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Executive Summary

This Research Paper considers the role of Italian fighter aircraft in missions abroad in the post-Cold War period, the current Air Power's trends and doctrinal evolution, as well as possible future scenarios of crisis management operations in the "Enlarged Mediterranean" envisaging the use of fighter aircraft. On the basis of such analysis, the needs of Italian military concerning fighter aircraft are outlined, and the possible procurement options to satisfy them are discussed. The last chapter addresses the Italian participation in the F-35 procurement programme and its industrial aspects.

The first chapter is aimed to outline the role of Italian fighter aircraft in crisis management operations that occurred in the last 24 years. Several missions abroad have been considered: the First Gulf War in Iraq (1991), the NATO operations in Bosnia-Herzegovina (1993-1998), in Serbia and Kosovo (1999) and Afghanistan (2001-2014), as well as the multinational air campaign in Libya in 2011, which came under NATO command after the first phase.

In the First Gulf War, under a UN mandate, the US led a "coalition of the willing" including 35 countries to conduct Operation Desert Storm aimed at freeing Kuwait territory occupied by Iraq. The bulk of air sorties was flown by the US (89,1%), while a non-marginal contribution was provided by the UK, Saudi Arabia, Kuwait, France and Italy. In particular, Italy deployed 8 Tornado which flew 2,326 sorties during the 40-day long air campaign. The military operation ended when Iraq withdrew its forces from Kuwait and accepted the ceasefire conditions.

Between 1993 and 1998, under UN mandate, NATO undertook several operations to deal with the civil war in Yugoslavia and particularly in Bosnia-Herzegovina. They included: Operation Sharp Guard in sup-

port of maritime embargo to combatants (1993-1996); Operation Deny Flight aimed to enforce a No-Fly Zone (NFZ) over Bosnia-Herzegovina (1993-1995); Operation Deliberate Force to protect UN-declared "safe areas" by targeting Bosnian Serb military capabilities (1995); Operation Joint Endeavour (1995-1996) a peace-keeping ground mission with considerable air support including fighter aircraft; finally Operation Deliberate Guard to support Operation Joint Guard (1996-1998). Italy contributed to all missions by deploying Tornado, AMX and AV-8B, conducting 5,023 sorties and flying for 11,973 hours. Italy also provided the military bases and the logistics support indispensable to conduct these operations. The set of NATO crisis management operations was instrumental to force the various Yugoslav parties to sign the Dayton Agreement in 1995, and to enforce it in the following years.

On March 1999 NATO undertook Operation Allied Force, aimed to put an end to the armed repression of Kosovar minorities conducted by the Serbian military and paramilitary forces. The air campaign lasted for 78 days with intense bombing against Serbian targets. Italy contributed with approximately 50 aircraft, including F-104, Tornado, AMX, reaching up 1,072 sorties and 2,903 hours of flight. Overall, the quantitative and qualitative effort of the Italian forces was highly regarded, as Italy was the third largest European contributor of aircraft and the fourth largest European in terms of number of air sorties. In particular, Tornado were utilized for Suppression of Enemy Air Defence (SEAD) tasks. As already happened for the operations in Bosnia-Herzegovina, Italian military bases and logistics support proved to be essential to conduct the air campaign. The operation ended in June 1999 with a military agreement between NATO and Serbia which envisaged the complete withdrawal of Serbian forces from Kosovo. The UN Security Council resolution 1244/1999 paved the way for the subsequent NATO peace-keeping mission in Kosovo.

Since 2001, the United States started operation Enduring Freedom in Afghanistan, with the contribution of several European countries comprising Italy, to undermine terrorist activities from groups linked to Al-Qaeda. Concerning the aerial component, the Italian contribution was mainly effectuated by AV-8B deployed on the Garibaldi aircraft carrier from 2002 to 2006, which carried on Intelligence, Surveillance and Re-

