA, EATC and OCCAR on the interoperability of platforms.

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<sup>45</sup> Czech Republic Armed Forces, *Piloti gripenu při Ample Strike 2017 nacvičovali tankování paliva ve vzduchu*, 2 September 2017, <http://www.acr.army.cz/informacni-servis/zpravodajstvi/piloti-gripenu-nacvicovali-tankovani-paliva-ve-vzduchu-136305>.

<sup>46</sup> Jacob Magid, "Israel agrees to sell 30 aging F-16 planes to Croatia", in *Times of Israel*, 26 January 2018, <https://www.timesofisrael.com/israel-agrees-to-sell-30-aging-f-16-planes-to-croatia>.

<sup>47</sup> Gianni Scuderi, "Aeronautica Militare: esercitazione Vega 2017 #VG17", in *Aviation Report*, 23 October 2017, <https://www.aviation-report.com/?p=13016>.

<sup>48</sup> Finnish Air Force, *Finland, Norway and Sweden Will Host Arctic Challenge Exercise 2017 in May and June*, 1 February 2017, [http://ilmavoimat.fi/sv/artikeln/-/asset\\_publisher/arctic-challenge-exercise-2017-lentotoimintaharjoitus-jarjestetaan-touko-kesakuussa-suomessa-norjassa-jarvuotsissa?\\_101\\_INSTANCE\\_zpOUAaUvEFjE\\_languageId=en\\_US](http://ilmavoimat.fi/sv/artikeln/-/asset_publisher/arctic-challenge-exercise-2017-lentotoimintaharjoitus-jarjestetaan-touko-kesakuussa-suomessa-norjassa-jarvuotsissa?_101_INSTANCE_zpOUAaUvEFjE_languageId=en_US).

<sup>49</sup> Albert Parkes, "Which fighter will replace the F-18 C?", in *Quora*, 17 January 2018, <https://www.quora.com/Which-fighter-will-replace-the-F-18-C-The-Finnish-Air-Force-is-replacing-its-current-fighters-F-18-C-and-the-options-are-the-Boeing-F-A-18-Super-Hornet-Lockheed-Martin-F-35-Saab-Gripen-E-Dassault-Rafale-and-the-Eurofighter-Typhoon>.

# Remotely Piloted Aerial Systems (RPAS)

## Estimated expenditure

The budget allocated by PMA31 countries for RPAS capabilities in 2018 ranges between EUR 200 million and EUR 800 million. The most relevant programs regard 16 countries: Belgium, Czech Republic, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Switzerland and the UK. Resources were allocated both for national and multinational - i.e. EURODRONE and Alliance Ground Surveillance (AGS) - programs.

Italy, Spain and Switzerland have also envisaged to spend between EUR 5 - 11 million to develop or acquire counter-RPAS, with a focus either on small, micro and tactical RPAS.

## Capabilities

The most significant capability developments in this field regard not only Medium Altitude Long Endurance (MALE) platforms, but also RPAS aimed to perform Intelligence Surveillance Reconnaissance (ISR) tasks, mini or micro RPAS and eventually capability to counter them.

## MALE RPAS

In Belgium, the Strategic Vision for Defence envisages a EUR 490 million investment between 2016 and 2030 that will lead to the acquisition of six MALE RPAS. Although there is no precise information about the budget for 2018,<sup>50</sup> the Belgian MoD selected the General Atomics Predator B for MALE. The Predator B programme will cost USD 278 million. The Government plans to acquire up to four MALE UAS - optionally armed - between 2021-2025 as a replacement of thirteen Hunter UAS that were acquired from Israel in 2002.<sup>51</sup>

France will spend EUR 18 million in 2018<sup>52</sup> to purchase MQ-9 Reaper system as well as to acquire a long-term MALE capacity. In this sense, Paris has ordered four MALE Reaper to be completed by 2019. On September 2017 the MoD announced that the Reaper RPAS will be armed.

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<sup>50</sup> The Belgium strategic document shares the expectation of the acquisition of a first batch of two systems between 2021 and 2025. The amount of these two systems is about EUR 180 million. Immediately after this first batch, another one composed of four systems, amounted at EUR 310 million, is expected to be delivered between 2029 and 2030. See Belgian Ministry of Defence, *The Strategic Vision for Defence*, 29 June 2016, <http://www.mil.be/sites/mil.be/files/pdf/strategic-vision-belgian-defence-en.pdf>.

<sup>51</sup> "Belgium Selects Predator-B Unmanned Aircraft", in *Scramble Magazine*, 25 March 2018, [http://www.defense-aerospace.com/articles-view/release/3/191863/belgium-selects-predator\\_b-unmanned-aircraft.html](http://www.defense-aerospace.com/articles-view/release/3/191863/belgium-selects-predator_b-unmanned-aircraft.html).

<sup>52</sup> French Ministry of the Armed Forces, *Projet de loi de finances 2018 - Extrait du bleu budgétaire de la mission Défense*, 3 October 2017, p. 54, [https://www.performance-publique.budget.gouv.fr/sites/performance\\_publique/files/farandole/ressources/2018/pap/pdf/DBGPGMPGM146.pdf](https://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2018/pap/pdf/DBGPGMPGM146.pdf).

By early 2019<sup>53</sup> Germany will have to decide upon the use of its Heron-1 MALE systems,<sup>54</sup> which have been leased to be deployed in Afghanistan and Mali.<sup>55</sup> The Heron-1 could be substituted with an adapted version of Heron TP, five of which are supposed to be purchased before 2025<sup>56</sup> as a temporary solution, in view of the EURODRONE.<sup>57</sup> The agreement consists of two parts: an industrial contract (worth EUR 720 million) about the lease and other technical arrangements, and an intergovernmental deal with Israel (worth EUR 177 million) regarding the assistance that will be provided by the Israeli Air Force.<sup>58</sup> This program had been suspended in 2017,<sup>59</sup> and will be probably re-activated by the new Government.<sup>60</sup> Germany has also been the leading nation in the definition study of the EURODRONE project (for which Berlin in 2016 estimated a total expense of EUR 1 billion) together with France, Italy and Spain. Finally, in June 2017 the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw, *Bundesamt für Ausrüstung, Informationstechnik und Nutzung der Bundeswehr*) authorized the procurement of 15 LUNA NG small tactical RPAS with a contract worth EUR 63 million to be completed by 2020.<sup>61</sup> Greece has opted for second-hand MQ-1 Predator from the US, hence important developments are expected in summer 2018, when the US Air Force will formally terminate the use of these platforms. In addition, Athens will lease seven Heron MALE RPAS for three years to enhance its ISR capabilities in the Aegean Sea. The contract will be worth EUR 35.5 million.<sup>62</sup> Finally, Greece has launched a research program to develop a new tactical RPAS, which can be used for both security and military missions.<sup>63</sup>

<sup>53</sup> German Ministry of Defence, *Haushaltsausschuss des Bundestages genehmigt weitere Rüstungsprojekte*, 29 June 2017, <https://www.bmvg.de/de/aktuelles/haushaltsausschuss-genehmigt-weitere-ruestungsprojekte-11238>.

<sup>54</sup> German Ministry of Defence, *5. Bericht des Bundesministeriums der Verteidigung zu Rüstungsangelegenheiten*, 2 April 2017, p. 14, <https://www.bmvg.de/resource/blob/12452/014be5cb5cf6ebc8b721e1978d78a2cd/b-07-01-02-download-5-ruestungsbericht-data.pdf>.

<sup>55</sup> For an analysis of the role of Heron in Mali please cf. “The Heron UAV, the Bundeswehr and the Joint Operator Support Model”, in *SLDinfo.com*, 7 December 2017, <https://sldinfo.com/?p=114224>; “Heron 1 fliegt weiter in Mali und Afghanistan”, in *Flug Revue*, 21 December 2017, <https://www.flugrevue.de/militaerluftfahrt/uav/iai-heron-1-fliegt-weiter-in-mali-und-afghanistan-fuer-die-bundeswehr/744334>; “Heron I completes one year of flight operations for the Bundeswehr in Mali”, in *DefenceWeb*, 7 December 2017, [http://www.defenceweb.co.za/index.php?option=com\\_content&view=article&id=50146](http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=50146).

<sup>56</sup> German Ministry of Defence, *5. Bericht des Bundesministeriums der Verteidigung zu Rüstungsangelegenheiten*, cit., p. 147. According to some sources these platforms could be purchased starting from the end of 2019. See “Germany to Lease Israeli Military Drones for US\$1.1 Billion”, in *Defense World*, 9 April 2018, <http://www.defenseworld.net/news/22298>.

<sup>57</sup> CDU, CSU and SPD, *Koalitionsvertrag zwischen CDU, CSU und SPD*, 14 March 2018, [https://www.cdu.de/system/tdf/media/dokumente/koalitionsvertrag\\_2018.pdf](https://www.cdu.de/system/tdf/media/dokumente/koalitionsvertrag_2018.pdf).

<sup>58</sup> German Ministry of Defence, *7. Bericht des Bundesministeriums der Verteidigung zu Rüstungsangelegenheiten*, 14 March 2018, p. 151, <https://www.bmvg.de/resource/blob/23010/7362820057116c6763aaec84147ce3ea/20180319-7--bericht-des-bmvg-zu-ruestungsangelegenheiten-data.pdf>.

<sup>59</sup> Sebastian Schulte, “Bundestag fails to fund Heron TP”, in *IHS Jane’s 360*, 29 June 2017, <http://www.janes.com/article/71861>.

<sup>60</sup> CDU, CSU and SPD, *Koalitionsvertrag zwischen CDU, CSU und SPD*, cit.

<sup>61</sup> Bundeswehr, *Datenblatt LUNA NG*, [https://www.bundeswehr.de/resource/resource/NmU3NTZjNmMzNjM1MzZMDMwMzAzMDMwMzAzMDMwMzAzMDMwMzAzMDZhMzgZNTZkn2E2ODZmNmUyMDIwMjAyMDIw/LUNA\\_NG\\_Datenblatt.pdf](https://www.bundeswehr.de/resource/resource/NmU3NTZjNmMzNjM1MzZMDMwMzAzMDMwMzAzMDMwMzAzMDMwMzAzMDZhMzgZNTZkn2E2ODZmNmUyMDIwMjAyMDIw/LUNA_NG_Datenblatt.pdf).

<sup>62</sup> Igor Bozinovski, “Greece to lease Heron UAVs from Israel”, in *IHS Jane’s 360*, 7 February 2018, <http://www.janes.com/article/77680>.

<sup>63</sup> George Tsiboukis, “IDE UAS: A new innovative Tactical (UAS) emerges from Greece”, in *Defence iQ*, 15 December 2017, <https://www.defenceiq.com/news/ide-uas-a-new-innovative-tactical-uas-emerges-from>.

Italy will spend around EUR 21 million for the continuation of the EURODRONE program, as well as for the NATO AGS program and the update of the Predator RPAS. The country is also expected to get its first P.1HH Hammerhead RPAS in 2018,<sup>64</sup> and will also invest in the acquisition of 20 new Super-MALE P2HH by 2032 with a total of EUR 766 million envisaged.<sup>65</sup> The platforms will fulfil ISR activities both in land and maritime domains.

In Poland, the Zefir program is delayed and back to study phase, thus the acquisition of MALE RPAS is unlikely to take place before 2020.<sup>66</sup> In any case, the program is foreseen to be a Government-to-Government (G2G) agreement either with the US or Israel.

In Spain, the budget for RPAS capabilities is around EUR 27 million.<sup>67</sup> Madrid has plans to acquire a MALE system which can be operated by the Air Force for ISTAR tasks. The chosen system will come under the remit of the chief of the defence staff and will therefore be a joint service capability. It is likely that the acquisition will be done through a G2G agreement. This program is an *interim* solution pending the European MALE 2025 program, for which no industrial compensation program has been required.

### Tactical RPAS

As for Czech Republic, the country is about to spend around CZK 1 billion until 2025 for RPAS (EUR 39 million).<sup>68</sup> In addition, Josef Bečvář – the Chief of the General Staff of the Czech Military – stated that the country is to buy in 2019 six new ScanEagle RPAS for 200 million Czech crowns (EUR 790,000). Czech Republic has already been using ScanEagle from the US in Afghanistan.