connaissance (ISR) and Close Air Support (CAS) operations, amounting to 328 sorties and 860 hours of flight. In the meanwhile and starting from 2001, the International Security Assistance Force (ISAF) has been deployed in Afghanistan under a UN mandate, in order to actively support the establishment of a peaceful and stable Afghan state that will not collude with Al Qaeda or other terrorist groups threatening NATO members. In August 2003, NATO took over the command of ISAF and extended the area of operation to cover the entire country with the contribution of fifty NATO members and partners. Italy has participated to ISAF since 2002. Italian General Mauro Del Vecchio took command of the whole ISAF operation between 2005 and 2006. Since the establishment of ISAF Regional Commands in 2006, Italy has maintained the Regional Command West. As of February 2014, Italy had 2,165 units on the ground, ranking fourth among contributing nations. Concerning air capabilities, in 2007 the Joint Air Task Force was established in Kabul as part of the Regional Command West. As of 31st December 2013, the fighter aircraft deployed by Italy, including Tornado, AMX and AV-8B, conducted a total of 3,301 air sorties in theatre, and 8,477 flight hours. Most sorties concerned ISR activities, but fighter aircraft were also used for CAS to ground troops engaged with insurgents. The ISAF mission is set to last until the end of 2014, when the transition of security responsibilities to Afghan national security forces and civilian authorities will be completed.

The reasons that led some NATO countries to plan and conduct a prolonged air campaign in Libya in 2011 are still a contentious issue and an object of studies and analysis. In March 2011 the UN Security Council resolution 1973 authorized the use of force, including the establishment of a NFZ to protect civilians and civilian areas targeted by the Gaddafi loyalist forces. On 19 March the US-led operation Odyssey Dawn started with French and British military support. On 31 March, NATO formally assumed command of the Operation Unified Protector, which lasted until 31 October 2011. Both operations resulted in the establishment and enforcement of a NFZ over the entire Libyan territory, as well as in targeting of Libyan government's military and paramilitary forces. The military operation ended with the collapse of the Libyan government, without, nonetheless, any follow-up NATO mission to support the stabilization of the country. Italian military contribution was three-fold. First, in a

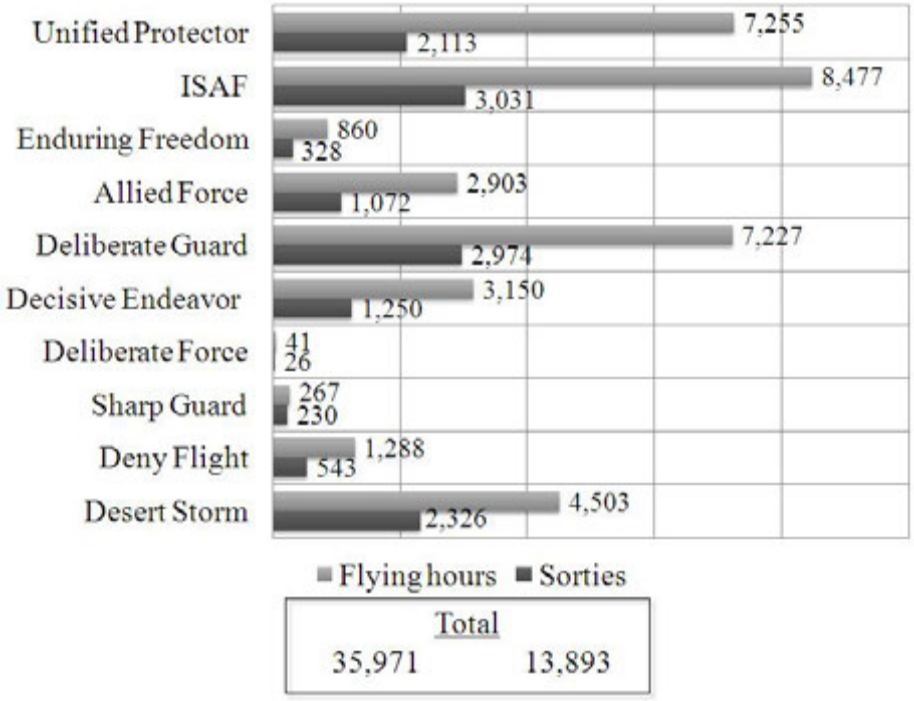
chronological order, the Italian Navy led the NATO naval operation to enforce the UN arms embargo. Second, the use of military bases in the Italian territory was crucial to carry on operations, which could not have been possible without such a large footprint close to the operational theatre. Third, and most importantly for the focus of this study, Italian aircraft conducted about 7% of the total allied missions in the Libyan skies. The bulk of committed Italian air capabilities were fighter aircraft including F-16, AMX, AV-8B, Eurofighter and Tornado. These aircraft executed different types of missions, such as SEAD, Defensive Counter Air (DCA), Offensive Counter Air (OCA), Strike Coordination and Reconnaissance (SCAR) and ISR activities. The Italian armed forces totalled 2,113 sorties flown and 7,255 flight hours during operations in Libya, being this the largest air campaign Italian Air Force has been engaged in since World War II.