Lithuania has also plans to initiate procurement of tactical level UAVs in 2018, in the context of the Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) capability development. Luxembourg is considering the possibility to acquire new ISR RPAS by 2025. The purpose is to invest in new aerial ISR capabilities in order to support the Armed Forces.<sup>69</sup> Nevertheless, there is no available information regarding precise quantities as there will be no deliveries in 2018.

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<sup>64</sup> “Piaggio Aerospace approva il Piano Industriale quinquennale”, in *Analisi Difesa*, 24 December 2017, <http://www.analisedifesa.it/?p=112048>. However, due to problems emerged in the testing phase, this timeline may not be respected. Cf. Pier Paolo Cervone, “Piaggio, il drone torna a volare ma l’azienda resta nella nebbia”, in *La Stampa*, 12 July 2017, <http://www.lastampa.it/2017/07/12/edizioni/savona/piaggio-il-drone-torna-a-volare-ma-lazienda-resta-nella-nebbia-16FP3ukh9gYtcxSnIw8Hel/pagina.html>.

<sup>65</sup> Pietro Batacchi, “Via libera per il nuovo UAV P2HH”, in *Portale Difesa*, 16 February 2018, [http://www.portaledifesa.it/index~phppag,3\\_id,2181\\_npp,1\\_npag,1.html](http://www.portaledifesa.it/index~phppag,3_id,2181_npp,1_npag,1.html).

<sup>66</sup> “W Sejmie RP o modernizacjitechnicznejpolskiejarmii”, in *Dziennik Zbrojny*, 7 February 2018, <http://dziennikzbrojny.pl/aktualnosci/news,1,10822,aktualnosci-z-polski,w-sejmie-rp-o-modernizacji-technicznej-polskiej-armii>.

<sup>67</sup> For broader analysis on Spanish Defence budget, see Jorge Ventura, “España gastará casi 2.000 millones de euros en programas especiales de armamento...”, in *EXTRACONFIDENCIAL.COM*, 1 December 2017, <https://extracconfidencial.com/?p=30042>.

<sup>68</sup> “Bojové drony pořídíme do roku 2025, plánuje náčelník štábu Bečvář”, in *iDnes.cz*, 29 November 2017, [https://zpravy.idnes.cz/becvar-drony-bojove-armada-uav-obrana-zeman-fki-/zpr\\_nato.aspx?c=A171128\\_170731\\_zpr\\_nato\\_inc](https://zpravy.idnes.cz/becvar-drony-bojove-armada-uav-obrana-zeman-fki-/zpr_nato.aspx?c=A171128_170731_zpr_nato_inc).

<sup>69</sup> Luxembourg Ministry of Foreign and European Affairs-Directorate of Defence, *Luxembourg defence guidelines for 2025 and beyond*, July 2017, p. 37, <https://defense.gouvernement.lu/dam-assets/la-defense/luxembourg-defence-guidelines-for-2025-and-beyond.pdf>.

In the Netherlands, the first of four MQ-9 Reaper will be delivered in 2020, for an estimated cost of EUR 40 million per unit.<sup>70</sup>

Spain is expected to acquire two new tactical systems, one of which should be an Unmanned Combat Air Vehicle (UCAV).<sup>71</sup>

In Switzerland, the procurement of MALE RPAS will have a budget of around EUR 50 million.<sup>72</sup> In 2015, Switzerland agreed to purchase six Hermes 900 from the Israeli company Elbit Systems with a contract worth USD 229 million from 2016 to 2019. Although there is no clear indication regarding the possible timeline for the systems' delivery, the testing phase is ongoing.<sup>73</sup> The timescale for finalizing this program should be four years.

In the UK,<sup>74</sup> the Defence Equipment Plan 2017 states that GBP 704 million (EUR 800 million) will be spent from 2017 to 2025 to acquire 26 new Protector RPAS from General Atomics.<sup>75</sup> The timing of deliveries leaves space for a maintenance contract with the USA<sup>76</sup> of the current Reaper fleet, which will be operational until 2019.

### Small, mini and micro RPAS

The Czech Ministry of Defence (MoD) announced plans to award a research and development contract in June to its subsidiary, the Military Technical Institute (VTU), to develop a light vertical take-off and landing (VTOL) RPAS. In addition, the country is seeking to procure additional mini RPAS Wasp III and ScanEagle platforms for CZK 200 million (USD9.8 million) by 2020.<sup>77</sup>

In Italy, the Government is expected to allocated further resources to finance the acquisition of micro, mini and MALE RPAS.<sup>78</sup>

Latvia will acquire three RQ-20A Puma tactical hand-launched RPAS to strengthen its surveillance and reconnaissance capabilities.<sup>79</sup>

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<sup>70</sup> "Niederlande erhalten MQ-9 Reaper", in *Aerobuzz.de*, 9 January 2018, <https://www.aerobuzz.de/military-news/niederlande-erhalten-mq-9-reaper>. See also DSCA, "Major arms sales", <http://www.dsca.mil/major-arms-sales/netherlands-mq-9-reapers>.

<sup>71</sup> The most relevant information on RPAS in 2017 can be found in Tania M. Tomás, "Las diez noticias más destacadas del año en RPAS", in *Infodron.es*, 21 December 2017, <http://infodron.es/id/2017/12/21/noticia-noticias-importantes-sector.html>.

<sup>72</sup> Beth Stevenson, "Sense and avoid capability development on schedule for Swiss Hermes 900", in *FlightGlobal*, 3 August 2016, <https://www.flightglobal.com/news/articles/sense-and-avoid-capability-development-on-schedule-f-428176>.

<sup>73</sup> Alexander Fulbright, "Swiss says no more drone tests in 'occupied' Golan", in *Times of Israel*, 2 November 2017, <https://www.timesofisrael.com/swiss-say-no-more-drone-tests-in-occupied-golan>.

<sup>74</sup> UK Ministry of Defence, *The Defence Equipment Plan 2017*, 31 January 2018, <https://www.gov.uk/government/publications/the-defence-equipment-plan-2017>.

<sup>75</sup> Beth Stevenson, "UK allocates funding to Protector programme", in *FlightGlobal*, 7 December 2016, <https://www.flightglobal.com/news/articles/uk-allocates-funding-to-protector-programme-432203>.

<sup>76</sup> "UK requests support for MQ-9 Reapers", in *Shephard*, 9 April 2018, <https://www.shephardmedia.com/news/mil-log/uk-requests-support-mq-9-reaper-programme>.

<sup>77</sup> Jiri Kominek, "Czechs to develop VTOL UAV", in *IHS Jane's 360*, 18 April 2018, <http://www.janes.com/article/79371>.

<sup>78</sup> These plans are part of a list of possible programs with EUR 160.9 million envisaged for 2018 and EUR 249.5 million for 2019.

<sup>79</sup> Latvia Ministry of Defence, *US drone systems acquired by the National Armed Forces will improve surveillance and reconnaissance capabilities*, 16 April 2018, [http://www.mod.gov.lv/en/Aktualitates/Preses\\_pazinojumi/2018/04/17-01.aspx](http://www.mod.gov.lv/en/Aktualitates/Preses_pazinojumi/2018/04/17-01.aspx).

In 2017, Poland acquired approximately 1,000 Warmate micro RPAS systems for around PLN 100 million (EUR 24 million) by 2018.<sup>80</sup> In addition, Warsaw is to acquire the Insitu RQ-21A Blackjack small tactical RPAS through a FMS procedure with the US, most likely to replace the smaller ScanEagle systems. However, so far there is no information available about the final contract value, the number of platforms and their delivery. The acquisition is primarily meant for Special Operation Forces and their mission requirements, regarding expeditionary operations.<sup>81</sup>

Portugal will acquire 36 mini RPAS through NATO NSPA for ISR mission, with a contract worth EUR 6 million.<sup>82</sup>

Slovenia has plans to acquire four mini RPAS and it is interested in pooling of demand.

As for Spain, the main developments will regard the “Rapaz” project, as Madrid will evaluate a range of RPAS of less than 150kg which can be acquired by the Armed Forces.<sup>83</sup> In this context, Spain has already purchased two mini Tucan and five small Atlantic,<sup>84</sup> whereas the MoD has also signed a contract with Thales Spain (worth EUR 1.3 million) for the experimentation phase of two Fulmar systems.<sup>85</sup>

### Counter-RPAS: a new and growing sector<sup>86</sup>

As for counter-RPAS the main developments were registered in Germany, Italy, Poland, Spain and Switzerland. Germany is investing to protect critical infrastructure against potential attacks carried out by mini or micro RPAS. In this sense, the German Federal Ministry of Education and Research is funding a program called “Research for civil security” with around EUR 21 million. Within this program, four projects running between 2017 and 2020 - one of which is done in cooperation with Austria - are dedicated to counter RPAS technology. They focus on the development of several types of sensors which can also detect micro drones, evaluate the danger potential and take defensive actions.<sup>87</sup>

In Italy, Leonardo, Elettronica and IDS have got a contract to start the development and the operational evaluation of a national counter-RPAS. The future platform will be used to cope with

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<sup>80</sup> Jakub Palowski, “Wojskokupiłodronybojowe Warmate. Początekrewolucji?”, in *Defence24*, 20 November 2017, <http://www.defence24.pl/wojsko-kupilo-drony-bojowe-warmate-poczatek-rewolucji-komentarz>; “Macierewicz: Thousands of UAV Systems for the Territorial Defence Component and for the Operational Units of the Polish Army”, in *Defence24*, 14 November 2016, <http://www.defence24.com/macierewicz-thousands-of-uav-systems-for-the-territorial-defence-component-and-for-the-operational-units-of-the-polish-army>.

<sup>81</sup> Gareth Jennings, “Poland to acquire Integrator STUAS”, in *IHS Jane’s 360*, 8 February 2018, <http://www.janes.com/article/77727>.

<sup>82</sup> “Cinco firmas se disputan el suministro de mini-UAV a Portugal”, in *Infodefensa*, 25 April 2018, <http://www.infodefensa.com/mundo/2018/04/25/noticia-portugal-busca-fabricante-primeros-miniuav-istar.html>.

<sup>83</sup> Spanish Ministry of Defence, *Proyecto RAPAZ y tecnologías anti-RPAS*, December 2016, <https://publicaciones.defensa.gob.es/monografias-del-sopt-n-15-proyecto-rapaz-y-tecnologias-anti-rpas.html>.

<sup>84</sup> “Fuerzas Armadas de España adquieren drones Atlantic y Tucán de SCR – Everis”, in *Webinfomil.com*, December 2017, <http://www.webinfomil.com/2017/12/fuerzas-armadas-de-espana-adquieren.html>.

<sup>85</sup> Esteban Villarejo, “Defensa adquiere un UAV Fulmar de Thales España para la Infantería de Marina”, in *Por Tierra, Mar y Aire - ABC Blogs*, 24 October 2017, <http://abcblogs.abc.es/tierra-mar-aire/?p=22369>.

<sup>86</sup> In this report, the focus is on capabilities predominantly aimed to counter mini, micro up to tactical RPAS and not on air defence capacities as a whole. For further details see the Annex.

<sup>87</sup> Fraunhofer Institute for High Frequency Physics and Radar Techniques, *Drohnenabwehr – Die Gefahr auf dem Radar*, March 2018, <https://www.fraunhofer.de/de/forschung/aktuelles-aus-der-forschung/drohnenabwehr-technologien.html>.

potential terrorist threats undertaken by micro and mini-RPAS. The system is meant to localize and identify hostile drones, but will also develop a jamming component to interfere and alter its control capabilities and then make it landing in secure areas.<sup>88</sup>

Poland will buy these systems off-the-shelf, but it may probably keep opting for a domestic supplier, addressing the civilian/security dimension of the threat, coming from the micro RPAS which may disturb air safety or mass events.<sup>89</sup>

Spain is developing both fixed and portable counter-RPAS systems. The Navy has acquired the Drone Defender V2 produced by the US supplier Batelle for a cost of EUR 2 million, to be used on the Rayo ship (BAM, *Buque de Acción Marítima*) and on the “Patiño” one (BAC, *Buque de Aprovisionamiento de Combate*).<sup>90</sup> Moreover, the MoD has acquired a new fixed system called Anti-Unmanned Aerial Vehicle Defence System (AUDS), produced by the British company Blighter, to be installed in the Spanish base in Iraq. The need to use these systems has emerged as a consequence of terrorist attacks in both France and Syria.<sup>91</sup>

In Switzerland, the Military Aerospace and Defence Report outlines that the country has planned to spend a portion of the defence budget in the C4ISR Electronics & IT’s electronic warfare system.<sup>92</sup>

In conclusion, there is a new and growing demand for these systems spread across PMA31 countries, often aimed to respond to potential terrorist threats. Five PMA31 countries have started to invest in this field and no cooperative effort has yet been put in place in Europe.