Considering the aforementioned 10 air operations,[1] Italy has deployed its fighter aircraft 90% under UN Security Council mandate, and 80% under NATO's chain of command and control. This insight shows not only Italy's deep integration and commitment to those organizations, but also the strong influence of a globalized international system which requires the management of crises by the whole international community. Moreover, Italy's operational participation in missions abroad envisaging the use of Air Power has grown in qualitative and quantitative terms over the last 24 years.

Italy's use of fighter aircraft in the post-Cold War period has gone hand in hand with developments occurred in Air Power's doctrine. The second chapter of this Research Paper outlines the doctrine fundamentals and trends stemming from the recent operational experience, with the aim to understand current and possible future ways to utilize air capabilities, including fighter aircraft. Air Power is defined as the capacity to project power in the air to influence people's behaviour and the course of events. Coupled with increasingly capable technology, Air Power is a flexible, rapid, 24/7 available tool to influence the operating

[1] Desert Storm, Deny Flight, Sharp Guard, Deliberate Force, Decisive Endeavour, Deliberate Guard, Allied Force, Enduring Freedom, Unified Protector, and International Security Assistance Force (ISAF).

Figure 1. Italian Air Force activities in international missions



environment. As a result, Air Power can be considered as a force multiplier for deployed land and maritime military forces.

Overall, it is possible to identify four main roles in which Air Power finds its concrete application: Control of the Air; Intelligence, Surveillance, Target Acquisition, Reconnaissance (ISTAR); Engagement; Air Mobility. The first three roles are particularly relevant in relations to fighter aircraft. Achieving Control of the Air means being free to use a specific volume of airspace in a given period of time for one's own purposes, while denying its use to others, if necessary. Thanks to the acquisition of information, ISTAR activities contribute to planning activities and decision making during all air operations' phases. It improves the ability to gain and maintain information superiority, and aims to achieve Situational Awareness, that is having a full comprehension of the operational situation in theatre. In terms of Engagement, Air Power role includes various types of strike missions, with maritime and terrestrial targets.

In this context, some important trends seem to emerge from air op-

erations conducted in these latest 24 years. First, the recent operational experience has raised awareness at the political-strategic level that complex air operations require the availability of all air components to perform the four Air Power's roles, and that air capabilities are more and more intertwined among each other. Second, ISTAR is not provided only by dedicated platforms, such as the Remotely Piloted Aircraft Systems (RPAS), but by a number of sensors and systems embedded in a wide and complementary range of aircraft, including fighter. Third, Control of the Air should not be taken for granted: in Libya (2011), Kosovo (1999) and Iraq (1991) the priority of the first days of operations was still to ensure coalition's Control of the Air by destroying opponent command and control structures, most of its air defence fixed systems and combat aircraft. Fourth, with regard to Engagement, the use of Precision Guided Munitions (PGM) has exponentially grown from the First Gulf War to the Libya campaign. In the future, the need to attack individual targets accurately will continue to be paramount, especially to limit the number of collateral damages in highly populated areas.

Building on the analysis of previous crisis management operations, as well as on trends and doctrinal evolutions of Air Power, the third chapter of this Research Paper presents two scenarios, showing how air capabilities, in particular fighter aircraft, may be used in crisis management operations in the 2015-2025 timeframe. In the first scenario, it is exposed how air operations are undertaken to establish and enforce a NFZ, while the second outlines how air operations support land operations. Each scenario has been redacted on the basis of the same structure, which includes the following elements: Strategic Context; Mission Objectives; Critical Factors of the Operational Environment; Adversary Capabilities and Course of Actions; Air Component Course of Actions and Associated Capabilities.

Despite this Research Paper does not address the likelihood of these two scenarios, it is assumed that they are at least possible examples of air operations European countries such as Italy may join in the future. As a matter of fact, Italian fighter have been deployed in different contexts, that is in an interstate war (Gulf), in civil conflicts (Bosnia-Herzegovina, Kosovo and Libya) and in a failed state with some typical connotations of insurgency and civil war (Afghanistan). Indeed, armed conflicts will still

be a feature of the international security environment in the medium-long term, with conflict areas particularly concentrated in Africa, Middle East and East and South Asia. The phenomenon of "failed states" will also remain on the scene for long, especially if the level of violence in the aforementioned regions will not decrease. In this context, it is possible to imagine the future employment of fighter aircraft in those regions, either for combat or stabilization purposes. As one might argue that NATO will never go "that out of area," one might reply that probably at the end of the Cold War none would have expected to see NATO running peace-keeping operations in Kosovo first and in Afghanistan later, or carrying on military interventions in the Balkans and in Libya.