## Cooperation

In the MALE sector, PMA31 countries still rely notably on US (Reaper, Predator, Protector) or Israeli (Heron, Hermes 900) basis models. Poland is likely to join this club at some point, since the Zefir program - currently delayed – is focusing on two non-European platforms: Israeli (Hermes 900) or US (MQ-9 Reaper) RPAS.<sup>93</sup> In this sense, the US predominance in the European market may be further strengthened by Washington’s plans to revise the regulation on the export of military products, including RPAS. Should this happen, the US would be allowed to sell them more easily than now through traditional FMS or direct commercial sale methods. Moreover, the US aims to keep the door

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<sup>88</sup> “Parte l’anti-drone nazionale”, in *Portale Difesa*, 5 December 2017, [http://www.portaledifesa.it/index~phppag,3\\_id,2070.html](http://www.portaledifesa.it/index~phppag,3_id,2070.html).

<sup>89</sup> Krzysztof Wilewski, “System antydronowy dla armii”, in *Polska-Zbrojna.pl*, 14 March 2018, <http://polska-zbrojna.pl/home/articleshow/24949>.

<sup>90</sup> Blighter Surveillance Systems, *Spanish Defence Ministry Selects AUDS System to Detect and Neutralise UAVs/Drones*, 21 June 2017, <http://www.blighter.com/news/press-releases/140-spanish-defence-ministry-selects-auds-system-to-detect-and-neutralise-uavsdrones.html>.

<sup>91</sup> “Sistemas Anti-UAV para la Armada Española”, in *Ejércitos*, 2 November 2017.

<sup>92</sup> Strategic Defence Intelligence, *Switzerland Defense Spends on C4ISR Electronics & IT: 2016 to 2024*, August 2016, <https://store.strategicdefenceintelligence.com/report/sdi0186dfdb--switzerland-defense-spends-on-c4isr-electronics-it-2016-to-2024>.

<sup>93</sup> Rafał Lipka, “Unmanned Aerial Vehicles in the Polish Armed Forces – current status of the Technical Modernisation Programme”, in *Pulaski Policy Papers*, 17 January 2017, <https://wp.me/p93jwx-2G0>.

open for American companies (i.e. Bell, Boeing or Sikorsky) and to develop cutting-edge rotorcraft that could be modified in the future to be unmanned.<sup>94</sup>

On the one hand, all these developments clearly mirror that suppliers in PMA31 countries still lag behind and are not able to meet public demand in this domain. In this context, chances of cooperation may emerge between France and the Netherlands, since their timeline for the acquisition of MQ-9 coincides. Therefore, the two countries could work together not only on training but also for what concerns MRO. On the other hand, such an industrial dependency demonstrates how urgent it is for PMA31 countries to invest on cooperative programs, the most important being the EURODRONE. Looking forward to the procurement and entering into service of this platform, it does not seem there is already a coordinated way forward among France, Germany, Italy and Spain. Addressing this issue is crucial especially in light of the fact that the development phase and the signature of the contract with OCCAR in 2019 will open important windows of cooperation for the four countries and others potentially interested governments like Belgium. In fact, in December 2017, Brussels obtained the observer status in this OCCAR-led program.<sup>95</sup>

So far, there may be an acceleration from France with the future approval of the *Loi de Programmation Militaire*. Indeed, Paris considers the EURODRONE an important asset for its Armed Forces as it will fill the capability gap produced by the Harfang's out-phasing, and more broadly for national and European strategic autonomy. In Germany, the government still has to decide whether the Heron TP will be a temporary solution before purchasing the EURODRONE in 2025, whereas in Italy the P2HH is expected to be developed for external rather than internal users. In this context, coordination among the national planning of these four countries is needed for an effective procurement and entering into service of EURODRONE, as well as to start addressing the training, logistics and MRO aspects. Understanding how PMA31 countries are preparing for the future EURODRONE is essential as this program may become an important industrial alternative for all those states interested in investing in this sector. Although Belgium or Luxembourg have not yet revealed the basis models that they will procure, both countries are highly interested in a possible European cooperation within this capability area,<sup>96</sup> including not only procurement but also logistic cooperation, MRO, etc. Croatia may also be interested, as it is considering to procure RPAS through a public procedure, either domestically or through a cooperation with Finland or other NATO/European Union (EU) countries.<sup>97</sup>

At the regulatory level, the revision of EU competencies on the use of civilian RPAS is also likely to be another important driver for cooperation and could help preparing PMA31 countries for the EURODRONE use. It is no coincidence that one of the biggest challenges of this program is defining commonly shared standards and procedures to use RPAS in the controlled air traffic, without raising concerns at the public level (e.g. by developing effective sense and avoid systems which impede any form of potential collision with civil aircraft). This is particularly true for what concerns the

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<sup>94</sup> Valerie Insinna and Aaron Mehta, "Here's how the Trump administration could make it easier to sell military drones", in *Defense News*, 19 December 2017, <https://www.defensenews.com/air/2017/12/19/heres-how-the-trump-administration-could-make-it-easier-to-sell-military-drones>.

<sup>95</sup> OCCAR website, *MALE RPAS*, <https://www.occar.int/node/14>.

<sup>96</sup> Belgian Ministry of Defence, *The Strategic Vision for Defence*, cit., p. 57-58.

<sup>97</sup> Within the procurement of the successor of the F-18s the Finnish Defence Forces Logistics Command has asked contractors to look into alternative options, which includes UAVs (but only as a complement to fighter aircraft).

possibility to use them in ISR missions, including cross-border operations.<sup>98</sup> In this sense, the EDA's deployment and linking of MALE RPAS desktop simulators in France and Italy is an important step forward. This will allow not only networked collaborative training, but also to build over time a European MALE RPAS community of interest to improve procedures, tactics and to harmonise training approaches. This will enhance interoperability among EU Member States (MS) who currently field MALE RPAS and those that aspire to procure them within a five-to-ten-year timeframe.<sup>99</sup> Moving to mini and micro RPAS, Estonia, Italy and Poland will procure these platforms in the next years. However, since the domestic solution seems to be the most privileged one, it is difficult that PMA31 countries may cooperate either for the acquisition or for MRO activities. Finally, there is an open question concerning the Future Combat Air System (FCAS) since France and the UK have not planned any follow up activities after their cooperative efforts on feasibility study. Hence, it remains to be seen which PMA31 countries may look to this future capability and what cooperation opportunities may arise.

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<sup>98</sup> EASA, *Unmanned aircraft system (UAS) operations in the 'open' and 'specific' categories*, Opinion 01/2018, 6 February 2018, <https://www.easa.europa.eu/node/45153>.

<sup>99</sup> The project involves France, Germany, Greece, Italy, the Netherlands, Poland and Spain and was developed by EDA under the mandate of the European MALE RPAS Community and is a joint effort with the European Air Group (which also includes Belgium and the UK). See EDA, *EDA sets-up collaborative RPAS training*, 18 January 2018, <https://eda.europa.eu/info-hub/press-centre/latest-news/2018/01/18/eda-sets-up-collaborative-rpas-training>.

# Space-Based Capabilities for Security and Defence

## Estimated expenditure

The estimated expenditure by PMA31 countries in space-based capabilities for security and defence in 2018 will range between EUR 600 and EUR 900 million, with major investments planned in Germany, France and Italy. The main portion of these 2018 funding will be allocated for capabilities which fulfil Earth Observation (EO) or satellite communication (SATCOM) tasks

## Capabilities

### Earth Observation

In the EO domain, the majority of resources are allocated for the MULTinational Space-based Imaging System (MUSIS)<sup>100</sup> a bilateral program between France<sup>101</sup> and Italy,<sup>102</sup> open to third countries such as Belgium<sup>103</sup> and Germany. The mentioned countries have allocated a range of EUR 100-200 million in 2018. In addition, PMA31 countries will invest in a multinational project called Helios 2,<sup>104</sup> with a range of EUR 50 - 100 million allocated in particular by France,<sup>105</sup> Italy and Spain. PMA31 countries will also allocate resources for national EO programs, with a range of EUR 150 - 200 million envisaged for 2018. The most important resources will be devoted by Germany for the SARah radar system, and by Italy to maintain the capability of Cosmo SkyMed platform. Further resources may be added by Rome to realize the Italian National Space program, which envisages, among others, the procurement of a new EO system.

Major capability developments in the EO domain involved France, Germany and Italy. In the context of the MUSIS program, Paris and Rome will use the ground segment (which is to be operational in 2021) to coordinate the platforms they are developing at the national level, and to provide access to third countries upon specific agreements. Against this backdrop, France will develop one Optical Space Component (CSO, *Composante Spatiale Optique*) in 2018 and two units in the following years.

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<sup>100</sup> The program involves Belgium, France, Germany, Greece, Italy and Spain. See French Ministry of Armed Forces, *Le programme MUSIS*, 24 March 2016, <https://www.defense.gouv.fr/dga/equipement/information-communication-espace/musis>.

<sup>101</sup> Ibid., p. 61.

<sup>102</sup> These plans are included in a list of possible programs with EUR 161 million envisaged for 2018 and EUR 250 million for 2019.

<sup>103</sup> Belgian Ministry of Defence, *The Strategic Vision for Defence*, cit., p. 54.

<sup>104</sup> Which involves Belgium, France, Greece and Spain.

<sup>105</sup> These resources cover the overall maintenance of French image reconnaissance satellites and not only the Helios 2 maintenance. See French Ministry of Armed Forces, *Le programme MUSIS*, cit. See also French Government, *Projet de loi de finances pour 2018 - Mission Défense*, 29 September 2017, <https://www.performance-publique.budget.gouv.fr/documents-budgetaires/lois-projets-lois-documents-annexes-annee/exercice-2018/projet-loi-finances-2018-mission-defense>.

In addition, Airbus also announced that the company's planned constellation Pléiades Neo is on schedule for launch in 2020.<sup>106</sup> This program will also involve Belgium and Germany.

In particular, Berlin's participation to the MUSIS program will be realized both by investing in the SARah radar and through resources devoted to acquire the third CSO for which the German MoD already awarded a EUR 210 million contract in 2015 to the French MoD.<sup>107</sup> SARah will replace Search and Rescue (SAR) Lupe and provide the Armed Forces with improved reconnaissance capabilities in 2019-2020.<sup>108</sup> The costs initially foreseen by the contract amounted to EUR 816 million.<sup>109</sup> Moreover, the German Bundestag has finally reached an agreement for the construction of three new spy satellites for EUR 400 million.<sup>110</sup> These platforms, called Georg, are expected to be operational in the early 2020s<sup>111</sup> and be used by the country's foreign intelligence service (BND, *Bundesnachrichtendienst*). The scale of the project is made evident by the official released part of the BND 2017 budget, which is about EUR 833 million (USD 968 million).<sup>112</sup>

France and Germany agreed to provide Satellite images (SARah/CSO) to the European External Action Service (EEAS), if possible in partnership with other MS. They also agreed to cooperate with the aim of creating a jointly coordinated space situational picture in the field of military surveillance of space. In addition, they stressed that a high Security level is required in order to strengthen the strategic independence of Europe (in particular Military applications) and to guarantee the international credibility of the Galileo program.<sup>113</sup>

Italy is developing the second generation of its dual use Cosmo SkyMed systems (CSG), which will gradually replace the current one starting from 2018. This will strengthen its efficiency and capacity in crucial sectors for internal, regional and global security, including civil protection.<sup>114</sup> The CSG will keep its dual use nature and will be used to meet both Governments' and private companies' needs. Moreover, Italy and Poland have signed an agreement which will allow Warsaw to have access both to CSG and to OPTSAT-3000 satellite that Rome has acquired from Israel. The Cosmo-Sky Med End User Ground Segment (P-DUGS) should be operational by the end of 2018.

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<sup>106</sup> Tereza Pultarova, "Growing new EO data markets will require user-friendly approaches, say executives", in *Space News*, 14 September 2017, <http://spacenews.com/?p=70798>; Airbus, *Airbus to reshape Earth observation market with its Pléiades Neo constellation*, 12 September 2017, <http://www.airbus.com/newsroom/press-releases/en/2017/09/Press-release-SpaceDataHighway.html>.

<sup>107</sup> "OHB liefert Aufklärungssatelliten an den Bund", in *Hartpunkt.de*, 13 November 2017,

<https://www.hartpunkt.de/?p=3098>. See also French Ministry of Armed Forces, *Le programme MUSIS*, cit.

<sup>108</sup> OHB System, *Annual Report 2016*, 2017, [https://www.ohb-system.de/tl\\_files/system/pdf/OHB\\_GB\\_2016\\_en\\_s.pdf](https://www.ohb-system.de/tl_files/system/pdf/OHB_GB_2016_en_s.pdf).

<sup>109</sup> OHB System, *OHB System AG awarded contract for the development and integration of the SARah radar satellite reconnaissance system for the German federal armed forces*, 2 July 2013, <https://www.ohb-system.de/press-releases-details/ohb-system-ag-awarded-contract-for-the-development-and-integration-of-the-sarah-radar-satellite-reconnaissance-system-for-the-ge.html>. The MoD 2017 budget plan includes the procurement of SARah in a broader expenditure item to which are allocated EUR 88 million for 2018. See Federal Ministry of Defence, *Bundeshaushaltsplan 2017 – Einzelplan 14*, December 2016, p. 48, 53, 54, <https://www.bmvg.de/resource/blob/12018/761e75747477f8efd8c73ece68492808/b-08-01-download-1-data.pdf>.

<sup>110</sup> "Germany to Spend \$465Mln on New Spy Satellites", in *Sputnik*, 5 November 2017, <https://sptnkne.ws/tSmX>.

<sup>111</sup> "German Intelligence Agency Gets Spy Satellite System Funds", in *Defence Talk*, 8 November 2017, <https://www.defencetalk.com/german-intelligence-agency-gets-spy-satellite-system-funds-70750>.

<sup>112</sup> "OHB liefert Aufklärungssatelliten an den Bund", cit.

<sup>113</sup> Thomas Wiegold, "Deutsch-französische Pläne: Neuer Panzer, neuer Kampfjet gemeinsam (Update)", in *Augen Geradeaus!*, 13 July 2017, <http://augengeradeaus.net/2017/07/deutsch-franzoesische-plaene-neuer-panzer-neuer-kampfjet-gemeinsam>.

<sup>114</sup> Michele Della Maggesa, "L'Italia festeggia Cosmo-SkyMed e pensa alla terza generazione", in *AirPress*, 7 December 2017, <https://www.airpressonline.it/27651>.

Luxembourg will launch a new EO satellite in 2020. It will be operational over 14 years with an estimated cost of EUR 170 million.<sup>115</sup>

Spain will also launch the Ingenio satellite system in late 2019/early 2020. The SEOSat/Ingenio is part of Spain’s National Earth Observation Satellite Program whose second component is PAZ, a satellite that was also built by Airbus.

The table below provides an overview of EO capabilities of PMA31 countries, at both national and multinational levels.

Table 2: Earth Observation Programmes

	National Programs	Cooperative Programs	EU Programs
Civil	TanDEM-X (DE) Terra SAR-X (DE) Helios 2 (FR) SPOT (FR)		Copernicus
Military	SAR Lupe (DE) SARah (DE) PAZ (IOC 2018) (ESP) CSO (Optical Space Component) (FR)		
Dual	INGENIO (IOC 2019-20) (ES) Pléiades (FR) Pléiades Neo (IOC 2020) (FR) COSMO-SkyMed (IT) CSG (IOC 2018) (IT)	Helios 2 – COSMO-SkyMed Helios 2 – SAR Lupe MUSIS (FR - IT) + BE-DE-ES- GR -PL-SE ORFEO (FR-IT)	

### SATCOM

In the SATCOM field, developments were registered both at the national and multinational level. France will invest in the Syracuse III, the Syracuse IV, and the COMCEPT ground system which will elaborate data collected by the ATHENA-FIDUS satellite and will be used notably by the Navy. The main delivery for 2018 corresponds to 9 COMCEPT ground components.

In Germany, Airbus Defence & Space has received a contract from Bundeswehr to extend the operational capability of the SATCOMBw, with a contract worth EUR 145 million until 2022.<sup>116</sup> In the meanwhile, Germany is currently defining requirements for the future systems replacing the existing SATCOMBw Stage 2 capacities. This is due to the fact that Berlin’s current satellite

<sup>115</sup> Roxana Mironescu and Pol Schock, “Luxembourg to Reinforce Defence Capabilities”, cit.

<sup>116</sup> “Vertragsverlängerung für SATCOMBw”, in *Flug Revue*, 9 March 2016, <https://www.flugrevue.de/raumfahrt/airbus-defence-space-erhaelt-vertragsverlaengerung-fuer-satcombw/671304>; German Ministry of Defence, *Haushaltsausschuss genehmigt Rüstungsprojekte*, 21 June 2017, <https://www.bmvg.de/de/aktuelles/haushaltsausschuss-genehmigt-ruestungsprojekte-11244>.

communication systems, (i.e. COMSAT 1 and COMSAT 2) will reach their end of life by 2027. In order to fill this potential gap, prospective solutions must be investigated in due course. The range of options is manifold and will encompass acquisition (procurement, lease, cooperation) and in service aspects (staffing, maintenances, training).

Luxembourg has launched its first satellite (called GovSat-1)<sup>117</sup> that will serve for national purposes as well as NATO missions and which is designed to operate for 15 years, for a total cost of around EUR 225 million.<sup>118</sup>

Italy is also planning resources' allocation to maintain the capability of the SICRAL satellite, and further resources may be added by the National Space program for the acquisition of the SICRAL 3 system for strategic communications.

In Spain, Indra recently got a contract to provide detachable SECOMSAT (*Sistema de Comunicaciones Militares por Satélite*) systems through the acquisition of new TLB-50IP terminals worth more than EUR 4 million.<sup>119</sup> In addition, Hisdesat and Satlink were awarded a contract to manage communication satellites for the Spanish MoD for 3 years, for a value worth EUR 4.2. The programme also include the establishment of an operation centre.<sup>120</sup> Madrid is also working to replace the XTAR-EUR and Spainsat satellites that will reach their final operational capability between 2021 and 2022.<sup>121</sup> In this sense, Hisdesat was also awarded EUR 150 million for the new Governmental SATCOM project. The new programme will be called SATCOM NG will be based on 2 platforms (Spainsat NG I and Spainsat NG II. The satellites will offer protection against anti-jamming and anti-spoofing as well as defence systems against High-Altitude Nuclear Explosions (HANE). The first satellite will be launched in 2021, whereas the second the following year.<sup>122</sup>

The Dutch government is interested in investing in a Military Satellite Communication program.<sup>123</sup> The tenth satellite of the Wideband Global Satcom (WGS) spacecraft system - procured in cooperation with Australia, Canada, Denmark, Luxembourg, New Zealand and the US - is to be tentatively in orbit in November 2018.<sup>124</sup> The satellite is to operate for 15 years,<sup>125</sup> and will be realised by the US, which in 2012 got a contract worth around EUR 260 million.<sup>126</sup>

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<sup>117</sup> Caleb Henry, "SpaceX launches GovSat-1 with previously flown Falcon 9 booster", in *Space News*, 31 January 2018, <http://spacenews.com/?p=74084>.

<sup>118</sup> Barbara Tasch and Roxana Mironescu, "GovSat's first satellite launches", in *Luxembourg Times*, 1 February 2018, <https://luxtimes.lu/luxembourg/32669-govsat-s-first-satellite-launches>.

<sup>119</sup> "Indra Sistemas suministra SECOMSAT desplegable: adquisición de nueve terminales TLB-50IP", in *Infodefensa*, 23 November 2017, <http://www.infodefensa.com/es/2017/11/23/concurso-indra-sistemas-suministra-secomsat-desplegable-adquisicion-nueve-terminales-tlb50ip.html>.

<sup>120</sup> "Hisdesat y Satlink gestionarán los servicios satelitales de Defensa", in *Infodefensa*, 5 April 2018, <http://www.infodefensa.com/es/2018/04/05/noticia-hisdesat-satlink-gestionaran-servicios-satelitales-defensa.html>.

<sup>121</sup> Stefan Barensky, "L'Espagne va renouveler ses satellites de télécommunications militaires", in *Aerospatium*, 11 November 2017, <https://wp.me/p7fCTo-3n3>.

<sup>122</sup> B. Carrasco, "Hisdesat contará con 150 millones para nuevos satélites", in *Infodefensa*, 11 April 2018, <http://www.infodefensa.com/es/2018/04/11/noticia-hisdesat-contara-millones-nuevos-satelites>.

<sup>123</sup> Dutch Ministry of Defence, *Rijksbegroting 2018 x Defensie*, September 2017, p. 55, <https://www.rijksoverheid.nl/documenten/begrotingen/2017/09/19/x-defensie-rijksbegroting-2018>.

<sup>124</sup> "Delta IV – WGS-10", in *Spaceflight101*, 1 November 2018, <http://spaceflight101.com/?p=47076>.

<sup>125</sup> "WGS – Wideband Global Satcom", in *Spaceflight101*, <http://spaceflight101.com/spacecraft/?p=1443>.

<sup>126</sup> U.S. Air Force, "Contract awarded for 10<sup>th</sup> WGS satellite", 27 July 2012, [http://www.airforcemag.com/SiteCollectionDocuments/Reports/2012/July%202012/Day30/072712\\_SMC\\_WGS-10.pdf](http://www.airforcemag.com/SiteCollectionDocuments/Reports/2012/July%202012/Day30/072712_SMC_WGS-10.pdf).

In the UK, the MoD has not yet signed a contract for the future Skynet 6 satellite — an estimated USD 8 billion project over 20 years. It is not clear whether Airbus will build and operate the Skynet 6A geostationary military communications satellite, scheduled to be operational by mid-2025. The MoD signed an outsourcing agreement with Airbus for Skynet 5 that expires in 2022.<sup>127</sup> In 2016, a contract valued GBP 3.6 billion (EUR 4.7 billion) until 2022 has been agreed, making it the largest-ever military satellite communications outsourcing deal.<sup>128</sup>

At the multinational level, several developments are linked with the so called Govsatcom Precursor projects undertaken by the European Space Agency (ESA). These projects are the first steps to demonstrate how the European space industry can respond to a globally emerging market of secure SATCOM and support the future EU GOVSATCOM initiative, developed under the auspices of the European Commission. The ESA’s GOVSATCOM Precursor consists of several PACIS projects based on public–private partnerships with major European satellite operators and service providers in the 2017-20 timeframe. Among them, in November 2017, the ESA and a European consortium, led by the Luxembourg company SES (*Société Européenne des satellites*), signed a contract to create satellite networks available for Europeans countries (called Pacis-1).<sup>129</sup> Moreover, ESA has awarded a contract to Inmarsat (UK), as the prime contractor for the new “Pacis-6” Govsatcom Precursor project under ESA’s programme of Advanced Researching Telecommunications Systems (ARTES). The Inmarsat-led initiative will develop and demonstrate a pooling and sharing (P&S) platform that will enable European government users and European Union(EU) agencies to access secure, affordable commercial satellite services; augmenting government-owned satcom capabilities.<sup>130</sup>

Finally, Airbus has got a contract to add a third node to the European Data Relay System (EDRS) constellation of satellites that use laser links to download live imagery from EO satellites and provide military communications that are virtually impossible to intercept. The third node, EDRS-D, to be launched in 2020 or 2021, will expand the constellation’s coverage.<sup>131</sup>

The table below outlines the current situation of SATCOM capabilities across PMA31 countries.

**Table 3: Satellite Communication (SATCOM) Programmes**

	National Programs	Cooperative Programs	EU Programs
Civil	SigMa (IOC 2019-2020) (IT)		

<sup>127</sup> Sandra Erwin, “U.K. military seeks to ride wave of commercial space innovation”, in *Space News*, 7 November 2017, <http://spacenews.com/?p=72022>.

<sup>128</sup> Peter B. de Selding, “Airbus mulls options if massive U.K. Skynet 5 military satcom contract is not renewed”, in *Space News*, 13 April 2016, <http://spacenews.com/?p=59122>.