The analysis of past operational experiences, Air Power's trends and possible future scenarios of air operations pose a number of key questions that should be asked to Italian policy-makers, including civilian authorities – in primis the Parliament and the Government – and the armed forces. Therefore, the fourth chapter of this Research Paper aims to address such questions, to discuss the related procurement's needs of the Italian military, and finally to assess whether the F-35 procurement programme might be able to satisfy those needs or not.

The first key question is whether Italian participation in crisis management operations together with European and North American allies does serve national interests. The changes occurred in the international context make national interests affected by crisis, risks and threats occurring well beyond territorial borders. Globalization and economic interdependence have obviously played a fundamental role in this regard. The Italian participation in crisis management operations in the last 24 years has contributed directly or indirectly to protect and promote national interests. For example, the stabilization of Bosnia-Herzegovina, Kosovo and, generally speaking, the Western Balkans was a clear, direct national interest. Since the early 1990s, Italy had suffered both the flows of illegal immigrants from these regions and the emergence of illicit traffics or the development of organized crime. For that reason, international missions, including those conducted through Air Power, have been instrumental to pacify and stabilize a geographical area extremely close to the Italian soil and linked to Italy's economic system.

Italian participation in other missions abroad has served national in-

terests in a more indirect way. For instance, the active participation in NATO operations represents an investment in a kind of "insurance policy" for Italy's national security. Italy does not have sufficient capabilities to protect alone its security interests. In effect, they stretch well beyond national borders and include: safe trade routes in the "Enlarged Mediterranean," energy supplies from North Africa, Middle East and Central Asia, border control in the Mediterranean in relation to illegal immigration and maritime security. An active, reliable and stable Italian participation in all NATO missions is instrumental to gain the necessary credibility to push the Alliance to deal with the purposes of Italian international agenda. Furthermore, being these crisis management operations set up and led by international organizations, it allows Italy to share security risks and costs, to extend its intervention's range to protect national interests, and to enhance inter-allies solidarity. Finally, Italian participation in missions abroad is also a manner to maintain strong relations with its main security ally, the US. Being surrounded by unstable regions – from Western Balkans to the Southern Mediterranean shores – and unable as a "middle power" to shape the events in these regions on its own, Italy has traditionally relied on "asymmetric alliances" with stronger partners (such as the US) to address common security concerns. Italian participation in crisis management operations foreseeing the use of Air Power does not guarantee per sé the protection of Italy's national interests. Such protection depends, among other things, by the capacity of the Italian government to make the best of the military contribution provided vis-à-vis the allies. In this regard, Italy's participation in missions abroad, which also includes air operations, is a fundamental enabler for Italian defence and foreign policy.

If it is assumed that maintaining the capacity to project Air Power in crisis management operations does serve Italian defence and foreign policy, and ultimately Italy's national interests, the second key question is what kind of air capabilities are needed. As a matter of fact, the fighter aircraft fleet used so far will be phased out in the next decade. There is thus an unavoidable need to replace 253 aircraft belonging to three different line-ups, including 18 AV-8B of the Navy, 136 AMX and 99 Tornado of the Air Force. Many of them have been built in the 1980s, or even in the 1970s, and as far as their life-cycle reaches 35/40 years, they can-

not guarantee safety conditions to the aircrew anymore. Besides, one should consider that, although RPAS are likely to complement future air fleets, they will not yet replace manned fighter aircraft completely. In this regard, to identify Italian future air capabilities' needs, several lessons can be learned from missions considered in this study. First of all, interoperability constitutes a crucial requirement, since Italian aircraft – both from the Air Force and the Navy – have always operated within international coalitions. Second, the capacity to connect fighter aircraft to other platforms, from units on the ground to the command and control centres is fundamental: the aircraft should be "net-centric," that is being fully able to gather and disseminate information from and to the other nodes of the net. A third crucial need is the radar low-observability (also called "stealthness"), as it greatly reduces the chances of an aircraft to be shut down by the opponent air defence system. Finally, the fact that all considered crisis management operations have taken place beyond national territory makes "deployability" at strategic distance another fundamental need for air capabilities.

If it is assumed that keeping the capacity to project Air Power through crisis management operations does serve Italian defence and foreign policy, and ultimately Italy's national interests; if it is assumed that current Italian fighter aircraft fleet needs to be replaced by aircraft which should be interoperable, net-centric, low-observable and deployable; then the next key question for policy-makers is what procurement options are available to acquire the kind of air capabilities needed by Italy. In theory, a first option is to develop a European procurement programme bringing together the main European countries in terms of defence capabilities, namely France, Germany and the UK, aimed to develop a 5th generation fighter aircraft. Such an investment should have been done in the mid-1990s in order to deliver a fighter capability by 2020. Yet, this has not occurred, either because European countries preferred to invest in national procurement programmes, like France for instance, or because they preferred to cut the defence budget and so benefit from the so-called "peace dividends", as Germany did. As today there is no political will in Europe to invest in this kind of programme, such procurement option remains off the table because of the choices made by major European countries back in the 1990s. A second theoretical option for

Italy, in order to obtain needed air capabilities to replace old ones, would be to develop and build a ground-attack version of the Eurofighter, the fighter aircraft designed by Germany, Italy, Spain and the UK in the 1980s, with a full 5th generation strike capacity. Again, this option should have been undertaken at maximum in the early 2000s, through significant European joint investments in research and development activities, aiming to modify an aircraft which was not originally designed to fulfil such a ground-attack role. Given that members of the Eurofighter consortium were (and are) not willing to undertake this path, therefore this option is off the table too.

The third and last option to satisfy Italian military needs in terms of air capabilities is to acquire F-35 aircraft. It has been estimated that more than 3,000 F-35 units will be procured, 2,443 of them for the US armed forces, and the rest for other 12 countries (Australia, Canada, Denmark, Italy, Israel, Japan, the Netherlands, Norway, Singapore, South Korea, Turkey and the UK). This will permit high level of interoperability to those countries taking part to the procurement program. The F-35 presents all the advanced features typical of 5th generation fighter aircraft: it is equipped with sensors and computing capacity for data fusion in a net-centric perspective; its low observability is ensured by a number of elements, including its airframe's design, the configuration of its internal bays where weapons are stored and a specific type of painting. Moreover, the F-35 internal bays avoid that weapon's systems located on the external side would damage aircraft's aerodynamic, its speed or manoeuvrability; in turn, this diminishes fuel consumption while favouring the aircraft range and deployability. The latter is greatly augmented by the presence of a specific version of the F-35 (F-35B) capable of vertical take-offs and landing from aircraft carriers, for instance from Italian Cavour carrier. This is particularly important for Italy in order to maintain Navy's air capabilities, so far guaranteed by AV-8B aircraft.

If it is assumed that the F-35 is the only available option to procure an interoperable, net-centric, low-observable and highly deployable fighter aircraft to satisfy Italy's military needs to participate in crisis management operations, the last key question for policy-makers regards how to acquire this aircraft. In principle, two ways are available: either to participate in the procurement programme, or to buy F-35 "off-the-

shelf" that is on the marketplace. From a military point of view, participating in the procurement programme generates several positive outcomes. First, it boosts the "operational sovereignty" – that is the possibility to have platform, weapons' system and ISTAR's functions at your complete disposal, without relying on third parties for technology, updates, security of supply of various components – which is clearly reduced, if not depleted, in case of "off-the-shelf" acquisitions. Second, it allows Italian pilots to start as soon as possible their training with partners' aircrews – particularly US ones – thus enjoying immediate benefits in terms of interoperability. Eventually, the construction of the Final Assembly and Check Out (FACO) of Cameri, as part of the procurement programme, implies that the Italian Ministry of Defence will not have to spend more to build another facility to maintain and upgrade the 90 F-35 Italy has committed itself to buy for the Air Force and the Navy. Indeed, FACO is already set to become the Maintenance Repair Overhaul and Upgrade (MRO&U) center for F-35 based in Europe. Regarding the timeline of F-35's acquisition and its related cost, Italy has chosen to wait the sixth tranche of Low Rate Initial Production (LRIP) to buy its first aircraft at the cost of around 130 million dollar, way less in comparison to the 230 million dollar of the first aircraft produced. The cost at the full rate production is estimated to decrease at 85 million dollar per unit.