<sup>129</sup> ESA, *Mutualisation et partage pour des communications gouvernementales par satellites plus sûres*, 21 November 2017, [http://www.esa.int/fre/ESA\\_in\\_your\\_country/Luxembourg/Mutualisation\\_et\\_partage\\_pour\\_des\\_communications\\_gouvernementales\\_par\\_satellites\\_plus\\_sures](http://www.esa.int/fre/ESA_in_your_country/Luxembourg/Mutualisation_et_partage_pour_des_communications_gouvernementales_par_satellites_plus_sures).

<sup>130</sup> ARTES ESA, *Govsatcom precursor PACIS-6 contract signed with Inmarsat*, 10 April 2018, <https://artes.esa.int/node/95583>.

<sup>131</sup> Tereza Pultarova, “SpaceDataHighway to add third node for global coverage”, in *Space News*, 15 March 2017, <http://spacenews.com/?p=66517>.

<b>Military</b>	Heinrich Hertz (IOC 2021) (DE) SATCOMBw (DE) Secomsat (ES) Syracuse 3 (FR) Comsat NG (IOC 2021-2023) (FR) Sicral (IT) Skynet 5 (UK) Skynet 6 (IOC 2020+) (UK)	ESCPC [EDA-(BE-FI-FR-IT-LU-PL-RO-UK)] NSP2K (NATO) Sicral 2 (FR-IT)	
<b>Dual</b>		Athena-FIDUS (FR-IT) EDRS (ESA)	

## Cooperation

### Earth Observation

The EO field is a sector where cooperation has been strengthened by the so called “shared sovereignty”. Strong bilateral cooperation open to third parties has created the right preconditions for mini-lateral activities to develop in a faster way. However, it is a very peculiar sector, where cooperation is more complicated than expected, as demonstrated by the CSO program, in which France and Germany had to negotiate three years before reaching an agreement.

Against this backdrop, the French-Italian “Space Alliance” is not a novelty, as it draws on the experience of other bilateral cooperative programs launched in the past. However, it has managed to take advantage of some lessons learned from previous cooperative attempts, such as the need to develop a common ground system like in the MUSIS program as well as to establish a clear division of work and shares at the institutional and industrial levels. In addition, the decision of the two countries to specialize in two complementary fields (optical for France and SAR for Italy) has helped them to reach the agreement ORFEO on the exchange of satellite imagery capabilities – an arrangement involving the Italian Cosmo-SkyMed and the French Helios 2. The combination of these factors allows the two countries to set up a more durable and effective cooperation and is already producing important results for the MUSIS program. France and Italy will use the capabilities they are procuring domestically and will put them at the disposal of third interested countries through bilateral agreements. In this sense, Belgium, France and Germany are already working together for the development of the CSO capabilities whereas Italy and Poland have signed the aforementioned deal about the access to services provided by the new CSG and OPTSAT-3000 satellites. Moreover, the MUSIS program goes hand in hand with the out-phasing of existing French Helios satellites, the French Pléiade System, the German SAR-Lupe, and first generation of Italian Cosmo-SkyMed systems.<sup>132</sup>

At the multinational level, Helios 2 program brings together six PMA31 countries: Belgium, France, Germany, Greece, Italy and Spain. Germany and Italy have already started to connect their capabilities (SAR-Lupe and Cosmo-SkyMed) with the Helios platform.

<sup>132</sup> French Ministry of Armed Forces, *Le programme MUSIS*, cit.

An important demand for cooperation in the EO field could be driven by Spain, where the lack of a surveillance satellite has already pushed Madrid to accelerate its National Space Program, with the aim to overcome potential crises.<sup>133</sup> Against this backdrop, the new Spanish PAZ SAR satellite will indeed be placed on the same orbit with German TerraSAR and TanDEM-X satellites to form a SAR constellation.<sup>134</sup>

Other cooperative opportunities may emerge in the Nordic region, since Denmark has identified surveillance via satellites as a potential area for investment.<sup>135</sup>

## SATCOM

The French-Italian Space Alliance is a strong driver of European cooperation also in the SATCOM field, especially thanks to the COMCEPT which works in a synergic way with ATHENA-FIDUS and the Syracuse III systems. These satellite capacities are being supplemented by the satellite SICRAL 2, the outcome of a French-Italian cooperation. Looking ahead, Thales and Leonardo may play an important role by contributing to a Franco-Italian roadmap for a long-lasting space partnership, aiming to identify cooperative opportunities for the new generation of communication and observation systems.<sup>136</sup> The existing industrial cooperation in the space sector between France and Italy would likely take advantage of a new bilateral deal – the so-called “Quirinale Treaty” – whose elaboration process started in January 2018.

Cooperative opportunities may also emerge among some countries like Denmark, Norway, Sweden and the UK, which are planning to invest in SATCOM capabilities both nationally or regionally, for instance by participating in an Arctic communications satellite.<sup>137</sup> Norway and Sweden have plans to modernise their own Armed Forces SATCOM capabilities, respectively between 2021-2024<sup>138</sup> and 2016-2019.<sup>139</sup> According to a recent document released by the government of Luxembourg, the country aims to invest more both in the field of Military Satellite Communication (MILSATCOM) and satellite imagery.<sup>140</sup>

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<sup>133</sup> Ghalia Kadiri, “Morocco’s secret launch of a powerful observation satellite puts neighbouring countries on alert”, in *France24*, 21 November 2017, <http://f24.my/27hI.T>.

<sup>134</sup> Jaroslaw Adamowski, “Morocco satellite launch could accelerate Spanish space efforts”, in *Space News*, 5 January 2018, <http://spacenews.com/?p=73149>.

<sup>135</sup> Danish Ministry of Defence, *Danish Defence Agreement 2013-2017*, 30 November 2012, <http://www.fmn.dk/eng/allabout/Pages/DanishDefenceAgreement2013-2017.aspx>.

<sup>136</sup> Luca Peruzzi, “L’accordo su STX getta le basi per una più ampia alleanza italo-francese”, in *Analisi Difesa*, 4 October 2017, <http://www.analisdifesa.it/?p=110260>.

<sup>137</sup> David Pugliese, “Canada talking to U.S., Norway and Denmark about footing bill for new Arctic military satellite”, in *National Post*, 14 March 2017, <http://nationalpost.com/wcm/d5ad907b-08f4-4cf4-8bbd-023611cf8e16>.

<sup>138</sup> Government of Norway, *Future Acquisition for the Norwegian Defence Sector 2017-2025*, April 2017, <https://www.regjeringen.no/en/dokumenter/future-acquisitions-for-the-norwegian-defence-sector-2017-2025/id2549259>.

<sup>139</sup> *Ibid.*

<sup>140</sup> Luxembourg Ministry of Foreign and European Affairs-Directorate of Defence, *Luxembourg defence guidelines for 2025 and beyond*, cit., p. 33.

At the ESA level, the production of “Pacis-1” platform will improve the availability and the quality of communications between governments and institutions.<sup>141</sup> The satellite system will serve also for border control and maritime surveillance.

As for the Governmental Satellite Communication (GOVSATCOM) project, the main development has regarded the decision of Norway to join the program.<sup>142</sup> In the meanwhile, in summer 2018 there will be a demonstration enabling to fully implement the program by 2020.<sup>143</sup> The GOVSATCOM project continues to be an important cooperative effort, yet it needs to be carved in a way to avoid duplications with existing national or bilateral programs which so far proved to be an effective way to spur cooperation among interested PMA31 countries.

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<sup>141</sup> “SES and ESA Set Up New Government Satcom Platform”, in *Markets Insider*, 21 November 2017, <http://markets.businessinsider.com/news/1008917781>.

<sup>142</sup> Norwegian Space Centre, *Interessentmøte om Govsatcom*, 24 November 2017.

<sup>143</sup> Tereza Pultarova, “Govsatcom demonstration aims to start service next summer”, in *Space News*, 8 November 2017, <http://spacenews.com/?p=72066>.

# Intelligence Surveillance Reconnaissance (ISR) Capabilities in the Maritime Domain

## Estimated Expenditure

According to available sources, in 2018 the whole estimated expenditure by PMA31 countries on the ISR capabilities in the maritime domain considered by this Report ranges between EUR 1.7 billion and EUR 2.2 billion. Due to the lack of precise financial information,<sup>144</sup> the following resources need to be understood as a minimum for each capability:

1. Around EUR 275.5 million for MPA;<sup>145</sup>
2. Around EUR 678.7 million for naval helicopters with ISR task;<sup>146</sup>
3. Around EUR 667.7 million for naval units under 3,000 t;<sup>147</sup>
4. Around EUR 26.7 million for maritime UAV and UUV.<sup>148</sup>

The following paragraphs will look at each of the aforementioned areas in terms of capability developments and cooperation.

## Maritime Patrol Aircraft (MPA)

### Capabilities

Seven PMA31 countries own proper MPA, although often with old assets: France, Germany, Greece, Italy, Norway, Poland and Portugal. Moreover, Denmark, Estonia, Finland and Sweden have aircraft which can be used for maritime patrol missions.

Since September 2017, only few PMA31 countries have invested in this capability, mostly via upgrading programs. Greece should have received the first upgraded aircraft P-3B Orion in February 2018,<sup>149</sup> but its delivery has been delayed. Athens will potentially launch an acquisition of three new MPA instead of the modernisation of five P-3B, while the sixth unit currently available could be used as a spare part equipment.

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<sup>144</sup> For further information see the Explanatory Annex.

<sup>145</sup> By France, Germany, Italy, Norway.

<sup>146</sup> By Belgium, France, Denmark, Germany, Italy, Spain and the Netherlands.

<sup>147</sup> By Belgium (between 2016 and 2030), Croatia, Denmark, France, Germany, Italy, Poland, Romania, Spain, Sweden.

<sup>148</sup> By Belgium (between 2016 and 2030), France.

<sup>149</sup> “Kamménos: Aftó einai to kóstos ton P-3B tou PN”, in *ArmyNow.net*, 12 September 2017, <http://www.armynow.net/kammenos-ayto-einai-kostos-p-3b-pn>.

France is expected to welcome two upgraded E-2C Hawkeye in 2018,<sup>150</sup> as well as one upgraded Falcon 50<sup>151</sup> within the Aircraft for surveillance and maritime intervention (*Avions de Surveillance et d'Intervention Maritime* AVSIMAR) program. Within the Atlantique2 upgrading program, the first unit was primarily expected to be delivered in 2018, but its arrival has been postponed to 2019. The French Military Programming Law 2019-2025 states that France will receive respectively eight Falcon aircraft and 18 (instead of the planned 15) upgraded Atlantique2 on the 2025 horizon.<sup>152</sup> Three Falcon will be delivered since 2024 to replace older platforms. The *Avion de Patrouille Maritime Futur* (PATMAR) program will start between 2019 and 2025 in order to replace progressively Atlantique2 with the objective to have two (out of 12) platforms by 2030.<sup>153</sup>

Italy has planned to devote EUR 400 million to the procurement of four P-72, conceived as an interim solution to replace the Breguet MPA,<sup>154</sup> and other resources to the logistic support for the G-550 Conformal Airborne Early Warning (CAEW) and control.<sup>155</sup> While Germany has planned to invest in 2018 around EUR 32 million to the mid-life upgrade of P3-C Orion,<sup>156</sup> Norway has signed an order for five Poseidon MPA, with deliveries expected by 2022-2023 and worth of NOK 10 billion, to replace the ageing six Orion aircraft.

## Cooperation

The challenge for cooperation in this field is to develop the next generation of MPA. The current situation shows that most national programs are based on a short/medium term vision consisting in upgrading current platforms. These programs are necessary for the current ageing fleets, but they could not be part of a long-term procurement strategy: there is a clear need of European cooperation with regards to this capability.

Cooperative opportunities may indeed arise. France and Germany have agreed to study a European solution to replace current MPA capabilities, thus contributing to potential cooperation in the sector. Accordingly, in April 2018, the French defence minister Florence Parly and her German counterpart

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<sup>150</sup> French Ministry of Armed Forces, *Projet de loi de finances 2018 - Bleu budgétaire de la mission Défense*, 3 October 2017, p. 341, [https://www.performance-publique.budget.gouv.fr/sites/performance\\_publique/files/farandole/ressources/2018/pap/pdf/PAP2018\\_BG\\_Defense.pdf](https://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2018/pap/pdf/PAP2018_BG_Defense.pdf).