The fifth and last chapter of this Research Paper discusses the industrial aspects of the F-35 multinational collaboration and the Italian participation in the procurement programme. Italy participation in the F-35 programme began in 1998 when the left-wing government decided to invest 10 million dollar in the Concept Demonstration Phase. In 2002, the Italian right-wing government confirmed this choice by committing 1,028 billion dollar in the System Design and Development Phase. In 2007, the left-wing government signed the bilateral Memorandum of Understanding (MoU) with the US for the Production, Sustainment, and Follow-on Development Phase, with an investment of 904 million dollar. In 2009, the Italian Parliament approved the acquisition of 131 F-35. At the same time, Italy decided to build the FACO/MRO&U facility at Cameri. In 2012, the Italian government reduced the overall fleet number of F-35 from 131 to 90 (60 F-35A and 30 F-35B). Since Italy is involved in the F-35 programme as Level 2 partner, sharing roughly 4% of

the total cost, it has limited opportunities to influence aircraft's requirements.

The F-35 entails a radical change of the way to envisage a multinational procurement programme in the defence field. In fact, it is based on the principle of "best value for money", which implies a certain degree of competition among suppliers to offer the best price/quality ratio to the prime contractor – Lockheed Martin. This is quite new considering Italian industry's past experience in programmes based on the "juste retour principle", whereby cost-share divided among participating governments must equal the work-share among national industries composing the industrial consortium. Nevertheless, it has been considered necessary to apply these two concepts – competition and best value for money – with certain flexibility to avoid to "overstress" the supply chain. For instance, Lockheed Martin foresees the possibility of signing agreements with two different suppliers of a given item, as it deems strategic to having more than a single supply source – the so-called "strategic second sources" method. This is the case of the Finmeccanica company Alenia Aermacchi that has a "strategic second source" status for the F-35 wings.

The majority of supplier agreements with Lockheed Martin have a one-year term, as the US government decides the number of F-35 to be purchased year by year, influencing the production planning of the prime contractor. Such a management system seems to overstress the supply chain and it does not encourage sub-contractors to adopt long-term investments plans, because it has to take on its own the risk to make investments without the assurance that the volume of production will be guaranteed in the next years. Another critical issue regards the lack of Italian industries' participation in development and integration phases, characterized by a greater use of high technologies. Obstacles are mainly, but not only, due to US regulation such as the International Traffic in Arms Regulation (ITAR), as well as to American National Disclosure Policy.

Around 90 Italian companies are involved in the procurement programme, and so far the contracts awarded to the Italian industries have reached an overall value of 715 million dollar. Of this amount, 565 million dollar are related to the Finmeccanica group, mainly through Alenia Aermacchi, which is responsible for the construction of more than 1,200

wings. The term "wings" includes both the two semi-wings – more than 2,400 units – and the central cell of the aircraft holding them together, being this 30% of the entire airframe with significant engineering challenges. Concerning Small and Medium Enterprises (SMEs), they proved to be flexible and adaptable in offering the best value for money within the F-35 programme. However, they suffered more than larger contractors the one-year contracts approach, this practice discouraging them to make long-term investments.

The procurement programme presents potential revenues around 10 billion dollar for Italian industries, but this will depend on the ability to exploit the infrastructures created – first and foremost the Cameri FACO/MRO&U – to build components and to provide maintenance, support and upgrade, in particular regarding avionics and electronics. The Cameri site includes: a FACO facility to assemble the Italian F-35A and F-35B variants, the F-35A procured by Netherlands, and potentially the aircraft to be procured by other European partners such as Denmark and Norway; a wing construction facility which serves the entire procurement programme; the aircraft test facility aimed at testing low-observable performance, and the related final paint facility; buildings aimed to support F-35 operating by the US and allies in Europe. Being the only FACO outside US territory, Cameri represents a fundamental asset for the entire F-35 global production and maintenance system. Maintenance will also introduce significant technological developments and innovation because it will go hand in hand with the platform's upgrade and revision throughout its whole life-cycle of 30/40 years.

As a whole, the Italian participation in the procurement programme presents pros and cons, opportunities and challenges. In other past programmes, based on the juste retour principle, negotiations largely ended when the agreement on cost-share and work-share was reached. This is not the case of the F-35 programme. The new procurement approach based on the best value for money principle has imposed on the Italian industry to become more competitive and to take more risks in managing its own investments. It also requires the Italian military and government to assist the industry in this regard, by making an additional and constant effort in negotiating with US counterparts on technology transfer and other relevant aspects of the procurement programme.