<sup>151</sup> This MPA will be devoted to rescue capacity in the maritime domain and for a renewal of the surveillance capacities.

<sup>152</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, February 2018, p. 47, <https://www.defense.gouv.fr/content/download/523150/8769279/file/LPM%202019-2025%20-%20Rapport%20annex%C3%A9.pdf>.

<sup>153</sup> *Ibid.*, p. 34.

<sup>154</sup> Carmelo Savoca, "L'Atlantic del 41° stormo in congedo dopo oltre 45 anni di attività", in *Aeronautica Militare-Notizie*, 22 November 2017, [http://www.aeronautica.difesa.it/comunicazione/notizie/Pagine/20171122\\_LAtlantic-del-41-Stormo-in-congedo-dopo-oltre-45-anni-di-attivita.aspx](http://www.aeronautica.difesa.it/comunicazione/notizie/Pagine/20171122_LAtlantic-del-41-Stormo-in-congedo-dopo-oltre-45-anni-di-attivita.aspx).

<sup>155</sup> Arie Egozi, "Italy receives second G550 for AEW duties", in *FlightGlobal*, 23 January 2018, <https://www.flightglobal.com/news/articles/italy-receives-second-g550-for-aw-duties-445131>.

<sup>156</sup> "Lockheed Martin erhält \$158.5 Mio. Auftrag für das P-3C MPA Modernisierungsprogramm der Deutschen Marine", in *Griephan*, 2 November 2017, <http://www.griephan.de/news/produkte-technik/single-view/news/lockheed-martin-erhaelt-1585-mio-auftrag-fuer-das-p-3c-mpa-modernisierungsprogramm-der-deutschen-marine.html>. See also Lockheed Martin, *Lockheed Martin Awarded \$158.5 Million Upgrade Contract for Germany P-3C Orion Aircraft*, 1 November 2017, <https://news.lockheedmartin.com/2017-11-01-Lockheed-Martin-Awarded-158-5-Million-Upgrade-Contract-for-Germany-P-3C-Orion-Aircraft>.

Ursula Von der Leyen signed a LoI at the Berlin Air Show, to jointly work on the replacement to their respective MPA capabilities.<sup>157</sup> The programme has been named “Maritime Airborne Warfare System” (MAWS) and the purpose is to replace in 2030 French Atlantique2 and German P-3C Orion. Meanwhile, France is upgrading its Hawkeye jointly with the US through Foreign Military Sales (FMS). While the construction sites are in France, the project manager is the American Navy and exchange of information is implied. At the same time, Germany is currently upgrading P-3C Orion acquired from the Netherlands.

Belgium and the Netherlands may work together in a program to cover the North Atlantic area with maritime patrol capability. Nevertheless, these countries currently do not have such capabilities, and two solutions appear possible: a common acquisition of a P8-A aircraft or the participation in development of a new European MPA.

Lastly, potential room of cooperation is embodied by the NATO-launched Maritime Multimission Aircraft (M3A) initiative aiming at easing multinational synergy in the development of an Anti-Submarine Warfare (ASW)/MPA platform. Eight Allies participate to the M3A initiative: Canada, France, Germany, Greece, Italy, Poland, Spain and Turkey.<sup>158</sup> Among these, the participation is particularly noteworthy for Poland, which signed the LoI on the 15<sup>th</sup> of February 2018, in light of the *Rybitwa* program whose objective is to procure a new capability in the foreseeable future.<sup>159</sup>

## Naval helicopters with ISR Tasks

### Capabilities

There are around 550 naval helicopters with ISR tasks in 15 PMA31 countries: Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Italy, Lithuania, Norway, Poland, Portugal, Spain, Sweden and the UK. These units are dedicated to ISR, SAR, ASW and other missions, and their number is increasing following the deliveries to several European countries.

A number of countries expects to receive NH-90 units in 2018. Among these, Spain is waiting for its eighth platform (out of 22 total units),<sup>160</sup> whereas France is expecting two new units this year, following a multiannual contract which foresees the delivery of 22 units by 2019, with five more units expected by 2025 in order to reach the number of 27.<sup>161</sup> In Germany, the search for new units is partly motivated by the inadequacy of recently acquired multirole NH-90 helicopters in light of their frequent technical faults.<sup>162</sup>

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<sup>157</sup> French Ministry of Armed Forces, *Avancées dans la coopération capacitaire franco-allemande*, 25 April 2018, <https://www.defense.gouv.fr/actualites/articles/avancees-dans-la-cooperation-capacitaire-franco-allemande>.

<sup>158</sup> NATO, *Canada and Poland join six NATO Allies in developing next-generation maritime multi mission aircraft*, 15 February 2018, [https://www.nato.int/cps/en/natohq/news\\_152066.htm](https://www.nato.int/cps/en/natohq/news_152066.htm).

<sup>159</sup> Rafał Lesiecki, “Rybitwa Programme Revisited. Poland to Acquire MPA Jointly with the Allies?”, in *Defence24*, 16 February 2018, <http://www.defence24.com/rybitwa-programme-revisited-poland-to-acquire-mpa-jointly-with-the-allies>.

<sup>160</sup> Julio Maíz Sanz, “Airbus Helicopters España mantiene el ritmo de entregas de los NH90”, in *Defensa.com*, 11 October 2017, <http://www.defensa.com/espana/airbus-helicopters-espana-mantiene-ritmo-entregas-nh90>.

<sup>161</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, cit., p. 47.

<sup>162</sup> “Bundeswehrpiloten müssen auf ADAC-Helikoptern trainieren”, in *Der Spiegel*, 23 December 2017, <http://spon.de/ae817>.

While Italy continues investing in the NH-90 program, other resources will be allocated to the logistic support of the Navy's EH-101 platforms and of HH-139. Rome has also revealed the successor of the AW-129, a new platform called AH-249A which will be used for military purposes and to perform tasks similar to those of NH-90 and CH-47F. In addition, it will be able to interact with RPAS not only by sharing information but also by managing drones used by the Italian Armed Forces. Additional funds may be added by the Government to extend the operational capability of AW-129. Denmark has planned to acquire two US MH-60R Seahawk maritime in 2018,<sup>163</sup> while Greece plans procure ten Sikorsky Seahawk 60 decommissioned from the US Navy.<sup>164</sup> As for helicopters which could fulfil ISR tasks, the Spanish MoD has recently got certifications for two H215s.<sup>165</sup> While Croatia has no naval helicopters, the plan is to use 16 helicopters OH-58D Kiowa Warrior, recently acquired through a US donation, as support to ISR efforts in the Adriatic Sea. Poland is still negotiating the naval helicopters program (four units plus option for further four) for SAR/ASW with two contenders - Leonardo (AW 101 Merlin/Cesar) and Airbus (H-225M Caracal in the naval version - and changes of requirements are not excluded.

### Cooperation

In the period considered, no cooperative opportunity has arisen. Within this capability area, concerted efforts are currently defined by the procurement of the naval version of the NH-90. However, cooperation is imperfect due to the fact that the mentioned platforms are produced in too many variants.

### Naval units under 3,000 tons

#### Capabilities

25 PMA31 countries hold around 220 naval units under 3,000 t. A distinction is necessary with regards to the size and the type of units between Offshore Patrol Vessels (OPV), corvettes and coastal patrol vessels, since in the high-end of the category vessels are armed and have often anti-missile capacity. Most of PMA31 countries plan to invest in naval units in order to protect coastal borders and the Exclusive Economic Zone (EEZ). A number of PMA31 countries expects to receive several types of units.

Belgium has planned to acquire six units devoted to anti-mine warfare and to upgrade current maritime patrol units.<sup>166</sup> Regarding France, the last four multi-mission ships (*Bâtiments Multi-*

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<sup>163</sup> Danish Ministry of Defence, *Danish Defence Agreement 2013-2017*, cit., p. 12.

<sup>164</sup> Pétros Anastasiou, "Tríto 'pakéto' eníschysis ton ED: Déka 'machitiká' elikóptera SH-60F gia to PN", in *PRONews*, 26 February 2017, <http://www.pronews.gr/node/545278>.

<sup>165</sup> Nathan Gain, "Spanish MoD receives more NH90, H215 and Tiger HAD/E helicopters", in *Air Recognition*, 30 November 2017, <https://www.airrecognition.com/index.php/archive-world-worldwide-news-air-force-aviation-aerospace-air-military-defence-industry/global-defense-security-news/global-news-2017/november/3905>.

<sup>166</sup> "Belgium OKs acquisition of six new mine countermeasure vessels", in *Navaltoday.com*, 29 January 2018, <https://navaltoday.com/?p=147543>.

*Missions* - B2M) will be delivered in 2019.<sup>167</sup> Moreover, the French Navy is waiting for the replacement of patrol boats with new naval units within the BATSIMAR (*Bâtiments de surveillance et d'intervention hauturiers*) program, even though the current financial situation will probably require a modification of the program.<sup>168</sup> This is also proven by the French investigation on other types of smaller and less expensive units with a shorter delivery period. Two new platforms will be delivered by 2019 and nine new *Patrouilleur futur* by 2025 in order to have an overall capacity of 11 units.<sup>169</sup>

Italy is investing in the realization of the new Multipurpose High-Speed Units (UNPAV, *Unità Polivalente ad Altissima Velocità*) which will be operational between 2019 and 2020.<sup>170</sup>

In Spain, the third BAM ship - which will replace the Neptuno one – should enter in service from 2022 by supporting the new S-80 submarine. The supplier will have to be chosen through an open competition according to the EU directive on procurement implemented by Spain, and the Spanish industry Navantia will have to prove to fulfil the requirements requested for this new platform. The ship will have to perform SAR tasks, as well as support to submarines or fight against water contamination.<sup>171</sup> Spain will also finance the procurement of the new Auxiliary Oiler Replenishment (BAC).

In December 2017, Poland signed a contract for three new surface vessels and concluded another agreement, worth approximately EUR 180 million, for a newly developed Rawtonik-class service/rescue ship. The ISR capabilities will be linked to the use on unspecified Unmanned Underwater Vehicles (UUV) for rescue tasks. Poland will also acquire further two Kormoran-class counter-mine ships of 830 tons and performing mine-related ISR tasks, whose delivery is foreseen respectively in 2021 and 2022.<sup>172</sup>

Finland plans to procure four new corvettes under the project called Squadron 2020. These ships will be multirole surface combatants with anti-surface, anti-air and anti-submarine capabilities, but will also play a significant ISR role.<sup>173</sup>

Denmark is gradually replacing the ageing Agdek class with the larger Knud Rasmussen class patrol vessel (1,720 tons). In Sweden, the delivery of the recently acquired new signals intelligence ship to replace the ageing HSwMS Orion is expected by 2020.<sup>174</sup>

Romania announced, in November 2017, the intention to purchase four new corvettes to be built in national shipyards by 2024.

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<sup>167</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, cit., p. 46.

<sup>168</sup> French National Assembly, *Audition de l'amiral Christophe Prazuck, chef d'état-major de la marine, sur le projet de loi de finances pour 2018*, 11 October 2017, <http://www.assemblee-nationale.fr/15/cr-cdef/17-18/c1718008.asp>.

<sup>169</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, cit., p. 42.

<sup>170</sup> Attilio Borda Bossana, "Come saranno le due unità per la Marina Militare affidate ai cantieri navali ex Rodriguez di Messina", in *Agora Metropolitana*, 21 November 2016, <https://wp.me/p7MafN-1hj>.

<sup>171</sup> "El futuro BAM-IS mejorará la capacidad de la Armada española en salvamento y rescate de submarinos", in *Defensa.com*, 22 November 2017, <http://www.defensa.com/espana/futuro-bam-is-mejorara-capacidad-armada-espanola-salvamento>.

<sup>172</sup> Remigiusz Wilk, "Poland commissions ORP Kormoran mine countermeasures vessel", in *IHS Jane's 360*, 8 December 2017, <http://www.janes.com/article/76273>.

<sup>173</sup> Finnish Ministry of Defence, *Squadron 2020. The Finnish Defence Forces' strategic project*, June 2017, [https://www.defmin.fi/files/3819/Squadron\\_2020\\_The\\_Finnish\\_Defence\\_Forces\\_strategic\\_project.pdf](https://www.defmin.fi/files/3819/Squadron_2020_The_Finnish_Defence_Forces_strategic_project.pdf).

<sup>174</sup> It is not clear when and how payments are going to be made to SAAB for this new ship, but assuming that payments will be spread over the period 2017-2020, the order corresponds to about 0.3 percent of the Swedish defence budgets during those four years.

## Cooperation

The renewal of these capabilities continues to be based on national programs. Nevertheless, it seems possible to involve companies from other PMA31 countries within the process at different levels of production, i.e. supplies or embedding of sensors, combat and weapon systems. Moreover, two specific cooperative efforts have been undertaken respectively by Belgium-Netherlands and France-Italy, while Cyprus is open to cooperate in this regard within PESCO.

In January 2018, Belgium decided to order jointly with the Netherlands six mine countermeasures (MCM) units. Belgium will be in charge of the joint MCM development and acquisition, which corresponds to coupled naval units with Unmanned Aerial Vehicles (UAV)/UUV capabilities and amounts to EUR 1.1 billion.<sup>175</sup>

During the 34<sup>th</sup> French-Italian summit on September 2017, France and Italy paved the way for a stronger future cooperation in the naval sector, through the creation of a new hub under the lead of Fincantieri and Naval Group. This initiative is meant to spur cooperation in other sectors of naval defence such as electronic warfare or as a reflexion on the development of 3,000 tons frigates in order to replace French frigates (Lafayette and Floreal class) and Italian OPV (Comandanti class)<sup>176</sup> on the horizon 2020. The core of such renewed partnership will be a steering committee made of six representatives, which will propose a medium- and long-term roadmap to realize ambitious common projects. The committee will design the Governance, structure, areas of intervention, strategic priorities, financial conditions and all those terms necessary to make the Alliance durable and effective.<sup>177</sup> This will allow for instance a first exchange of shares (five to 15%) between the two groups<sup>178</sup> and the development of common export-oriented products. The path towards this future cooperation has been reinforced on February 2018 by a bilateral meeting between Ministers of Defence and Ministers of Economic Development of both countries.

In the same period, Cyprus launched a new OPV with the purpose to enhance its role on regional security,<sup>179</sup> revealing an interest to cooperate in the maritime sector with France and other European countries, especially within PESCO.

## Maritime Unmanned Aerial Vehicle (UAV) and Unmanned Underwater Vehicle (UUV)

### Capabilities

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<sup>175</sup> “Belgium OKs acquisition of six new mine countermeasure vessels”, cit.

<sup>176</sup> Michel Cabirol, “Fincantieri/Naval Group: un programme de frégates légères attendu vers 2020?”, in *La Tribune*, 23 April 2018, <https://www.latribune.fr/entreprises-finance/industrie/aeronautique-defense/fincantieri-naval-group-le-programme-de-fregates-legeres-reporte-apres-2025-775152.html>.

<sup>177</sup> French Government, *Sommet Franco-Italien*, Lyon, 27 September 2017, <http://www.elysee.fr/communiqués-de-presse/article/compte-rendu-du-34eme-sommet-franco-italien-du-mercredi-27-septembre-2017-a-lyon>.

<sup>178</sup> Luca Peruzzi, “L’ accordo su STX getta le basi per una più ampia alleanza italo-francese”, cit.

<sup>179</sup> “New vessel ‘enhances Cyprus role in regional security’”, in *Cyprus Mail*, 15 January 2018, <https://cyprus-mail.com/?p=165223>.

This capability area sees promising developments because of the previous absence of maritime UAV and UUV platforms across PMA31 countries. In 2017, ten PMA31 countries were listed because of their investment in these capabilities: Croatia, Denmark, Estonia, France, Germany, the Netherlands, Norway, Poland, Spain and Sweden. One of the main reasons for this activism is that UAV and UUV are useful for smaller naval units in order to increase their ISR specific capacity, such as maritime surveillance, mine-countermeasure operations and exploration.

In January 2018, the French MoD officially launched the future program Aerial drone systems for the Navy (SDAM, *Systèmes de drones Aériens pour la Marine*), which is planned to provide a first delivery in 2028 and 15 systems by 2030.<sup>180</sup> Airbus Helicopters and Naval Group have been awarded by France to realize a study to develop the VSR700, a future tactical Vertical Take Off Landing (VTOL) UAV capability. Although the purpose is to have a complete demonstrator by 2021,<sup>181</sup> the financing has not been identified yet.

In Germany the process for the procurement of three Triton UAV for signal intelligence<sup>182</sup> is ongoing. German Armed Forces want to procure a capability for Signal Intelligence (SIGINT) in 2025, from the US, and other two in the following years. The Letter of Offer and Acceptance (LOA) by the US Navy is expected to be sent by July 2018.<sup>183</sup>

The Spanish company Indra has completed the development of one of the first prototypes of Unmanned Surface Vehicle (USV) within the so called Civil UAV Initiative, funded by Galicia region with an investment of EUR 150 million. The company will now launch the next development phase of this system, aiming at improving its capabilities to cover SAR missions, coastal surveillance, fight against smuggling and even environmental protection.<sup>184</sup>

The Netherlands is progressing in this capability area with the replacement of ScanEagle Systems by three Insitu Integrator UAV, scheduled to be delivered from 2018 onwards.<sup>185</sup> Belgium plans to invest EUR 70.9 million in a tactical UAV to be used in the maritime domain between 2016 and 2030.

## Cooperation

Many PMA31 countries are considering UAV and UUV capabilities as a key issue over the next years in order to improve ISR maritime capabilities and particularly maritime surveillance, MCM operations and explorations. Although most programs are currently planned on a national basis, several initiatives are growing this year at the bilateral and European level.

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<sup>180</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, cit., p.35.

<sup>181</sup> Vincent Groizeleau, "Drones aériens pour la marine: un démonstrateur du VSR100 va être réalisé", in *Mer et Maritime*, 12 January 2018, <https://www.meretmarine.com/fr/node/180538>.

<sup>182</sup> Lars Hoffmann, "German military to buy US Navy's Triton drones", in *Defense News*, 8 March 2017, <https://www.defensenews.com/air/2017/03/08/german-military-to-buy-us-navys-triton-drones>.

<sup>183</sup> German Ministry of Defence, *7. Bericht des Bundesministeriums der Verteidigung zu Rüstungsangelegenheiten*, cit., p. 141.

<sup>184</sup> "Indra avanza en el desarrollo de uno de los primeros drones marítimos con tecnología cien por cien española", in *Europa Press*, 1 October 2017, <http://www.europapress.es/economia/noticia-indra-avanza-desarrollo-primeros-drones-maritimos-tecnologia-cien-cien-espanola-20171001120051.html>.

<sup>185</sup> Mike Rees, "Insitu Integrator UAV selected by Netherlands MoD", in *Unmanned Systems Technology*, 1 June 2017, <http://www.unmannedsystemstechnology.com/?p=26562>.

At bilateral level, a Franco-British consortium cooperates in the Maritime Mine Counter Measures (MMCM) program. France and the UK reaffirmed this initiative within the last bilateral summit in Sandhurst in January 2018.<sup>186</sup> In the French defence long-term planning, the MMCM is included in the New mine-countermeasures force (SLAMF, *Système de Lutte Anti-Mines du Futur*) program as confirmed by the French military programming law.<sup>187</sup> The objective is to be able to deploy two naval units, four drones systems and three dipper bases by 2025. The UMS Skeldar is also produced by a joint venture between UMS aero and Saab. They develop together two VTOL, the Skeldar V-200 and the Skeldar V-350.

At the European level, a push has come by the recent implementation of PESCO, through the *Maritime (semi-)Autonomous Systems* (MAS) for the MCM project.<sup>188</sup> Finally, cooperative opportunities are also created by OCEAN2020, a Leonardo-led project involving 42 partners and 15 European countries. The project is funded by the Preparatory Action on Defence Related Research (PADR) within the European Defence Fund (EDF), to boost technological research in the naval domain through the integration of manned and unmanned platforms in surveillance and interdiction missions.<sup>189</sup>

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<sup>186</sup> UK Government, *United Kingdom-France Summit Communiqué*, 18 January 2018, <https://www.gov.uk/government/publications/uk-france-summit-2018-documents>.

<sup>187</sup> French Ministry of Armed Forces, *Projet de loi de programmation militaire 2019/2025: Rapport annexé*, cit., p. 51.

<sup>188</sup> It will involve Belgium, Greece, Ireland, Italy, the Netherlands, Portugal and Romania.

<sup>189</sup> Leonardo, *Leonardo to lead OCEAN2020 program, the first and most important European Defence Agency research tender for naval surveillance technology*, 12 January 2018, <http://www.leonardocompany.com/en/-/ocean-2020>.

# Annex I – Expenditure Estimate’s Explanation

## Introduction

This annex is meant to provide an explanation of the way the expenditure by PMA31 countries<sup>190</sup> has been estimated for each capability area, as mentioned in the “Estimated Expenditure” paragraphs of the present paper.

Since a number of problems in collecting and aggregating solid data has been found, the recourse to estimates and assumptions has been helpful in order to provide a meaningful picture. To this end, considerable effort has been put into developing and coherently using a methodology to elaborate the Estimated Expenditure paragraphs across the four chapters.

The following paragraphs present the general elements of the approach adopted. In addition to this overall explanation, further specific clarifications are made for each of the four chapters dedicated to the single capability areas.

## Number of Countries

A first issue regards the number of countries holding and/or investing in the four capability areas. As indicated in the sample below, the number of countries is not homogeneous across the four of them:

- Air-to-Air Refuelling (AAR) – 15 PMA31 countries: Belgium, Bulgaria, France, Germany, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Portugal, Romania, Slovakia, Spain, Sweden and the United Kingdom. This counting does not include four countries holding platforms which may be adjusted to carry out refuelling tasks: Austria, Denmark, Greece and Poland.
- Remotely Piloted Aerial Systems (RPAS) – 16 PMA31 countries: Belgium, Czech Republic, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal, Poland, Slovenia, Spain, Switzerland and the United Kingdom. This also includes the five countries which have invested in counter-UAS capabilities: Germany, Italy, Poland, Spain and Switzerland.
- Space-based capabilities for security and defence – eight PMA31 countries: Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Spain and the United Kingdom. This grouping gathers both countries investing in Earth Observation (EO) and Satellite Communication (SATCOM) programmes.
- In the case of Intelligence Surveillance Reconnaissance (ISR) capabilities in the maritime domain, the following sub-categories should be considered:
  - Maritime Patrol Aircrafts (MPA) – seven PMA31 countries: France, Germany, Greece, Italy, Norway, Poland and Portugal. Four countries have non-MPA aircraft which can be used for maritime patrol missions: Denmark, Estonia, Finland and Sweden.

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<sup>190</sup> Permanent Monitoring and Analysis of military capabilities and defence sector trends (PMA). Accordingly, the report covers 31 European countries (PMA31) over the first ten months of 2017.

- Naval helicopters with ISR tasks – 15 PMA31 countries: Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Italy, Lithuania, Norway, Poland, Portugal, Spain, Sweden, the United Kingdom.
- Naval units under 3,000 tons – ten PMA31 countries registered developments in this field: Belgium, Cyprus, Denmark, Finland, France, Italy the Netherlands, Poland, Spain and Sweden.
- Maritime Unmanned Aerial Vehicles (UAV) and Unmanned Underwater Vehicles (UUV) – 10 PMA31 countries: Croatia, Denmark, Estonia, France, Germany the Netherlands, Norway, Poland, Spain and Sweden.

## Available Sources

The following sources have been used to elaborate this Report:

1. Institutional sources from PMA31 countries, such as budgetary laws or decrees, financial documents, strategic documents, Parliamentary audits of government representatives;
2. Publications from think tanks and specialized press, i.e. The Military Balance published by the International Institute for Strategic Studies (IISS);
3. Articles from national and European media;
4. Press releases, i.e. from defence companies;
5. Background knowledge and interviews made by the PMA research team with relevant stakeholders.

Sources 1 is considered as primary source, most relevant in terms of reliability. Secondary sources 2-5 are considered as relevant complementary information in case of lack of primary ones or incomplete data.

## Variation across PMA31 Countries

Data is presented at different levels of detail across PMA31 countries. Moreover, some investments are interlocked in broader budgets. In these cases, the detailed breakdown may be itself classified or simply not sufficiently detailed, or scheduled to be released at a later date or on an ad hoc basis. Furthermore, budget lines, bureaucratic processes and accounting mechanisms are often dependent upon national specificities and calendars, which makes it difficult to achieve effective compilation of data and put together the estimated expenditure.

The availability of electronic sources has improved in this field, as many European countries now publish budget data and in some cases their full national budgets on the websites of the Ministry of Finance and/or the Ministry of Defence. However, some specific data may only be obtained through direct contacts with officials from the countries concerned. This means that every source utilised in this Report, including institutional ones, may present incomplete or unclear information, which has been re-assessed by the research team in order to reach the most accurate estimate possible.

## Multiannual Investments

However, investments are often part of multi-annual procurement programmes and available figures cover several years without providing precise information on their yearly allocation. In that case, figures for selected years have been estimated by evenly dividing the total amount of the investment by the number of years foreseen by the programme stated in the source. For this reason, estimated expenditures for capability area fluctuate between a minimum and a maximum amount. In particular, regarding the chapter on ISR capabilities in the maritime domain, the maximum amount has been calculated by adding the minimum threshold of budgets dedicated to the four capabilities to other national expenditure plans in the ISR domain which are not specifically focused on the selected four capability areas.

## Currency Exchange Rate

In case of currencies other than the Euro, the European Commission's (EC) currency converter has been used.<sup>191</sup> By doing so, the date of the source has been used to select the reference month for the exchange rate: i.e. if the source dates January 2018, January 2018 would also be selected when calculating the exchange rate in the EC online tool.

## Rounding

Estimated expenditures have been rounded to EUR million, according to the following rule for rounding off numbers: EUR 0.6 million or more are rounded at 1 million; EUR 0.5 million or less are rounded at 0 million.

## Specific Clarifications for Different Chapters

### Chapter 1 – Air-to-Air Refuelling (AAR)

In order to have a comprehensive analysis of the AAR sector, the Consortium has first of all identified the basis models held by PMA31 countries which have been designed to perform AAR, as well as the platforms which may be adjusted to carry out refuelling tasks. In this sense, two sources have been analysed. First, gathered data have been compared with the ones available on Military Balance 2018. Second, interviews have contributed to further refining data. This has been functional to assess the portion of the defence budgets allocated to platforms which may impact the overall PMA31 AAR capability.

In addition, as countries tend to spread investments throughout several years (i.e. in Belgium, France, Germany, Italy, Luxembourg, the Netherlands and the United Kingdom), the range of expenditure for selected years has been calculated by assuming that the total sum would be equally distributed throughout the years foreseen by the project (cf. paragraph 6). For instance, all data related to the

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<sup>191</sup> See European Commission website: *InforEuro. Monthly accounting rate of the euro*, [http://ec.europa.eu/budget/contracts\\_grants/info\\_contracts/inforeuro/index\\_en.cfm](http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm).

procurement of the Belgian A-330 MRTT have been retrieved from open source and, therefore, it is unclear whether the total amount of EUR 258 million will be entirely spent in 2018 or throughout the following years. Therefore, it has been estimated that the Belgian expenditure for A-330 MRTT in 2018 may range from zero to EUR 258 million.

Finally, no information for 2018 has been retrieved for Bulgaria, Lithuania, Portugal, Romania, Slovakia and Switzerland.

## Chapter 2 – Remotely Piloted Aerial Systems

Exact investments for 2018 were only retrieved from defence budgets for France, Italy, Poland, Spain and Switzerland. For instance, the Italian *Documento Programmatico Pluriennale 2017-2019* issued by the Ministry of Defence allocates EUR 5.7 million for the EURODRONE project and EUR 5 million for the maintenance of Predator systems.

In the case of Switzerland the final amount was calculated considering open source information only. In the Swiss case, in 2015 the country signed a contract valued EUR 229 million to be concluded by 2018: since there was no available data on the yearly allocation, the total amount has been evenly divided by the number of years foreseen by the programme to have the 2018 estimate.

The chapter also included a section on counter-RPAS systems. The Consortium has decided to concentrate on assets meant to counter mini, micro up to tactical UAS. This decision has stemmed from the need to maintain a certain degree of homogeneity among the different platforms analysed. In this sense, information was retrieved only for Germany, Italy, Poland, Spain and Switzerland.

## Chapter 3 – Space-based capabilities for Security and Defence

The third chapter differentiated the space-based capabilities for security and defence into two parts: SATCOM and EO.

The chapter has taken into account information available on national defence budgets (France, Germany, Italy and Spain) as well as on secondary sources (Belgium, Luxembourg, the Netherlands and the United Kingdom).

Precise data for 2018 was easier to find both for France and Italy. One of the clearest examples was the French Defence Law, where a clear breakdown of resources has allowed the Consortium to identify precise data for the analysis.

In some cases (Belgium, Germany, Luxembourg and the Netherlands) it was not possible to retrieve exact figures for 2018, also due to the fact that several of the considered programmes are spread across multiple years.

## Chapter 4 – ISR Capabilities in the Maritime Domain

The chapter encompasses a variety of platforms, thus being of greater complexity than the others. ISR functions are performed by a greater number of military assets, ranging from submarines to fighter aircraft, particularly in the context of Network Enabled Capabilities. However, a perimeter of analysis had to be defined in order to provide a strategic picture, and therefore the following capabilities have been considered according to the relevance of their ISR tasks:

- MPA.
- Naval helicopters with ISR tasks.
- Naval units under 3,000 tons.
- Maritime UAV and UUV.

For instance, investment in other types of vessels under 3,000 tonnes or purely mine-counter-measure vessels are outside the scope of this Report. One exception is the French programme *Système de Lutte Anti-Mines Futur* (SLAMF) programme, which is a combined investment in UAV, UUV and mine countermeasure vessels for a total of EUR 27 million allocated for 2018. Since it is difficult to split expenditures devoted to UAV to those allocated to UUV for this programme, it has been estimated that investments on UUV and UAV may range from zero to EUR 27 million.

In this context, the estimated expenditure has been calculated by taking into account the total investment dedicated to two types of assets performing not only ISR functions, namely corvettes approaching the 3,000 tons limit endowed with anti-aerial capacities, as well as naval helicopters whose main mission is Search and Rescue (SAR) and/or Anti-Submarine Warfare (ASW). As a result, the whole estimated expenditure is somehow larger than the one strictly covering ISR capabilities in the maritime domain.

With regards to each sub-capability area, Croatian, Italian and Spanish budgets have not been included in the respective list because of the absence of detailed expenditures specifically allocated to one of these capabilities. Therefore, these budgets are only included in the overall PMA31 countries estimated expenditures dedicated for ISR capabilities in the maritime domain.

Despite the efforts made to estimate investments, the overall expenditure allocated by PMA31 countries to UAV and UUV remains particularly unclear for several reasons. Firstly, albeit widespread Research and Technology (R&T) and Research and Development (R&D) activities related to UUV, these programmes may be configured as engineering projects aimed at developing technologies and demonstrators not necessarily related to defence requirements. However, the strong reliance upon dual-use technologies may turn R&T and R&D activities into military procurement programmes. Secondly, when PMA31 countries allocate funds to R&T and R&D activities for UAV and/or UUV, sufficient sources have rarely been found to estimate a plausible range of expenditure. This is also caused by the lack of real military procurement programmes in this sector.

## List of Acronyms

AAR	Air-to-Air Refuelling
ACE	Arctic Challenge Exercise
AGS	Alliance Ground Surveillance
ASW	Anti-Submarine Warfare
Athena-Fidus	Access on Theatres and European Nations for Allied forces – French Italian Dual Use Satellite
AUDS	Anti-Unmanned Aerial Vehicles Defence System
AVSIMAR	Avions de surveillance et d'intervention maritime
BAAINBw	Bundesamt für Ausrüstung, Informationstechnik und Nutzung der Bundeswehr
BAC	Buque de Aprovisionamiento de Combate
BAM	Buque de Acción Marítima
BATSIMAR	Bâtiments de surveillance et d'intervention hauturiers
BND	Bundesnachrichtendienst
B2M	Multi-mission ships
CAEW	Conformal Airborne Early Warning
CARD	Coordinated Annual Review on Defence
CDU	Christlich Demokratische Union Deutschlands
COMCEPT	Complément de Capacités en Elongation, Projection et Théâtre
COMSAT NG	Communication par satellite de nouvelle generation
COSMO-SkyMed	Constellation of small Satellites for Mediterranean basin Observation-SkyMed
CSG	2nd generation of Cosmo SkyMed systems
CSO	Composante Spatiale Optique
CSU	Christlich-Soziale Union in Bayern
CZK	Czech Republic Koruna
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
DIRCM	Directional Infrared Counter Measures
DGA	Direction générale de l'armement
EASA	European Aviation Safety Agency
EATC	European Air Transport Command
EC	European Commission
EDA	European Defence Agency
EDF	European Defence Fund
EDRS	European Data Relay System
EEAS	European External Action Service
EEZ	Exclusive Economic Zone
EI2	European Intervention Initiative
EO	Earth Observation
ESA	European Space Agency
ESCPC	European Satellite Communications Procurement Cell
EU	European Union
EUR	Euro
FCAS	Future Combat Air System
FMS	Foreign Military Sales
GBP	Great British Pound
GOVSATCOM	Governmental Satellite Communications
G2G	Government-to-Government
H	Hours
HARMSPRO	Harbour & Maritime Surveillance and Protection
IISS	International Institute of Strategic Studies
IS	Islamic State
ISR	Intelligence Surveillance Reconnaissance
ISTAR	Intelligence Surveillance Target Acquisition
Kg	Kilos

Km	Kilometres
l	Liters
LOA	Letter of Offer and Acceptance
LoI	Letter of Intent
MALE	Medium Altitude Long Endurance
MAS	Maritime (semi-) Autonomous Systems
MAWS	Maritime Airborne Warfare Systems
MCCE	Movement Coordination Centre Europe
MCM	Mine Counter Measures
MENA	Middle East and North Africa
MILSATCOM	Military Satellite Communications
MMCM	Maritime Mine Counter Measures
MMF	Multinational Multi-role tanker transport Fleet
MoD	Ministry of Defence
MPA	Maritime Patrol Aircraft
MRO	Maintenance, Repair and Overhaul
MRTT	Multi Role Tanker Transport
MS	Member States
MUSIS	Multinational Space-based Imaging System
M3A	Maritime Multimission Aircraft
NATO	North Atlantic Treaty Organisation
NOK	Norwegian Krone
NPR	Nuclear Posture Review
NSP2K	NATO SATCOM Post 2000
NSS	National Security Strategy
OCCAR	Organisation Conjointe de Coopération en matière d'Armement
OPV	Offshore Patrol Vessels
OPTSAT	Optical Satellite
ORFEO	Optical and Radar Federated Earth Observation
PADR	Preparatory Action on Defence Related Research
PATMAR	Programme d'avion de patrouille maritime
PESCO	Permanent Structured Cooperation
PLN	Polish Zloty New
PMA	Permanent Monitoring and Analysis of military capabilities and defence sector trends
PMA31	31 European countries covered by PMA report
P-DUGS	Cosmo-Sky Med End User Ground Segment
RPAS	Remotely Piloted Aircraft Systems
R&D	Research and Development
R&T	Research and Technology
SAR	Search and Rescue
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SATCOMBw	Satellitenkommunikation für die Bundeswehr
SDAM	Systèmes de drones Aériens pour la Marine
SECOMSAT	Sistema de Comunicaciones Militares por Satélite
SEOSat	Spanish Earth Observation Satellite
SES	Société Européenne des satellites
SIGINT	Signal Intelligence
SICRAL	Sistema Italiano per Comunicazioni Riservate e Allarmi
SLAMF	Système de Lutte Anti-Mines Marines Futur
SPOT	Satellite Pour l'Observation de la Terre
SPD	Sozialdemokratische Partei Deutschlands
Syracuse	Systeme de Radio Communications Utilisant un Satellite
T	Tons
TanDEM-X	TerraSAR-X-Erweiterung für digitale Höhenmessungen

UAV	Unmanned Aerial Vehicles
UCAV	Unmanned Combat Air Vehicle
UK	United Kingdom
UNPAV	Unità Polivalente ad Altissima Velocità
US	United States
USD	United States Dollar
USV	Unmanned Surface Vehicle
UUV	Unmanned Underwater Vehicles
VTOL	Vertical Take Off Landing
WGS	Wideband Global Satellite Communications